



Japan International Cooperation Agency

**PREPARATORY SURVEY FOR METRO MANILA
SEWERAGE AND SANITATION
IMPROVEMENT PROJECT- PHASE-2**

FINAL REPORT

VOLUME 3

JULY 2011

OEC ORIGINAL ENGINEERING CONSULTANTS CO., LTD.

SAP
CR(3)
11-043

PROJECT STUDY AREA MAP

EXECUTIVE SUMMARY

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MEASUREMENT UNITS

ABBREVIATIONS

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 (Source: DENR 2003-30 Procedural Manual)

MEASUREMENT UNITS

Length

mm - millimeter
cm - centimeter
m - meter
km - kilometer

Area

sq m - square meter
sq km - square kilometer
ha - hectare

Weight

g, gr - gram
kg - kilogram
t - ton

Time

s, sec - second
min - minute
hr - hour
dy - day
mon - month
yr - year

Volume

cum - cubic meter
l, ltr - liter
mcm - million cubic meter

Speed

cm/s - centimeter per second
m/s - meter per second
km/h - kilometer per hour

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Annex 1

INITIAL ACTIVITIES AND FIELD SURVEY

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1 Approach of Implementation for the Study

Main purposes of the initial site surveys for Preparatory Study (PS) of the project and the approaching process are as follows.

1.1 Preparative Activities and Interim Submittals

The field investigation as the project works expected in the contract area and the ordering performance processes are as follows.

- a. Identify drainage water ways and flows in each sub-basin.
- b. Identify drainage discharge points into the water catchment.
- c. Fix and define the sub-basin border lines.
- d. Select and recommend the sewage treatment sites for each sub-basin.
- e. Decide combined interceptor installation lines to the wastewater treatment plant from existing drainage discharge points.
- f. Decide the installation positions of manhole pumps and manholes in the interceptor lines.
- g. Execute wastewater quality analysis at the points selected during the site survey.
- h. Identify the electric power distribution lines and decide the electric power receiving points and recommendation of the power supply distribution lines to the points for manhole pumps and STPs.
- i. Select initial sewerage treatment system establishment plan with the conceptual designs and specifications (treatment plants and combined interceptors with manholes and manhole pumps).
- j. Conduct geographical and topographical surveys related to the sewage treatment plant conceptual designs.
- k. Prepare the field data and evaluation on the fact findings for the sewerage treatment system design preparation and the collection systems with the conceptual design drawings, technical specifications and cost estimation of them.
- l. Prepare interim report.

Regarding the feasibility study reports, the interim report shall be prepared and submitted through the field investigation and evaluation works. **Table 1** shows the detail Survey Team activities.

Table 1 Survey Team Activities

Duties	Works	Outputs		
<p>1. Project area check and assess on Paranāque Basin of the following sub-basins:</p> <ul style="list-style-type: none"> ♦ 7 sub basins in Paranaque Bsn ♦ 39 subsub basins in Paranaque city ♦ 19 subsub basins in Las pinas City 	1.1 Ste investigation of drainage, roads, creeks, discharging water receiving bodies with the features such as natural or concreting, pavement, covering over situations, plantings, odor and garbage problems, etc.	<ul style="list-style-type: none"> ♦ Sub-basin boarder lines ♦ Existing drainage, creeks, esteros location map ♦ Current conditions of infrastructural facilities 	Site Investigation and Assessment Report (Part of Feasibility Study Report)	
	1.2 Identify topographical/geographical terrain to decide water flow direction, and drainage or interceptor installation routes.	<ul style="list-style-type: none"> ♦ Facility list requiring repair and rehabilitation with explanatory. 		
	1.3 Identify the plant construction site candidates and illegal occupation of land or road, current land owners, the site positions and adjacent lands or waterways. To decide the plant construction sites.	<ul style="list-style-type: none"> ♦ Facility list requiring to add creeks, drainage and roads with location, specification 		
	1.4 Determine water sampling positions to analyze the water qualities.	<ul style="list-style-type: none"> ♦ Sewerage Treatment Plant sites to be recommended with interceptors and with interceptors 		
	1.5 Fact-finding of any obstructions, hampers, or difficulties to be resolved before implementation of the sewerage treatment system construction.	<ul style="list-style-type: none"> ♦ Overflow records 		
	1.6 Research or audit the site area physical conditions such as maximum flood level on past 10 years on gland and receiving bodies, local political problems to construct road or buildings, cutting greens, landscape conservation act or regulations, etc.	<ul style="list-style-type: none"> ♦ Conversion manhole positions with interceptor routes and specifications 		
	1.7 Possible STP land Candidates with treatment capability and construction maximum sizing.	<ul style="list-style-type: none"> ♦ Problem matters to be resolved ♦ Brief assessment on basins ♦ The other fact-findings ♦ Issues and Concerns 		
	2. Topographical/ geographical services and water quality analysis	2.1 Decide bowling points to get soil data for two pilot plant construction sites		<ul style="list-style-type: none"> ♦ Bowling data and soil profiles of pilot plant sites
		2.2 Topographical/geographical services on the interceptor routes for two pilot plant sewer collection to prepare detail design for the interceptor installation.		<ul style="list-style-type: none"> ♦ Topographical/geographical data ♦ Sewage plant site locations with interceptor routes and plant site sizes and access routes.
2.3 Select necessary positions to be identify the land terrains and conduct geographical measurement.		<ul style="list-style-type: none"> ♦ Water quality data and application process for each sewage plant. 		
2.4 Select sewerage plant site candidates to measure the area sections and conduct geographical measurement.				
2.5 Water quality analysis in selected water check points				

1.2 Personnel Input and Team Members of Survey Teams

Because of tight schedule and the wide area to be site-checked, the Survey Team survey team had been divided into two survey groups. OEC staff will be partially on site together with the local Survey Team (DCCD) staff, and DCCD staff shall continue to survey while OEC staffs are out of the site. Sustaining effective and insistent site check, all survey staff shall use formalized check sheets to be prepared by OEC.

Maynilad has prepared Project Office of 35m² for the Survey Team in their place and ordinarily Survey Team and counterpart staffs are working there, however; the project sites are far from the office (Quezon City), therefore OEC has prepared their second office in DCCD business building in Makati, where they have any activities regarding the site survey works. **Figure 1** shows field survey check lists for all survey members to record in. Periodical meetings with JICA have been held as requested, where the Survey Team activities with survey findings was reported and any problems or hampering matters against Preparatory Study (PS) works tabled by the Survey Teams was discussed to be resolved. The following week schedule by the team is noticed to JICA and the members in the meeting.

1.3 Field Survey Record

The site survey team has formed on 28th of June 2010, and after 2days discussions and preparations, two survey teams started surveys in field of Parañaque and Las Piñas cities respectively. Initial survey completed within July 2010, and confirmation, additional surveys was held by OEC enforcing team within August to September mainly to check and review on the first surveys. The surveys were conducted on the basis of site survey check lists and the check results are shown in Attachment 1.

The first stage survey ended on 7th of September, 2010 and 43 site candidates, 18 sites in Parañaque and 25 candidates in Las Piñas were reported with Survey Team first evaluation and concomitant information to Maynilad for them to evaluate and select the feasible STP sites for the project. Survey Schedules in detail are shown in **Table 2**.

River water quality analysis, current street drainage outfall conditions and locations, tidal river situation, over flood records, etc., have been surveyed and collected. During the course, schools, churches, national welfare, historical facilities, informal settler condition and locations, waterway conditions, sub-sub basin border lines, etc. were investigated. Detail data and fact findings with Survey Team's evaluation are revealed in Chapter 6. Attachment 1 and 2 show the survey records of Parañaque and Las Piñas respectively.

1.4 Survey Work Progress Check

The work progress as of end of January 2011 is shown in **Figure 2** The progress of site survey is on schedule or ahead the original plan, and delayed items are caused by suspension of geographical and topographical services of the treatment sight locations,

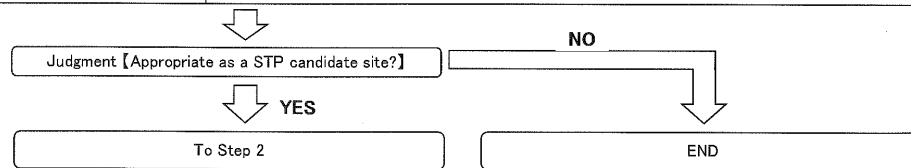
Figure. 1 Field Survey Check Sheet (Format 1 to 5)

【Format 1】 Survey of STP Candidate Sites

STEP 1 Outline Survey of STP Candidate Sites

1/2

Category	Survey	Remarks (enter any comments)
1. Survey preamble		
1.1 recorded information		
Survey date		
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloud <input type="checkbox"/> Rain	
Recorder		
1.2 Target site information		
Name of catchment area		
Name of discharge creek		
Name of Barangay		
Barangay representative		
Barangay representative contact info		
Target STP		
Candidate site address		
2. Candidate site outline survey		
2.1 Candidate site		
Address		
Use area		
2.2 Owner survey		
Name		
Address		
Telephone No.		
2.3 Site restrictions, etc.		
City planning district	<input type="checkbox"/> Inside (<input type="checkbox"/> Urbanization district, <input type="checkbox"/> Urbanization adjustment district <input type="checkbox"/> Non-designated) <input type="checkbox"/> Outside	
Fire protection district	<input type="checkbox"/> Fire protection district <input type="checkbox"/> Quasi fire protection district <input type="checkbox"/> Non-designated	
Landscape protection ordinance	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Tree planting and cutting ordinance	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Local political problems	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Large vehicle access	<input type="checkbox"/> Easily accessible <input type="checkbox"/> Possible <input type="checkbox"/> Impossible	
Other restrictions		



【Format 1】 Survey of STP Candidate Sites

STEP 2 Detailed survey of STP candidate sites

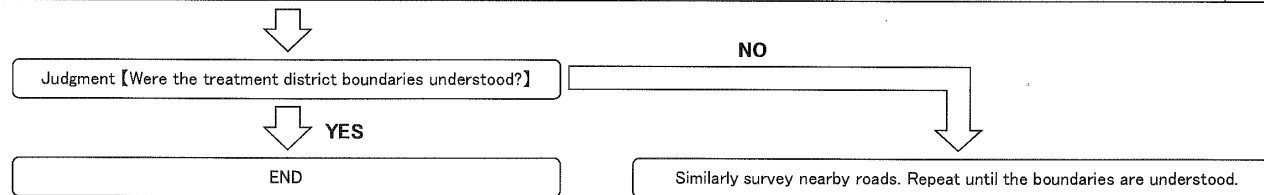
Concerning items where "O" is entered in the photograph column, take a photo showing conditions and enter the photographed site, direction and photo No. on the topographical map.

Category	Survey	Remarks	Photograph	Photo No.
3. Candidate site detailed survey				
3.1 Site conditions				
State of paving	<input type="checkbox"/> Asphalt, <input type="checkbox"/> Concrete, <input type="checkbox"/> Unpaved		○	
Dimensions				
Building(s)	<input type="checkbox"/> Yes (<input type="checkbox"/> Private houses, <input type="checkbox"/> Public facilities, <input type="checkbox"/> Squatters, <input type="checkbox"/> Abandoned buildings) <input type="checkbox"/> No		○	
Vegetation	<input type="checkbox"/> Yes <input type="checkbox"/> No		○	
Abandoned waste	<input type="checkbox"/> Yes <input type="checkbox"/> No		○	
Squatters	<input type="checkbox"/> Yes <input type="checkbox"/> No		○	
Inundation information (past 10 years)	<input type="checkbox"/> Yes (Water level GL+ m) <input type="checkbox"/> No			
Surrounding area	<input type="checkbox"/> Residential land, <input type="checkbox"/> Commercial land, <input type="checkbox"/> Industrial land, <input type="checkbox"/> Business area, <input type="checkbox"/> Public facilities (hospitals, schools, etc.)		○	
3.2 Access road				
Road width			○	
Number of lanes			○	
Pavement	<input type="checkbox"/> Yes <input type="checkbox"/> No		○	
State of paving	<input type="checkbox"/> Asphalt, <input type="checkbox"/> Concrete, <input type="checkbox"/> Unpaved		○	
Traffic controls	<input type="checkbox"/> Possible, <input type="checkbox"/> Impossible (Reason:)			
Length adjoining the candidate site			○	
Owner				
Address of owner				
Telephone No. of owner				
Electric power supply lines	<input type="checkbox"/> Yes (<input type="checkbox"/> High voltage, <input type="checkbox"/> Intermediate voltage, <input type="checkbox"/> Low voltage) <input type="checkbox"/> No	If Yes, show on the topographical map.	○	
3.3 Conditions in the discharge creek				
Structure (dimensions, cross section, material, etc.)			○	
Manager				
Address of manager				
Telephone No. of manager				
Distance from candidate site				
Height difference with candidate site				
Abandoned waste	<input type="checkbox"/> Yes <input type="checkbox"/> No		○	
Squatters	<input type="checkbox"/> Yes <input type="checkbox"/> No		○	
State of water contamination	<input type="checkbox"/> Very dirty, <input type="checkbox"/> Dirty, <input type="checkbox"/> Normal, <input type="checkbox"/> Quite clean, <input type="checkbox"/> Very clean			

【Format 2】 Treatment District Boundary Survey

Referring to the catchment area map, survey the area around treatment district boundaries. Determine boundaries through surveying roads and drainage pipes, etc. at each intersection. Concerning items where "O" is entered in the photograph column, take a photo showing conditions and enter the photographed site, direction and photo No. on the topographical map.

Category	Survey	Remarks	Photograph	Photo No.
1. Survey preamble				
1.1 recorded information				
Survey date				
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloud <input type="checkbox"/> Rain			
Recorder				
1.2 Target site information				
Name of catchment area				
Name of discharge creek				
Name of Barangay				
Barangay representative				
Barangay representative contact info				
Target STP				
2. Treatment district boundary survey				
2.1 Road survey				
Gradient	Viewing roads from intersections, enter each road gradient on the catchment area map.		○	
	Repeat local surveys until the catchment area boundaries (peak altitude parts) are understood.			
2.2 Drainage channel survey				
Shape	<input type="checkbox"/> Open sewer <input type="checkbox"/> Closed sewer		○	
Sectional dimensions			○	
Material	<input type="checkbox"/> Concrete <input type="checkbox"/> Other material		○	
State	<input type="checkbox"/> Abnormalities (breakage, cracking, corrosion, etc.) <input type="checkbox"/> No abnormalities	Abnormalities exist; enter their positions on the catchment area map.	○	
State	<input type="checkbox"/> Abnormalities (sediment, puddles, etc.) <input type="checkbox"/> No abnormalities	Abnormalities exist; enter their positions on the catchment area map.	○	
Drainage direction	Viewing drainage channels from intersections, enter the direction of drainage on the catchment area map.		○	



【Format 3】 Outfall Survey

Survey drainage pipe outfalls within the treatment district boundaries clarified in the boundary survey. Out of drainage pipes emptying into the main creek, survey round ones of ϕ 500 or more and square ones of 500 or more, but don't include pipes smaller

Category	Survey	Remarks	Photograph	Photo No.
1. Survey preamble				
1.1 recorded information				
Survey date				
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloud <input type="checkbox"/> Rain			
Recorder				
1.2 Target site information				
Name of catchment area				
Name of discharge creek				
Name of Barangay				
Barangay representative				
Barangay representative contact info				
Target STP				
2. Outfall survey				
2.1 Drainage channel survey				
Shape	<input type="checkbox"/> Open sewer <input type="checkbox"/> Closed sewer		○	
Sectional dimensions		Survey round ones of ϕ 500 or more and square ones of 500 or more.	○	
Material	<input type="checkbox"/> Concrete <input type="checkbox"/> Other material		○	
State	<input type="checkbox"/> Abnormalities (breakage, cracking, corrosion, etc.) <input type="checkbox"/> No abnormalities	Abnormalities exist; enter their positions on the catchment area map.	○	
State	<input type="checkbox"/> Abnormalities (sediment, puddles, etc.) <input type="checkbox"/> No abnormalities	Abnormalities exist; enter their positions on the catchment area map.	○	
Drainage direction	Viewing drainage channels from intersections, enter the direction of drainage on the catchment area map.		○	
Position	Enter the position of drainage pipes from the road to outfalls on the surveying map.		○	
2.2 Road survey (roads linked to outfalls)				
Road width			○	
Number of lanes			○	
Pavement	<input type="checkbox"/> Yes <input type="checkbox"/> No		○	
State of paving	<input type="checkbox"/> Asphalt, <input type="checkbox"/> Concrete, <input type="checkbox"/> Unpaved		○	
Traffic controls	<input type="checkbox"/> Possible, <input type="checkbox"/> Impossible (Reason: _____)			
Owner				
Electric power supply lines	<input type="checkbox"/> Yes (<input type="checkbox"/> High voltage, <input type="checkbox"/> Intermediate voltage, <input type="checkbox"/> Low voltage) <input type="checkbox"/> No	Abnormalities exist; enter their positions on the surveying map.	○	
Height difference with candidate site	(Candidate plant site is) <input type="checkbox"/> Higher <input type="checkbox"/> Lower			

【Format 4】 Detailed Surveying (For conceptual designs)

S.		
Category	Survey	Remarks
1. Survey preamble		
1.1 recorded information		
Survey date		
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloud <input type="checkbox"/> Rain	
Recorder		
1.2 Target site information		
Name of catchment area		
Name of discharge creek		
Name of Barangay		
Barangay representative		
Barangay representative contact info		
Target STP		
2. Detailed surveying		
2.1 Treatment plant site surveying		
Plane surveying	Prepare a plane view of the site. Enter any of the following facilities that may already exist on the site.	
	Buildings, structures	
	Ponds, vegetation	
	Underground structures, buried objects	
	Adjacent roads (state road names)	
	Including traversal views	
2.2 Interceptor surveying		
Plane surveying	Prepare a plane view of roads.	Enter road width, number of lanes, paving, power lines, buried objects, and other structures, etc.
Longitudinal surveying	Measure the altitude of manhole positions.	
Transversal surveying	Prepare a transversal view for each manhole position.	
2.3 Outfall sewer surveying		
	Same as for interceptor surveying	

【Format 5】 Drainage Pipe Survey

Survey drainage pipes in each district and gauge abnormalities and broken parts).

Category	Survey	Remarks	Photograph	Photo No.
1. Survey preamble				
1.1 recorded information				
Survey date				
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloud <input type="checkbox"/> Rain			
Recorder				
1.2 Target site information				
Name of catchment area				
Name of discharge creek				
Name of Barangay				
Barangay representative				
Barangay representative contact info				
Target STP				
2. Drainage pipe survey				
2.1 Drainage channel survey				
Shape	<input type="checkbox"/> Open sewer <input type="checkbox"/> Closed sewer			
Sectional dimensions				
Material	<input type="checkbox"/> Concrete <input type="checkbox"/> Other material			
State	<input type="checkbox"/> Abnormalities (breakage, cracking, corrosion, etc.) <input type="checkbox"/> No abnormalities	Abnormalities exist; enter their positions on the catchment area map.	○	
State	<input type="checkbox"/> Abnormalities (sediment, puddles, etc.) <input type="checkbox"/> No abnormalities	Abnormalities exist; enter their positions on the catchment area map.	○	
Drainage direction	Viewing drainage channels from intersections, enter the direction of drainage on the catchment area map.			
2.2 Drainage pipe completion drawing collection	Ask the barangay representative about drawings from when drainage pipes were installed.			
	If drawings exist, borrow them and make copies.			

Table 2 (1/2) Summary of Survey Schedule

Survey Date	PARAÑAQUE				Survey Date	LAS PIÑAS		
	Day	Survey Location	DCCD Survey Members	OEC Survey Members		Survey Location	DCCD Survey Members	OEC Survey Members
July 1, 2010 (Thursday)	1	Baclaran	Robert Baricaua Fzoe Yambao Haidee Hernandez Rizza Raymundo Clayton Bergado	Hanji Yasuyama	July 1, 2010 (Thursday)	-	-	-
July 2, 2010 (Friday)	2	Tambo North, Asia World City	Fzoe Yambao Robert Baricaua Clayton Bergado	Hanji Yasuyama	July 2, 2010 (Friday)	-	-	-
July 5, 2010 (Monday)	3	Tambo South, Dongalo	Fzoe Yambao Haidee Hernandez Robert Baricaua	Hanji Yasuyama	July 5, 2010 (Monday)	Ilaya, Daniel Fajardo, Mayuno Uno, Pulang Lupa Uno, Elias Aldana	Rizza Raymundo Clayton Bergado Robert Ajaban	Yasuhisa Sakurai
July 6, 2010 (Tuesday)	4	Vitale, Sto. Niño	Fzoe Yambao Haidee Hernandez	Hanji Yasuyama	July 6, 2010 (Tuesday)	Pulang Lupa Uno, Pulang Lupa Dos, Manuyo Dos	Rizza Raymundo Clayton Bergado	Yasuhisa Sakurai
July 7, 2010 (Wednesday)	5	Merville, Moonwalk	Fzoe Yambao Haidee Hernandez Robert Baricaua	Hanji Yasuyama	July 7, 2010 (Wednesday)	Manuyo Dos, BF International Pulang Lupa Dos	Clayton Bergado Robert Ajaban	Yasuhisa Sakurai
July 8, 2010 (Thursday)	6	Merville, Moonwalk, La Huerta Sto. Niño	Fzoe Yambao Haidee Hernandez	Hanji Yasuyama	July 8, 2010 (Thursday)	Pulang Lupa Uno, Pulang Lupa Dos Pamplona Uno, Zapote (Las Piñas), Pamplona Tres	Clayton Bergado Rizza Raymundo	Yasuhisa Sakurai
July 9, 2010 (Friday)	7	Merville	Fzoe Yambao Haidee Hernandez Robert Baricaua	Hanji Yasuyama	July 9, 2010 (Friday)	BF International	Rizza Raymundo Clayton Bergado Robert Ajaban	Yasuhisa Sakurai
July 12, 2010 (Monday)	8	Don Bosco, Sun Valley STP candidate sites	Fzoe Yambao Haidee Hernandez Robert Baricaua	Hanji Yasuyama	July 12, 2010 (Monday)	Pamplona Tres, Talon Uno (North of Zapote Road)	Rizza Raymundo Clayton Bergado Robert Ajaban	Yasuhisa Sakurai
July 13, 2010 (Tuesday)	9	San Martin de Porres	Fzoe Yambao Haidee Hernandez	Hanji Yasuyama	July 13, 2010 (Tuesday)	Talon Tres, BF International, Almanza Uno Talon Uno	Rizza Raymundo Clayton Bergado	Yasuhisa Sakurai
July 15, 2010 (Thursday)	10	San Martin de Porres Sun Valley, Moonwalk	Fzoe Yambao Haidee Hernandez	Hanji Yasuyama	July 15, 2010 (Thursday)	Talon Kuarto, Almanza Uno, Talon Uno	Rizza Raymundo Clayton Bergado	Yasuhisa Sakurai

Table 2 (2/2) Summary of Survey Schedule

Survey Date	PARAÑAQUE				Survey Date	LAS PINAS		
	Day	Survey Location	DCCD Survey Members	OEC Survey Members		Survey Location	DCCD Survey Members	OEC Survey Members
July 16, 2010 (Friday)	11	Marcelo Green, Don Bosco	Fzoe Yambao Robert Baricaua	Hanji Yasuyama	July 16, 2010 (Friday)	Pilar Village, Almanza Uno, Almanza Dos	Rizza Raymundo Clayton Bergado Robert Ajaban	Yasuhisa Sakurai
July 19, 2010 (Monday)	12	La Huerta, Don Galo San Dionisio	Haidee Hernandez Fzoe Yambao Robert Baricaua	Hanji Yasuyama	July 19, 2010 (Monday)	Talon Dos	Clayton Bergado Robert Ajaban	~
July 20, 2010 (Tuesday)	13	San Isidro, BF Homes San Dionisio	Fzoe Yambao Haidee Hernandez	Hanji Yasuyama	July 20, 2010 (Tuesday)	Pamplona Dos, Talon Dos	Rizza Raymundo Clayton Bergado	~
July 21, 2010 (Wednesday)	14	San Isidro	Clayton Bergado Rizza Raymundo	Hanji Yasuyama	July 21, 2010 (Wednesday)	~	~	~
		Parañaque 3 candidate STP sites	Robert Baricaua Fzoe Yambao	Seiichiro Miyamoto + JICA representatives		~	~	~
July 22, 2010 (Thursday)	15	San Isidro, Don Bosco	Haidee Hernandez Fzoe Yambao	Hanji Yasuyama	July 22, 2010 (Thursday)	Talon Dos, Talon Kwarto	Clayton Bergado Rizza Raymundo	~
July 23, 2010 (Friday)	16	San Isidro, Don Bosco	Fzoe Yambao Haidee Hernandez Robert Baricaua	Hanji Yasuyama	July 23, 2010 (Friday)	Talon Singko, Talon Uno,	Rizza Raymundo Clayton Bergado Robert Ajaban	~
July 26, 2010 (Monday)	17	San Antonio	Fzoe Yambao Haidee Hernandez Robert Baricaua	~	July 26, 2010 (Monday)	Pilar Village	Clayton Bergado Robert Ajaban	~
July 27, 2010 (Tuesday)	18	San Antonio San Isidro Marcelo Green	Haidee Hernandez Fzoe Yambao	~	July 27, 2010 (Tuesday)	~	~	~
July 28, 2010 (Wednesday)	19	Brgy. BF Homes, Manila Memorial Park	Fzoe Yambao Haidee Hernandez Robert Baricaua	~	July 28, 2010 (Wednesday)	Talon Uno, Almanza Uno, Almanza Dos	Clayton Bergado Robert Ajaban	~
July 29, 2010 (Thursday)	20	San Antonio BF Homes	Haidee Hernandez Fzoe Yambao	~	July 29, 2010 (Thursday)	~	~	~
August 11, 2010 (Wednesday)	21		~	~	August 11, 2010 (Wednesday)	Del Pilar Subdivision, Executive Subdivision	Clayton Bergado Fzoe Yambao	Atsuo Suzuki Hiroki Kameya

2. Daily Site Survey Report

2.1 Parañaque

Day 1 of Site Visits

Date and Time	July 01, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Baclaran, Parañaque City (Team 1 and Team 2)
Weather	Fine
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Mr. Robert Baricaua, Mr. Fzoe Yambao, Ms. Haidee Hernandez
	Team 2: DCCD: Mr. Clayton Bergado, Ms. Rizza Raymundo
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify existing condition of the Tripa de Galina Pumping Station

Findings:

- It has been found that drainage in Baclaran area was divided into two outfall directions, to Manila Bay and to Parañaque River. Outfalls going to Manila Bay, crossing the Roxas Boulevard Road, were (3) Ø900 and (1) Ø1500. Approximate sizes of observed outfalls going to the Parañaque River were (1) Ø900, (1) 4.0m box culvert, (2) 2-3.5m box culvert and (1) 3-box culvert.
- Water ponding occurs on the Taft Avenue road along the Baclaran Shopping Mall due to deficient and clogged drainage system at this area.
- Terrain of the area near the coast is almost flat.

Day 2 of Site Visits

Date and Time	July 02, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. Tambo North and Asia World City, Parañaque City (1 Team)
Weather	Fine
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Mr. Clayton Bergado, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- Baclaran Channel along Roxas Blvd. extends up to the Airport Road where the upstream end is piled-up with garbage and debris. Sidewalls of this channel are vertical and sloped concrete walls. A number of pipe outfalls were observed coming from Roxas Blvd. side. The opposite side of the highway is a reclaimed land managed by Aseana Business Park Estate Association, Inc. (ABPEA). The sideslopes of the downstream channel going to Manila Bay is lined with rubbles. The junction (~90° bend) was observed to be prone to accumulation of trash and debris.
- Most of the reclaimed lots of Aseana Business Park and Asia World City are not yet occupied. There are still vacant areas identified. These sites are possible location of the proposed STP for Parañaque. However, based on interviews and information from the internet, these sites are targeted to be high-end residential and commercial (mixed-use) estates. A number of land development construction works were observed.
- Being reclaimed land developments, the Aseana Business Park and Asia World City's drainage is suspected to directly discharge into Manila Bay.
- Two double barrel box culverts were observed to discharge into the Parañaque River at the bridge along NAIA Road, one coming from Parañaque area and one from the airport area (Pasay). A number of informal settlers were observed under the bridge.
- A drainage line along NAIA Road observed at the intersection with Domestic Road. It goes along the carriageway with a number of big (closed) manholes each having four precast concrete covers. This line most probably is a box culvert discharging at the outfall earlier observed at the bridge. This line originates from Pasay area.

Day 3 of Site Visits

Date and Time	July 05, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Tambo and Don Galo, Parañaque City (Team 1) Las Piñas City (Team 2)
Weather	Cloudy
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify existing condition of the Paranaque River at this area

Findings:

- The areas visited by the team in Barangays Tambo and Don Galo are mostly compounds. They are as follows (in no particular order): Camp Claudio, Mayuga Compound, Lopez Compound, Factor Compound and Cabeze Compound.
- It has been found that the drainage flow and outfall at Tambo, Paranaque City is going to the Manila Bay.
- Areas inside Camp Claudio are flooded due to blocked and deficient drainage system in the area.
- It has been said that during the storm Ondoy, Camp Caludio experienced as high as 0.60m flood level.

Day 4 of Site Visits

Date and Time	July 06, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Barangay Vitalez, Barangay Sto. Nino, Parañaque City (Team 1) Las Piñas City (Team 2)
Weather	Sunny
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, identify existing condition of the Paranaque River at this area and identify possible STP site, the Salt Field.

Findings:

- The areas visited by the team in Barangay Sto. Niño are mostly high-end subdivisions and housing area. They are as follows (in no particular order): Pacific Grand Villa Subdivision, Queensway Subdivision, Tia Salud Subdivision, Vitalez Compound, Jetlane Village, Airplane Village Subdivision, Airport Village Subdivision and Gat Mendoza Housing Area.
- It has been found that the drainage flow and outfall at is going to the Paranaque River.
- It has been said that during the storm Ondoy, squatters near Tia Salud subdivision experienced 1.0m flood level.
- The candidate site for STP, the Salt Field, in Sto. Nino, Paranaque City is a swampy area and has garbage all over the site.

Day 5 of Site Visits

Date and Time	July 07, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Barangay Merville, Barangay Moonwalk, Parañaque City (Team 1)
Weather	Sunny
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map.

Findings:

- It has been found that Brgy. Merville have two (2) drainage outfalls, Buensuceso Homes II Subdivision have one (1) drainage outfall, Citihomes Regency Subdivision. Have one (1) drainage outfall all going to Parañaque River.
- During the strongest storm Ondoy, Brgy. Ibayo experienced 4.0m flood level in Universal Solid Homes II Subdivision, 1.5m flood level in Buensuceso Homes II.

Day 6 of Site Visits

Date and Time	July 08, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City: La Huerta, Sto. Niño, Moonwalk and Merville
Weather	Sunny
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez,
Main Activities	Identify drainage flow directions & outfalls, identify possible STP sites near SM Warehouse

Findings:

- The areas visited by the team in La Huerta, Sto. Niño, Moonwalk and Merville Area are mostly high-end subdivisions and a number of commercial/industrial compounds. They are as follows (in no particular order): Perpetual Village Subdivision, Rodriguez Compound, Amvel Business Park, Silverland Village-2 Subdivision, Multinational Village Country Club, TDI-Multinational Village, Multinational Village, Sherwood Heights Subdivision, Christina Village II Subdivision, Eriberta Court Subdivision, Isabelle Garden Homes Subdivision, Moonwalk Village II Subdivision, La Casas 100 Subdivision, Donna's Ville Subdivision, St. Francis Subdivision, Brentwood Heights, The Isabelle Garden Villas, South Greenpark Village 1 & 2 Subdivision, South Greenpark Village Subdivision, South Greenpark Village 7 Subdivision, South Greenpark Village 4 Subdivision, Merville Park Subdivision, Merville Subdivision, Monte Villa De Monsod Subdivision, Scarlet Homes 2 Subdivision and Sagana Village Subdivision.
- There are three (3) candidate sites for STP determined along the C-5 area near SM Warehouse. All are privately owned vacant lot and are located on higher elevations.

Day 7 of Site Visits

Date and Time	July 09, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. Merville, Parañaque City (Team 1)
Weather	Cloudy and Fine
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- The areas visited by the team in Barangay Merville are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Merville Subdivision, Inland Executive Homes, Merville Park Subdivision, Buena Vida Homes, Molave Park Subdivision, South Admiral Village, Cubic Homes, Camella Homes, Admiralty Townhomes, South Pointe Townhomes, City Square Homes, Executive Heights Subdivision, and Rudolf Leitz Industrial Complex.
- The site has a mild to moderately rolling terrain as observed from the roads.
- The drainage systems are composed of curb-inlet/street manholes and concrete pipes.
- A number of low points were observed at the perimeter of the survey area. Since the boundaries of the subdivisions are fenced, presences of outfalls and creeks were not verified except for the confirmation of the interviewed residents. Upon validation back at the office, the creeks were identified to be Libho (north of Merville subdivision), Paete (originating from Executive Heights Subdivision going to Camella Homes), and Merville Creeks (originating from the South Luzon Expressway north of Sun Valley Drive passing at the south portion of _____ and Executive Heights Subdivision).
- According to a resident of Inland Executive Homes, recent drainage rehabilitation was done at their area where the drainage line which used to be discharging towards La Suerte Cigar Factory was reconstructed and opposed the road slope and drain to towards the Alpine Road.
- A small area of informal settlers was observed between Libho Creek and north of Inland Executive Homes.
- The area of _____ was observed to be a low end subdivision. The roads at this area are very tight for vehicles and almost impossible for cars to freely park at. The drainage at this area drains into Paete Creek.

Day 8 of Site Visits

Date and Time	July 12, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. Don Bosco & Brgy. Sun Valley, Parañaque City (Team 1)
Weather	Sunny
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- Areas visited by the team are as follows, in no particular order: Airport Village, Chateau Elysee, portion of Monte Villa de Monsod, Canaan Homes, Sta. Ana Village, Park View Homes, Countryside Village, Reman Subdivision, Annexes 35, 41 and 45 Subdivisions, Sun Valley Subdivision, Ramos Village, and Moonville Subdivision. These are mostly middle and high end residential areas.
- The terrain of the site is ranging from mild to moderately rolling.
- The site is bounded by Paete Creek at the north portion and by Baliwag Creek at the south, i.e. along Doña Soledad Avenue.
- Most of the waterways are realigned and contracted by vertical and trapezoidal shape riprap/concrete walls with varying widths. Some portion of the creeks at Annexes 35, 41, and 45 are slightly vegetated along the sides.
- The roads cross the waterways typically via concrete box culverts.
- The Sun Valley Creek crisscrosses along Dandelion Street of Sun Valley Subdivision and finally merges with Paete Creek at the end portion of Sun Valley Drive at Rosemallow Street. Garbage was observed to accumulate at this confluence point. A box culvert coming from Sun Valley Drive was observed to discharge at this point.
- Most of the drainage outfalls observed were concrete pipes ranging from Ø300 to Ø600 mm discharging near the bridge culverts.
- Another creek confluence point (Baliwag Creek and Sun Valley Creek) was observed along Albatross Street.

Day 9 of Site Visits

Date and Time	July 13, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. San Martin de Porres, Parañaque City (Team 1)
Weather	Fine
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- The site is bounded by Taguig boundary (Bicutan) at the east and the East service road (South Luzon Expressway) at the west.
- The boundary is at the left of Raja Sumakwel Avenue. It is observed to be a ridge, thus confirming that this is the catchment area boundary.
- The site's terrain is considered moderately rolling. In contrast, the Bicutan side (outside project boundary) was very rolling and hilly.
- Barangay San Martin de Porres has a ridge at the midsection. This observation was verified the next site visit.
- A drainage line, which is approximately Ø1500 mm concrete pipe, was observed coming from Supa Street turning at Tindalo Street going to the East Service Road. According to a resident at the area, this drainage pipe is serving the area of Gelmart Philippine Industry which is at a relatively higher elevation than their area and enclosed by a very high concrete hollow block fence at the property boundary. The catchment extends up to the East Service Road connecting to Raja Sumakwel Avenue.
- A distinct area low point was observed at Apitong Street. However, the drainage line opposed the road grade and connected to the drainage line along Tindalo Street.
- The site survey area has an ultimate low point located along East Service Road near its intersection with Marian Road 2. The drainage crosses South Luzon Expressway and ultimately discharges into Paete Creek, north side of Sun Valley Drive.
- The drainage system of the site is composed of curb inlet manholes and drainage pipes.
- No outfalls were observed at the site since there were no waterways observed as well.

Day 10 of Site Visits

Date and Time	July 15, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. San Martin de Porres, Brgy. Sun Valley, Brgy. Moonwalk, and Brgy. Annex 5 (Team 1)
Weather	Sunny
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- The areas visited were the upper portion of Brgy. San Martin de Porres (United Parañaque Subdivisions I and III, Makati South Hills, Marian Park II, and Marian Lakeview Park), United Parañaque 2, Ramos Village, Marimar Village, Scienceville, Don Bosco Village, and Better Living Subdivision (South Arch).
- The site is considerably moderately rolling terrain.
- There was an observed small concrete canal at the southern end of Cattleya Street (Ramos Village), constricted by a very high concrete wall fence of Marimar Village. This canal connects to a branch of Paete Creek between Dandelion and Lotus Streets of Sun Valley Subdivision.
- Near the point of water confluence, there was an observed Ø1050 outfall originating from Camia and Sampaguita Streets. During the site inspection, the creek water is very turbid, colored mocha brown. According to the residents in this area, the dirty water came from the upstream commercial area along Doña Soledad Avenue.
- Most of the creeks seen were generally unlined, i.e. they are not improved but rather constricted by walls built by different properties. The creek crossing France Street of Annex 51 is lined with vertical masonry walls. The outfall at this portion are two Ø450 pipes, one coming from the Barangay (encroached by a property/house) and one originating from Doña Soledad Avenue.
- In Brgy. San Martin de Porres, high points were observed at Caliraya Drive, Lake Lanao, Daang Hari, Guijo, Molave, Duhat Streets, and East Service Road confirming that the flow direction at the upper half of the barangay has a different subcatchment. The area's low point converges at the East Service Road near its intersection with Avocado Street. Another set of high points were observed at Banaba St., Narra St., and East Service Road suggesting that there is a different subcatchment at the upper portion of the barangay (United Parañaque Subd. I). No creeks or waterways were observed at this area. The Parañaque boundary is bounded outside by the Cucumber Road.
- Buildings fronting South Luzon Expressway are commercial, industrial, and high-end residential establishments and a number of small businesses.
- At the southern portion of Better Living Subdivision (Japan, Jordan, and Kuwait Streets), which is relatively the lowest area, there was an ongoing construction observed. An installation of a single Ø600mm drainage line connecting discharging to the

ephemeral creek at Malacañang Village which eventually flows to the Sapang Buwaya Creek.

- Drainage systems are mostly composed of curb-inlet manholes and drainage pipes.

Day 11 of Site Visits

Date and Time	July 16, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City (Team 1): Don Bosco and Marcelo Green
Weather	Cloudy
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay Don Bosco and Marcelo Green are mostly subdivisions. They are as follows (in no particular order): Better Living Subdivision, Villa Sagrada Familia Subdivision, Better Living Subdivision Annex 3, Philtrust Compound, Agro Compound, Aero Park Subdivision, Marcelo Green Village Phase 8 Subdivision, Palmera Lane Subdivision, Marcelo Green Village Subdivision, Ireneville 2 Subdivision, Greenvale Homes Subdivision, Buensuceso Homes III Subdivision, Aroma Compound, Isabelle Executive Homes Subdivision, Better Living Annex 31 Subdivision and Marcelo Green Village-Phase V Subdivision.
- Roads are relatively flat.
- Outfalls were found in the area.
- New Creek was found in Titan Street flowing to the Doña Soledad Avenue. There is no outfall. There are plants & bushes along the sides of the creek. Houses draining directly on the creek.
 - a. New Creek was found at the entrance of Better Living Annex-31 Subdivision along Onyx Street. An approximate 2-Ø1050mm RCP was located passing through the bridge. Presence of garbage on the upstream portion of the creek.
- During the Site survey, there were New Creeks discovered which does not appear on the map.
- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 12 of Site Visits

Date and Time	July 19, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City (Team 1): San Dionisio, La Huerta and Don Galo
Weather	Cloudy
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Ms. Haidee Hernandez, Mr.Fzoe Yambao, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay La Huerta and Don Galo are mostly supermarkets, informal settlers near the river, cemeteries, subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Olivarez Plaza, Seafood Center, Oyster Plaza, Catholic Cemetery, Himlayang Palanyag (Palanyag Cemetery), portion of Las Piñas Public Cemetery, Lim Compound, Jaleville Subdivision, Amvel Business Park, One Aeropolis, Gatchalian Subdivision 1, R. Medina Subdivision, Aurenina Compound, Rodriguez Compound, Gardenvale Subdivision and Espiritu Subdivision.
- Roads are relatively flat.
- Outfalls were found in the area:
 - a. There is an outfall at Dandan Street discharge to Parañaque River.
 - b. Ø1800mm outfall discharge to Parañaque River from F. Capistrano Street Drainage Line.
 - c. Ø450mm outfall discharge to Parañaque River. There is presence of garbage in the river.
 - d. Ø600mm outfall submerged at the right side of the upstream portion of Parañaque River.
 - e. Ø450mm outfall discharge to Kay Boboy Creek. There is presence of garbage in the river.
 - f. Ø600mm outfall from Ninoy Aquino Avenue discharge to Kay Boboy Creek. There is presence of garbage in the river.
 - g. Ø1800mm outfall from Amvel Business district discharge to Kay Boboy Creek.
 - h. Ø450mm outfall from Ninoy Aquino Avenue discharge to Kay Boboy Creek.
 - i. Ø1050mm outfall from Amvel Business district discharge to Kay Boboy Creek.
 - j. Ø450mm outfall from Ninoy Aquino Avenue discharge to Kay Boboy Creek.
 - k. Ø1200mm outfall from Ninoy Aquino Avenue discharge to Kay Boboy Creek. Top of the outfall becomes a house for these squatters.

1. 900mmW x 1000mmH outfall discharge to creek merging to San Dionisio Creek.
- There is a separate Sewage Treatment Plant for the Amvel Condominium inside the Amvel Village.
 - During the Site survey, there were New Creeks discovered which does not appear on the map.
 - The candidate site for STP, the vacant lot in between Parañaque River and SM Sucat. There are plants & bushes all over the area and has garbage on the river.
 - Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 13 of Site Visits

Date and Time	July 20, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. San Isidro and portions of San Dionisio and BF Homes, Parañaque City (Team 1)
Weather	Fine and cloudy day
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- Areas visited were Bernabe Subd., Pag-asa Homes, Top Land Subd., C.H. Woodshow II Townhouse, Mihara Homes, Salvador Estate, Sandiville, Villanueva Village, Carmen Village, Sandiville, Equity Homes 4, San Antonio Valley 12, Guerrero Country Homes, Verville Homes II, San Antonio Valleys 6, 8, 14, & 16, Plaza Crest, Equity Homes 2, 3, & 6, BF Homes, Lopez Village, Grand Monaco South, and The Elysium.
- The site is generally moderately rolling terrain.
- The site is bounded by Sapang Buwaya, Villanueva, and Tungtong Creeks at the northern portion and only Villanueva Creek at the East side.
- The sides of Sapang Buwaya Creek are concrete vertical walls as observed from Rupees Lane St. of Villanueva Village. Same is Villanueva creek's treatment seen from Schilling Lane St.
- Vegetation and debris accumulation were observed at creek bends and outfalls.
- The Villanueva Creek as observed from Salvador Bridge is lined with trapezoidal grouted riprap walls with vegetation and debris accumulation. This extends up to the Salvador Estate. Sizes of outfalls observed at the area were Ø450, Ø600, Ø900, and Ø1050.
- Villanueva Creek at San Pedro Bridge is not properly rehabilitated as there are riprap fully covered by debris and vegetated. There is also a house protruding the waterway. Outfall observed were Ø600, Ø1050, and 0.6m x 0.6m protruding thru the vertical riprap walls.
- There was an observed waterway at the boundary of Parañaque and Las Piñas in Guerrero Homes, at the end portion of San Jose St. across Papa Pio St. Apparently, this waterway is the upstream section of Tungtong Creek. A 0.6m x 0.6m outfall was observed at the area. There were a number of squatters downstream of San Jose Street (across Papa Pio Street) who built their houses and a small concrete bridge at Tungtong Creek, constricting the flow of the waterway.
- At the Lopez Village Bridge at N. Lopez Ave. crossing Villanueva Creek, only portion of the creek near the bridge was observed to be protected by trapezoidal riprap walls. Portions of the wall are eroded. Vegetation and debris accumulation is present at the

area. Minimal garbage was observed. Two Ø450 pipe outfalls were discharging from both sides of the bridge. There were no squatters observed nearby.

- As the Grand Monaco South is still under construction, the site cannot be surveyed yet. However, judging from the topography of the site, its drainage system may possibly discharge into Tungtong Creek.
- According to the security guards of The Elysium, their water supply is not currently being provided by Maynilad.

Day 14 of Site Visits

Date and Time	July 21, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City (Team 1): San Isidro (South) and BF International
Weather	Cloudy
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay San Isidro (South) and BF International are mostly high-end subdivisions. They are as follows (in no particular order): Vitalez Compound, United Parañaque 5 Subdivision, Esperanza Garden Homes Subdivision, Primavera Homes Subdivision, Rainbow Village 2 Subdivision, Francisca Compound, San Dionisio Subdivision and Camella Homes Parañaque 2 Subdivision.
- Roads are relatively flat.
- Outfalls were found in the area.
 - a. Ø900mm outfall discharge to San Isidro River from the other side.
 - b. Ø300mm Curb Inlet discharge to Creek from Edinburg Street Drainage Line.
 - c. Ø300mm RCP outfall discharge to Aguirre Creek.
 - d. Ø375mm RCP outfall discharge to the Creek.
 - e. Ø375mm Curb Inlet outfall discharge to the Creek.
 - f. Approximately Ø300mm outfall discharge to Creek beside the *Annunciation Orthodox Church*.
 - g. Ø300mm outfall discharge to Creek.
 - h. 3-RCBC below the 9th street Bridge.
 - i. Ø450mm outfall discharge to Creek at San Isidro.
 - j. Ø450mm outfall discharge to Creek at United Parañaque 5.
 - k. Ø300mm outfall discharge to Creek at Road 8-A (near Road 10-D of Manila Memorial Park).
 - l. Ø1200 (left) and Ø900 (right) RCP Outfall discharge to Creek.
- Most Creek has a side slope protection such as RC wall, masonry wall or riprap grouted wall.
- During the Site survey, there were New Creeks discovered which does not appear on the map.

- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 15 of Site Visits

Date and Time	July 22, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City (Team 1): San Isidro (North) and Don Bosco
Weather	Cloudy
Surveyors	Team 1: OEC: Mr. Hanji Yasuyama DCCD: Ms. Haidee Hernandez, Mr. Fzoe Yambao
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay San Isidro (North) and Don Bosco are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Camella Homes Classic Parañaque IV Subdivision, Ina Executive Homes Subdivision, Ambassador Hills, Levitown Villas, CRC-Multinational Village Subdivision, Pag-ibig sa Parañaque Subdivision, Verdant Acres Subdivision, Garden City Subdivision, St. Catherine Village Subdivision, Valentino Executive Village Subdivision, Fortunata Village Subdivision, Carmen Village Subdivision, Filinvest Classic Estate Subdivision, Fountain Breeze Condominium and Cecilia Village Subdivision, Manhattan Ville.
- Roads are relatively flat.
- Outfalls were found in the area.
 - a. Ø375mm (left) and Ø900mm (right) outfall at Fortunata Village discharge to South San Isidro River.
 - b. Ø900mm RCP outfall discharge to South San Isidro River.
 - c. Ø1050mm RCP outfall discharge to South San Isidro River.
- Most Creek has a side slope protection such as RC wall, masonry wall or riprap grouted wall.
- During the Site survey, there were New Creeks discovered which does not appear on the map.
- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 16 of Site Visits

Date and Time	July 23, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. Don Bosco and Brgy San Isidro, Parañaque City (Team 1)
Weather	Fine and cloudy day
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- The areas visited include Better Living Subdivision, Camella Homes Bicutan, 4J Compound, Valley Vista Village, Ina Executive Homes I & II, Camella Homes Classic Parañaque IV, Levitown Ph.6, Nayong Maharlika 2, Levitown Estate Subd., Krause Village, Camella Homes Parañaque 3, Matatdo Homes, Villa Mendoza Subdivision, Green Heights Subdivision, and Simplicio Cruz Compound. Majority of these areas are high end residential subdivisions.
- The terrain of the site is moderately rolling.
- Sizes of outfall observed at the site ranges from Ø375 to Ø900.
- Creeks visited were either unlined or lined with riprap/concrete walls. There was a type where the walls of the creek are concrete-stepped. Vegetation and debris accumulation at the sides of the creeks contract the water flow.
- A bridge crossing at a creek was only made of 2 barrel pipes not large enough to accommodate the full flow of the creek.
- Concrete fences of some houses are built directly on top of creek banks.
- Some squatters were observed to dwell beside the creeks.

Day 17 of Site Visits

Date and Time	July 26, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City (Team 1): San Antonio
Weather	Cloudy
Surveyors	Team 1: DCCD: Mr. Fzoe-Rauld Yambao, Ms. Haidee Hernandez, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay San Antonio are mostly high-end subdivisions and compounds. They are as follows (in no particular order): Better Living Subdivision Remmanville, Palm Grove Subdivision, Savio Homes Subdivision, Buensuceso Homes Subdivision, Malacañang Village Subdivision, Don Aguedo Bernabe Subdivision, San Antonio Valley 10 & 11 Subdivision, Jestra Villas Subdivision, San Antonio Valley 3, 8 & 9 Subdivision, Casa Filipina Executive Village Subdivision, Barangay Village Subdivision, San Antonio Valley 1 Subdivision, Ina Executive Homes Subdivision, Finasia Homes Subdivision, Santiago Homes Subdivision, Camella Townhomes Classic Parañaque Subdivision, El Puentebello Subdivision, Landcore Homes 1 Subdivision, Lim Compound, Equity Homes 1 & 5 Subdivision, Welcome Village Subdivision, Meliton Subdivision, Dreamland Sucat Subdivision, Reyes Compound and Sanapu Homes Subdivision.
- Roads are relatively flat.
- Outfalls were found in the area.
 - a. Ø900mm RCP outfall at the other side of Nery Street at Better Living Subdivision at Remanville discharge to South San Isidro River.
 - b. Ø1050mm RCP outfall from Nery Street at Better Living Subdivision at Remanville discharge to South San Isidro River.
 - c. Ø300mm RCP outfall at the left side of the upstream portion at San Antonio Valley 9 discharge to Creek.
 - d. Ø300mm RCP outfall at the left side of the downstream portion at San Antonio Valley 9 discharge to Creek.
 - e. Ø1050mm RCP outfall at San Antonio Valley 1 discharge to Creek.
 - f. Ø450mm RCP outfall along Maria Susafe Street discharge to Creek.
 - g. Ø450mm RCP outfall at Fuentebello Bridge along Masthead Street discharge to Creek.
 - h. Ø300mm RCP outfall at Fuentebello Bridge along Masthead Street discharge to Creek.

- i. Ø300mm RCP outfall at the right side of the upstream portion along Editorial Street in between Tropical Lane and Sanapu Homes discharge to Creek.
 - j. Ø600mm RCP outfall at the left side of the downstream portion along Editorial Street in between Tropical Lane and Sanapu Homes discharge to Creek.
- Most Creek has a side slope protection such as RC wall, masonry wall or riprap grouted wall.
- During the Site survey, there were New Creeks discovered which does not appear on the map.
- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 18 of Site Visits

Date and Time	July 27, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City (Team 1): San Isidro, San Antonio and Marcelo Green
Weather	Cloudy
Surveyors	Team 1: DCCD: Mr. Fzoe Yambao, Mr. Robert Baricaua
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay San Isidro, San Antonio and Marcelo Green are mostly subdivisions, condominiums and compounds. They are as follows (in no particular order): Justina Village, Pascual Compound, LDC Compound, NAPA Compound, Armela Compound, Savvy Village, COMMAR Condominium, Equity Homes-7 Subdivision, V. V. Dionisio Compound, Severina Diamond Subdivision, West Borough Homes Subdivision, Light Industry Compound, Sunrise Drive, Maywood Village II Subdivision, St. Martin Village Subdivision, AFSC Compound, Universal Solid Homes Subdivision, Garcia Heights Subdivision, United Parañaque 5 Subdivision, Sampaguita Hills Subdivision, IDI Subdivision, Superville Subdivision, United Parañaque -4 Subdivision, Goodwill Subdivision III, Mon-El Subdivision, South Wind Estate Subdivision, San Victores Compound, United Industrial Subdivision and Camella Homes Parañaque 2
- Roads are relatively flat.
- Outfalls were found in the area.
 - a. Ø400mm RCP outfall from Lauren Drive at Savvy Village discharge to Creek
 - b. Ø300mm Curb Inlet Manhole from Lauren Drive at Savvy Village discharge to Creek.
 - c. 3-Ø300mm RCP outfall from the other side at Sampaguita Avenue discharge to Creek.
 - d. Ø300mm RCP outfall at the left side of the downstream portion at San Antonio Valley 9 discharge to Creek.
 - e. Ø450mm RCP outfall at the left side of the upstream portion from Light Industry Compound at Champaca Extension discharge to Creek.
 - f. Ø300mm RCP outfall at the right side of the downstream portion from Light Industry Compound at Champaca Extension discharge to Creek.
 - g. Ø450mm RCP outfall at Bignay corner Sampaloc Streets discharge to Creek.
 - h. 300mmW x 600mmH outfall along Sports Street at ASPC Compound discharge to Creek.
 - i. Ø450mm RCP half-submerged outfall at the left side of the downstream portion along Sports Street at ASPC Compound discharge to Creek.

- j. Ø375mm RCP outfall at the end of Maywood Village discharge to Creek.
- Most Creek has a side slope protection such as RC wall, masonry wall or riprap grouted wall.
 - During the Site survey, there were New Creeks discovered which does not appear on the map.
 - Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 19 of Site Visits

Date and Time	July 28, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Brgy. B.F. Homes & Manila Memorial Park area, Parañaque City (Team 1)
Weather	Fine and cloudy day
Surveyors	Team: OEC: Mr. Hanji Yasuyama DCCD: Mr. Fzoe Yambao, Ms. Haidee Hernandez
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map

Findings:

- The areas visited by the team as follows (in no particular order): Manila Memorial Park, BF Homes Phase II and BF Classic Homes Village.
- The sites has a mild and moderately rolling terrain as observed from the roads.
- Outfalls were found in the area.
 - a. 2-Ø600mm and 1-Ø600mm RCP outfalls near Jacaranda Lane in Manila Memorial Park discharge to Creek.
 - b. 1-Ø600mm and 1- Ø300mm RCP outfalls at Bougainville Avenue corner Gumamela Road in Manila Memorial Park discharge to Creek.
 - c. Ø375mm and Ø375mm outfalls at Rosal Drive in Manila Memorial Park discharge to Creek
 - d. 2-Ø600mm and 2-Ø1050mm RCP outfalls from Jackielou Ville Subdivision discharge to Creek.
- Most Creek has a side slope protection such as RC wall, masonry wall or riprap grouted wall.
- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 20 of Site Visits

Date and Time	July 29, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque City (Team 1): San Antonio and BF Homes
Weather	Cloudy/Sunny
Surveyors	Team 1: DCCD: Mr. Haidee Hernandez, Ms. Jenelyn Ilagan
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay San Antonio and BF Homes are mostly high-end subdivisions. They are as follows (in no particular order): Sinag Tala Subdivision, BF Executive Village Subdivision, Teoville Subdivision, Maywood Village-1 Subdivision, Teoville III Subdivision, Jackielou Ville Subdivision, Tahanan Village Subdivision, BF Homes-1 Subdivision, Ireneville Subdivision-1, Goodwill Subdivision-2, Loyola Memorial Park, Bahaghari Compound and Southbay Gardens Subdivision.
- The site has a mild to moderately rolling terrain as observed from the roads. Roads are relatively flat.
- Outfalls were found in the area.
 - a. 2-Ø900mm RCP outfall at Domingo Poblete corner Nicanor Abelardo Streets discharge to Creek.
 - b. 4-Ø1350mm and 2-Ø600mm outfalls at Domingo Poblete corner Nicanor Abelardo Streets discharge to Creek.
 - c. Ø1800mm outfall from Mayuga BF Homes Subdivision discharge to Creek.
 - d. 2-Ø900mm above outfalls from BF Classic Homes Village discharge to Creek.
 - e. 1-Ø1800mm and 1-Ø600mm below outfalls from BF Classic Homes Village discharge to Creek.
 - f. Ø1800mm RCP drainage line flowing along Sampaguita Street corner Petunia Street at Tahanan Village.
- Most Creek has a side slope protection such as RC wall, masonry wall or riprap grouted wall.
- During the Site survey, there were New Creeks discovered which does not appear on the map.
- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

2.2 Las Piñas

Day 3 of Site Visits

Date and Time	July 05, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Ilaya, Manuyo Uno, Daniel Fajardo (Poblacion) and Pulang Lupa Uno (North), Elias Aldana
Weather	Cloudy
Surveyors	Team 2: OEC: Yasuhisa Sakurai / DCCD: Clayton Bergado, Rizza Raymundo, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in Barangay Merville are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Merville Subdivision, Inland Executive Homes, Merville Park Subdivision, Buena Vida Homes, Molave Park Subdivision, South Admiral Village, Cubic Homes, Camella Homes, Admiralty Townhomes, South Pointe Townhomes, City Square Homes, Executive Heights Subdivision, and Rudolf Leitz Industrial Complex.
- Roads are relatively flat.
- 5 Outfalls were found in the area:
 - a. 2-Ø1350 RCP at Bliss Compound was located. The drainage manhole had no proper concrete cover. The drainage line is assumed to be draining to Manila Bay, crossing the Coastal Road, however it still needs to be verified on site.
 - b. RCP outfalls at Tramo Bridge connecting to Quirino.
 - c. RCP outfalls drain to a creek found at Asuncion Avenue Tramo Intersection. Pipes were half submerged.
 - d. RCP outfalls drain to the river at Parañaque-Las Piñas Boundary near Las Piñas Public Cemetery. One outfall is broken and full of waste and debris. The confluence of the two tributaries is obstructed by informal settlers.
 - e. Good condition outfalls were found at the C5 Extension Bridges, some were half submerged due to stagnant water.
- Some curb inlets are broken and blocked with trash.

Day 4 of Site Visits

Date and Time	July 06, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Pulang Lupa Uno, Pulang Lupa Dos, Manuyo Dos
Weather	Sunny
Surveyors	Team 2: OEC: Yasuhisa Sakurai / DCCD: Clayton Bergado, Rizza Raymundo
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- A new creek (Marulas Creek) was discovered traversing thru Martinville, Sandigan Compound, Country Homes, Veraville Homes, and Veraville Regency 2.
- A new road was found connecting Gatchalian Village and the C5 Extension Road.
- Two STP Candidate sites are located in Pulang Lupa Uno. One is beside Camella Townhomes Las Piñas and another is beside Gatchalian Village. Areas are suspected to be owned by Senator Manny Villar.
- Two new subdivisions not reflected on the maps are Camella Homes beside Zarate General Hospital and Cartagena Townhomes, right side of Padre Diego Cera Homes.
- 11 Outfalls were found in the area.
 - a. Ø450 RCP at Veraville Townhomes. Entrance of the subdivision is at Asuncion Avenue.
 - b. Another outfall with Ø450 RCP is located beside Immaculate Mary Montessori School.
 - c. Another outfall is at a bridge along Naga Road, beside the Villa Isabelita Subdivision. Size of outfall could not be determined.
 - d. Ø900 RCP Outfall located at DBP Road where a new creek was found. The confluence of the two tributaries is obstructed by informal settlers.
- Some curb inlets are broken and blocked with trash.

Day 5 of Site Visits

Date and Time	July 07, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Manuyo Dos, Pulang Lupa Dos, BF International
Weather	Sunny morning and Cloudy afternoon
Surveyors	Team 2: OEC: Yasuhisa Sakurai / DCCD: Clayton Bergado, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- Roads within the vicinity of Pulang Lupa Dos are relatively flat while at Manuyo Dos the roads are gently sloping to the west towards the creeks.
- 3 Outfall locations were found in Manuyo Dos.
 - a. Ø750 RCP is located at Canaynay Court along Colt St. The outfall seemed to be draining well to the creek but it is full of garbage downstream.
 - b. Ø 450 RCP outfall is located at the bridge along Sto. Niño St. which is also a boundary of Parañaque and Las Piñas. The outfall is half submerged and covered by cogon grass.
 - c. A manhole near the bridge of Gatchalian Avenue leads an outfall to the creek but the outfall was not seen due to the houses built on top of the creek.
- The bridge along Angelina Canaynay Avenue can't be easily seen due to the illegal settlers inhabiting both sides of the bridge on top of the creek.
- A small creek was found at the east portion of the CAA 13 Compound flowing towards a small culvert leading to J. Aguilar Avenue.
- 3 Outfall locations were found in Pulang Lupa Dos.
 - a. Ø 900 RCP outfall was found at Casimiro Townhomes at the end of St. Thomas Street. The outfall was hardly seen due to the grasses covering the pipe.
 - b. Several outfalls were seen at the bridge along Camella Avenue near the elementary school at Camella Homes-3D.
 - c. Outfalls were found on both sides of the J. Aguilar Avenue. Ø1200 and Ø1050 RCP on the upstream side and Ø1200 and Ø1200 on the downstream side.

Day 6 of Site Visits

Date and Time	July 08, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Pamplona Uno, Zapote (Las Piñas), Pulang Lupa Dos, Pamplona Uno, Pamplona Tres
Weather	Sunny
Surveyors	Team 2: OEC: Yasuhisa Sakurai / DCCD: Clayton Bergado, Rizza Raymundo
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- One candidate STP site bounded by Alabang-Zapote Road, Republic Steel Compound and Zapote River was identified. The land is owned by Mayor Nene Aguilar. The land is currently used as parking area for Las Piñas City garbage trucks.
- An open area in between the Coastal Road and Quirino Avenue near Las Piñas District Hospital is used as garbage dumping site.
- A half submerged RCP outfall is located beside the bridge near the dump site. The pipe is approximately Ø1050.
- A new creek connecting to Zapote River was found beside the Casimiro Avenue. Several outfalls drain to this creek.
- An approximately Ø600 RCP is located beside Alido Bridge downstream of the Zapote River. The bridge is the confluence of the Zapote River and the new creek.
- An outfall along 5th St. in between 1st and 2nd streets was found with an approximate size of Ø750. The whole Doña Manuela Subdivision drain to this outfall.
- Roads inside the subdivisions of Barangay Pamplona Uno are relatively flat.
- Several outfalls were located along Caimito St. near the bridge along Macopa St. at Verdant Acres Subdivision.
- Another new creek was discovered adjacent to Verdant Road and traversing the intersection of Verdant and Narra Road at 2nd Reyville Subdivision. The bridge has a culvert with an approximate size of Ø1500 mm.
- A wooden bridge is located at the end of Rosal St. beside it is an outfall approximately Ø1050 in size with concrete encasement.

Day 7 of Site Visits

Date and Time	July 09, 2010 / 9:00 AM to 12:00 NN
Survey Areas	Las Piñas (Team 2): BF International
Weather	Sunny
Surveyors	Team 2: OEC: Yasuhisa Sakurai / DCCD: Clayton Bergado, Rizza Raymundo Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in BF International Village are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Receiver's Area, The Legacy South Subdivision, BF International South Subdivision, VAA Homes 1 Subdivision, Caseria Mariposa I Subdivision and BF Classic Square Subdivision.
- There were many illegal settlers at the eastern portion of BAT CAA Receivers Area. Due to this, the creek along the boundary of Las Piñas and Parañaque can't be seen anymore.
- Some of the open canals have garbage that may cause clogging.
- There are low point areas that have no drainage outfalls. Some of these areas are evident when there is ponding.
- The open area at the south portion of The Legacy South was being cleared of squatters since the area is being prepared for future residential development.
- An outfall at the end of Viceroy St. at Caseria Mariposa is already broken.

Day 8 of Site Visits

Date and Time	July 12, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Parañaque (Team 1) Las Piñas (Team 2) Pamplona Tres and Talon Uno
Weather	Partly Cloudy
Surveyors	Team 2: OEC: Yasuhisa Sakurai / DCCD: Rizza Raymundo, Clayton Bergado Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in Barangay Pamplona Tres and Talon Uno are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Doña Manuela Subdivision Phase IVA, Camella Homes IV Subdivision, Camella Homes 3C Subdivision, Greenlane Las Piñas Subdivision, Camella Homes 2 Subdivision, Doña Manuela Subdivision Phase IVC, Doña Manuela Subdivision Phase IVG, Doña Manuela Subdivision Phase IVH, Doña Manuela Subdivision Phase IVD, Doña Manuela Subdivision Phase IVF, Casimiro Village 2 Subdivision, Casimiro Village 1 Subdivision, Villa Miranda Subdivision, Doña Manuela Subdivision Phase IVE, Metropolitan Town and Classic Homes Subdivision, Rohm & Hass Compound, Hamdunt Village Subdivision, Pelayo Village Subdivision, Alburn Place Residential Homes Subdivision and Aristocrat Village Subdivision.
- Roads are relatively flat.
- Several outfalls were identified during the field work:
 1. Ø300 RCP Outfall at Miranda Subdivision.
 2. Ø600 RCP outfall of creek located at Narra Street Casimiro Village.
 3. Ø600 outfall downstream of creek at B. Mendoza Street, Pelayo Village.
 4. Ø800 and Ø1050 outfall upstream of creek at B. Mendoza Street, Pelayo Village.
 5. Ø600 RCP outfall downstream of creek at Molave Street, Admiral Village.
 6. Ø375 outfall downstream of creek at Northbound of Alabang Zapote Road Bridge between Admiral Avenue and J. Aguilar Avenue.
 7. Ø750 RCP outfall upstream of creek Southbound of Alabang Zapote Road Bridge between Admiral Avenue and J. Aguilar Avenue.
 8. Ø600 RCP outfall upstream at Platinum Street, Camella Homes IV.
 9. Ø700 outfall upstream of creek at Sinturis Street, Camella Homes IIIC.
 10. Observed 200mmW x 600mmD open canal downstream of creek at Dinar Street, Doña Manuela Subdivision Phase IV C.

11. Ø375 RCP outfall upstream of creek at Molave-Lauan Street, Doña Manuela Subdivision Phase IV C.
 12. Ø375 RCP outfall at downstream of creek located along the bridge of Anitpolo Street bound to Casimiro Avenue.
 13. Ø450 RCP outfall at upstream of creek located along the bridge of Antipolo Street bound to Casimiro Avenue.
 14. Outfall at upstream of creek located along Southbound of Alabang Zapote near Uniwide Sales. Size of outfall cannot be determined due to site obstructions.
 15. Outfall at downstream of creek located along Southbound of Alabang Zapote near Uniwide Sales. This outfall is assumed to be the property of Uniwide Sales.
 16. Ø700 RCP Outfall at downstream of creek located along Southbound of Alabang Zapote near Uniwide Sales.
- Creek water color during this field work is predominantly black in color which indicates septic condition of the body of water. Trash and debris are also present on creek banks. Minimal slope protection was also observed.

Day 9 of Site Visits

Date and Time	July 13, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Talon Tres, BF International, Almanza Uno, Talon Uno
Weather	Cloudy / Shower rain
Surveyors	Team 2: OEC: Yasuhisa Sakurai DCCD: Clayton Bergado, Rizza Raymundo
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in Barangay Talon Tres, BF International, Almanza Uno and Talon Uno are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Topman Village Subdivision, Las Piñas Centreville Subdivision, Chardale Subdivision, Camella Townhomes Subdivision, Southland Estate Subdivision, New BF Garden Homes Subdivision, Admiral Park Subdivision, Admiral Park 2 Subdivision, Casimiro Townhomes III Subdivision, RII Compound, Carmencita Village Subdivision, Aranda Compound and Southland Estate Townhomes Subdivision.
- A large RCBC with an approximate size of 3m x 3m was seen at the part of Kirishima St. near the boundary of Parañaque & Las Piñas and west of BF Homes Phase II. Beside it are 2-Ø1800 RCP outfalls.
- Near the 3mx3m RCBC is a weir. The portion of the creek where the weir is and its upstream has no water.
- A new creek was discovered traversing Palace St. & Seville St. at New BF Garden Homes and adjacent to Rio de Janeiro St. leading towards the RCBC at Kirishima St.

Day 10 of Site Visits

Date and Time	July 15, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Talon Kwarto, Almanza Uno, Talon Uno
Weather	Sunny
Surveyors	Team 2: OEC: Yasuhisa Sakurai DCCD: Clayton Bergado, Rizza Raymundo, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in Barangays Talon Kwarto, Almanza Uno, Talon Uno are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Angela Village 1, 2 & 3, Happyville Subdivision, Pag-Ibig sa Las Piñas Subdivision, Paraiso Subdivision, Equitable Bank Village, Hansuyin Village, Talon Village, Tierra Hermosa II Subdivision, Manila Doctor Village and SM City South Mall.
- BF Executive Village and BF Executive Village Phase II were not surveyed since we had no prior permission for our survey.
- Trees and bushes were seen at the channel of the creek at the northern boundary of Manila Doctor Village that impedes the flow of water in the channel. This is due to the recent storm that passes in the area.
- An outfall approximately Ø1350 RCP at Manila Doctor Village is almost submerged to the creek where it discharges.
- A broken outfall was seen at Vicente St., the southeast portion of Manila Doctor Village. There is no riprap along the sides of the creek at this area.
- Culverts were already submerged at the bridge at the end of Nicanor Abelardo St. which is a Las Piñas-Parañaque boundary. Garbage was also present near the culverts that obstruct the water flow.
- Two STP Candidate sites were identified. Both of the sites were south of SM Sucat and adjacent to the C5 extension road. One of the lands was owned by Manny Villar.

Day 11 of Site Visits

Date and Time	July 16, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Pilar Village, Almanza Uno, Almanza Dos
Weather	Sunny
Surveyors	Team 2: OEC: Yasuhisa Sakurai DCCD: Clayton Bergado, Rizza Raymundo, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in Barangay Pilar Village, Almanza Uno and Almanza Dos are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): San Francisco Del Monte Subdivision, Goodyear Park Subdivision, St. Joseph Subdivision, DBP Village II, Pag-asa Subdivision, Doña Josefa Subdivision, Great Plains Subdivision, BF Homes Almanza and T.S. Cruz Subdivision.
- Children have access to the RCP outfall along Sun Flower Road near Sampaguita Road at St. Joseph Subdivision, Pilar Village. This might be an indication of a broken manhole.
- Pilar Village – D.O. Plaza Portion was not surveyed since we were not allowed by the guards. Approximately Ø1800 RCP was seen along its main road, Cardinal Drive near the bridge. It was assumed that the entire village drains to this outfall.
- The creek both sides of the bridge along Doña Pilar Aguirre Avenue has 3-barrel pipe culverts. Some of the culverts were obstructed by plant leaves.
- An outfall with an approximate size of Ø900 RCP is located at the Catmon St. corner Ubas St., Doña Josefa Subdivision. According to the residents here this area was flooded up to 1 meter above road during the Typhoon Ondoy last year. The whole subdivision seems to be draining to this area.
- Low points are evident in some areas but there are no outfalls seen.
- An open dredged canal was seen near the end of CRM Nancy St. The owner of the lot said that this area is usually flooded during heavy rain that's why he dredged a part of his lot to guide the runoff flow towards the creek.

Day 12 of Site Visits

Date and Time	July 19, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Talon Dos
Weather	Partly Cloudy
Surveyors	Team 2: OEC: none DCCD: Clayton Bergado, Rizza Raymundo, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in Barangay Talon Dos are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Greymarville Subdivision, San Beda Homes, Villa Felisa Homes, VAA Homes II, St. Mary's Subdivision, Crismarcel Subdivision, Aguilar Compound, Mother Earth Subdivision, St. Michael Village and Camella Homes.
- Roads are relatively flat.
- Several outfalls were identified:
 1. Ø1200 RCP outfall downstream of creek located at Rainbow Street, Camella Homes. Ø1050 RCP outfall upstream of creek located at Evelyn Camus Street, BF Resort Village.
 2. Ø700 RCP outfall at downstream of creek at its opposite bank at Evelyn Camus Street, BF Resort Village.
 3. Ø1800 RCPC at Pechie Sacasas Street, BF Resort Village.
- Creek waters observed during this site work exhibits brown color indicating nutrient rich waters.

Day 13 of Site Visits

Date and Time	July 20, 2010 / 9:00 AM to 3:00 PM
Survey Areas	Las Piñas (Team 2): Pamplona Dos, Talon Dos
Weather	Sunny morning and Cloudy afternoon
Surveyors	Team 2: OEC: none DCCD: Clayton Bergado, Rizza Raymundo
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, update creek layout on map, and identify possible candidate STP sites

Findings:

- The areas visited by the team in Barangays Pamplona Dos and Talon Dos are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Pamplona Park Subdivision, Patricia Homes, Remarville Subdivision, Sterlinglife Homes, Philamlife Village, Sta. Cecilia Village, Veraville Subdivision, BF Resort Village, BF Class 1 and BF Homes I Subdivision.
- A gated open canal is located at the west end of Nueva Ecija St., Philam Life Village. The gate of the canal is opened during heavy rainfall occurrence according to the lot owner.
- The Zapote River during the site visit was observed to have a brown color which indicates nutrients rich waters.
- The creek located at the north boundary of Remarville Subdivision, Brgy. Pamplona Dos. It has no flow since its downstream portion has obstruction.
- A broken manhole cover is located at the corner of Margie Moran St. and Onelia Jose St., BF Resort Village.
- A dam is located along Zapote River at the south of Onelia Jose St., BF Resort Village. The dam is currently used as path to reach the other side of Zapote River.

Day 15 of Site Visits

Date and Time	July 22, 2010 / 9:00 AM to 3:35 PM
Survey Areas	Las Piñas (Team 2): Talon Kwarto & Talon Dos
Weather	Cloudy
Surveyors	Team 2: DCCD: Clayton Bergado, Rizza Raymundo
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangays Talon Kwarto and Talon Dos are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): BF Resort Village, Veraville Villa Grande Classic Subdivision (West), Donnaville Sheryl BF Homes, BF Vista Grande Subdivision (North), Camella Merida Subdivision, Casa California Exclusive Subdivision, Venezia Homes, BF Vista Grande Subdivision (South), Moonwalk Subdivision, Veraville Villa Grande Subdivision, San Antonio Valley Subdivision, Sihanun Subdivision, Berkeley Place Subdivision and Veraville Alegria Subdivision.
- Outfalls were found in the area.
 - a. An approximate Ø900mm RCP was located at Casa California Exclusive. The location of the Outfall is considered to be the Creek end. The New Creek is somewhat connected to the Creek line between the boundary of Bacoor and Las Piñas. Visible plants & bushes cover the outfall and there were abandoned garbage visible along the sides of the creek which impedes the flow of water.
 - b. An approximate Ø375mm RCP was located along Eileen Macapagal Road which is connected to the New Creek passing through Camella Merida Village going through the Creek end at Casa California Exclusive. Visible plants & bushes cover the outfall & abandon garbage is also visible along the sides of the creek.
 - c. An approximate Ø900mm RCP was also located at Camella Merida which is also aligned to the New Creek found at Casa California Exclusive.
 - d. An approximate Ø1800mm RCP was located along Marcellus Road which is aligned to the Creek line between Bacoor & Las Piñas.
 - e. An approximate Ø750mm RCP was located between Colloseo Road & Pizza de Venezia Ave. which is also aligned to the Creek between Bacoor & Las Piñas.
 - f. An approximate Ø450mm RCP was located along the bridge which connects the San Antonio Valley Subdivision to Rosas Road. This New Creek is perpendicular to the bridge and is likely to be connected to the Creek parallel to Dama De Noche Road. Squatters are present on both sides of the Creek.
 - g. Two RCP was located along Dama De Noche Road near Sihanuk Subdivision and the sizes are Ø450mm & Ø600mm RCP. This Creek is the continuation of the Creek located near San Antonio Valley.

- h. An approximate Ø900mm RCP was located at the end of Camia Road. Plants & bushes cover the RCP. Squatter area is on the other side of the Creek.
 - i. An approximate Ø1200mm RCP was located along Wilfredo Tecson. The Manhole is not well covered.
- During the Site survey, there were New Creeks discovered which does not appear on the map.
 - Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek which impedes the flow of water.

Day 16 of Site Visits

Date and Time	July 23, 2010 / 10:05 AM to 3:05 PM
Survey Areas	Las Piñas (Team 2): Talon Singko, Talon Uno
Weather	Partly Cloudy
Surveyors	Team 2: DCCD: Rizza C. Raymundo, Clayton Bergado, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangays Talon Singko and Talon Uno are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Castilian Classics Subdivision, United Moonwalk Village Subdivision, Metrocor B, West Side, Prutas Neighborhood Subdivision, Moonwalk Village Subdivision, Golden Acres Subdivision-1, Veraville Townhomes, Agro Homes-II Subdivision, Pamplona Metrocor Homes Subdivision, Agro Homes-I Subdivision, Golden Acres Subdivision-2, Veraville Townhomes Classic Subdivision, Villa Luningning Subdivision, Veraville Homes 3-A Subdivision, Veraville Homes Subdivision, Moonwalk Village Subdivision, St. Scholastica Subdivision, Veraville Homes IV and Mikesell Subdivision.
- Roads are relatively flat.
- Outfalls were found in the area.
 - a. An approximate Ø1200mm RCP Outfall was located at Veraville Homes IV. The location of the area is considered to be a private property.
 - b. Along Apollo III road near Immaculate Mary Parish Church, there were several Outfalls found under the Bridge in which the Creek flows.
 - c. A Creek was located along San Marco road near a school which leads us to the Creek line between Bacoor & Las Piñas and then connects to the New Creek which leads to San Marco Extension. Trees & shrubs & even abandon garbage exist along the sides of the Creek. During strong rainy weather, water level likely to reach a height of 1m as per told by squatters which have lived along the side of the Creek.

- d. An approximate Ø1050mm RCP Outfall was located at the corner of Columbia St. Possible height of water level during strong rainy weather is likely to reach 1.5m height as per told by near by residence.
 - e. Along San Marco Extension (Bridge), an approximate Ø 450mm RCP Outfall was located. The Creek which passes under the bridge connects to the large creek located along San Marco Road.
 - f. At the corner of Saturn Road an approximate Ø600mm RCP Outfall was located.
 - g. An approximate Ø1350mm RCP Outfall was located at Chesa St. The Creek that flows in this area is the continuation of the Creek found along San Marco Extension.
- During the Site survey, there were New Creeks discovered which does not appear on the map. Along the sides of those New Creeks were inhabited by Squatters.
 - Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek, which impedes the flow of water.

Day 17 of Site Visits

Date and Time	July 26, 2010 / 9:00 AM to 3:15 PM
Survey Areas	Las Piñas (Team 2): Pilar Village
Weather	Sunny
Surveyors	Team 2: DCCD: Clayton Bergado, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay Pilar Village are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Doña Leoncia Subdivision, Pilar Village –D.O. Plaza Portion Subdivision, Royal South Subdivision, Hamilton Heights Subdivision, Teresa Park Subdivision, Pilar Village Phase 1 Subdivision, Pilar Village Subdivision, Camella Homes Las Piñas Classic Subdivision and BF Classic Homes Subdivision
- Roads are relatively flat.
- Outfalls were found in the area.
 - a. An approximate Ø900mm RCP Outfall was located at Doña Leoncia Ave. which leads to the Creek. Squatter area is at the other side of the Creek.
 - b. An approximate Ø1200mm RCP Outfall was located at the low point of Royal South Village. Visible small rocks likely to impede the flow of water.
 - c. Five different sizes of RCP were located along Silicon Road. The 2- Ø1500mm RCP seems to be covered with branches/bushes & some garbage which impedes the flow of water which causes the RCP to malfunction.
 - d. An approximate two Ø600mm RCP Outfall was located along the road crossing between Camino Real & Doña Pilar Aguirre.
 - e. 2-Ø1050mm RCP passing through the bridge was located along Mercury road & at the 2nd bridge there were five different sizes of RCP and one of those RCP seems to have been covered by bushes & garbage that impedes the flow of water.
 - f. At the low point between Molave Road & Doña Pilar Aguirre there were approximately 1-Ø375mm Outfall & 1-Ø1350mm & 2-Ø1800mm RCP.
 - g. 2-Ø900mm RCP was located along Copper Road.
 - h. At the corner between Tindalo & Lanete Road, there is a manhole which might possibly leads to the Creek. Possible size of the RCP is around Ø900mm.
 - i. An approximate Ø1050mm RCP Outfall was located along Jerusalem Road and has determined the end of the Creek. The Creek is likely to be surrounded by bushes.

- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek which impedes the flow of water.

Day 19 of Site Visits

Date and Time	July 28, 2010 / 10:15 AM to 2:25 PM
Survey Areas	Las Piñas (Team 2): Talon Uno, Almanza Uno, Almanza Dos
Weather	Sunny
Surveyors	Team 2: DCCD: Clayton Bergado, Robert Ajaban
Main Activities	Identify drainage flow directions & outfalls, determine borderline of catchment areas, and update creek layout on map.

Findings:

- The areas visited by the team in Barangay Talon Uno, Almanza Uno and Almanza Dos are mostly high-end subdivisions and a number of commercial/industrial complexes. They are as follows (in no particular order): Golden Acres Subdivision, Rainbow Village-4 Subdivision, Pilar Village Subdivision-1, Pag-ibig Christian Subdivision, Golden Acres Subdivision-2, Savior VII Subdivision, Christian Ville Subdivision, Soldier's Hills II Subdivision, Ayala Southvale Village Sonera and Versailles Village.
- Roads are relatively flat.
- Outfalls were found in the area.
 - a. An approximate Ø600mm RCP was located at End Sapphire St. which leads to the Creek.
 - b. Along Sapphire St. (Bridge) an approximate Ø600mm RCP & two Ø1050mm RCP Outfall was located.
 - c. An approximate Ø375mm RCP Outfall and several RCP were located along San Antonio Road. Large sizes of RCP seem to be covered by garbage which impedes the flow of water.
 - d. At the corner between Kasoy & Kamachi St. approximately Ø450mm RCP Outfall was located.
 - e. At the end road of Casaya St. approximately Ø1050mm RCP Outfall was located. The Creek in which this outfall tends to dispose its water connects to the Creek located along Sapphire St.
 - f. The Bridge located along Marcos Alvarez Ave. Two outfalls of the same size, approximately Ø900mm RCP Outfall was located.
 - g. The Bridge at the boundary of Bacoor along Marcos Alvarez Ave. Several Outfalls of different sizes were located.
 - h. Two Outfalls were located at the end road of Papaya St. Approximately Ø375mm RCP & Ø900mm RCP in size.
 - i. Three Outfalls were located along Ayala-Las Piñas Drive. Approximately Ø1200mm RCP on the 1st bridge while Ø1050mm RCP & Ø900mm RCP was located on the 2nd bridge.

- Most of the Creek areas determined during the survey has visible abandon garbage along the sides of the Creek which impedes the flow of water.
- Versailles Village wasn't able to be surveyed for it is considered to be a private property. A request in a form of letter was needed to survey the area, to be forward to the Engineering Office of Versailles Village.
- At Ayala Southvalle Village Solera, a part of the area wasn't able to be surveyed due to the barricades installed inside the village.

Day 21 of Site Visits

Date and Time	August 11, 2010 / 12:30 PM to 3:00 PM
Survey Areas	Las Piñas
Weather	Fine (Cloudy)
Surveyors	OEC: Atsuo Suzuki, Hiroki Kameya
	DCCD: Clayton Bergado, Fzoe Yambao
Main Activities	Survey the subdivisions in Las Piñas that were not surveyed last time due to high security

Findings:

- Del Pilar subdivision is not yet accessible due to the absence of the subdivision manager as coordinated by the security guard. The team just managed to check the outfall of the whole subdivision at the bridge just before guard house. It was a single Ø1500mm diameter RCP.
- The bridge at the creek passing the executive subdivision is found to have plenty of garbage, majority of which are styropore materials.
- The creeks visited at the perimeter of the subdivision are inhabited by clusters of informal settlers and vegetated narrowing the available widths of the creeks.

Annex 2-1

WASTEWATER QUALITY MONITORING REPORT Parañaque and Las Piñas (January 29, February 1 and 2, 2011)

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1. INTRODUCTION

This report presents the procedures and results of wastewater quality monitoring conducted on February 1 and 2, 2011 for Original Engineering Consultants Company Limited (OEC) at six sampling stations confined in creeks of Las Piñas and Parañaque City. Berkman System (BSI) was commissioned to conduct the monitoring wherein Engr. Albert S. Tagubaras and Jose Arjay M. Santiago led the teams that administered the sampling.

A total of six (6) stations were monitored for wastewater quality, three (3) stations were located at Parañaque City and three (3) stations at Las Piñas City. The parameters monitored were Temperature, Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil and Grease, and Total Coliform.

The summary of sampling dates and time of monitoring each station were presented in *Table 1*. Meanwhile, locations of the stations found in the Las Piñas City and Parañaque City were shown in *Figure 1* and *Figure 2*, respectively.

Table 1. Summary of Sampling Dates and Time of Monitoring

Station Number	Location	Date Sampled	Time Sampled
Sampling Stations within Las Piñas City			
Station No. 1	IND 1 (Creek)	January 29, 2011	0800 H
Station No. 2	RES 4 (Creek)	January 29, 2011	0850 H
Station No. 3	COM 2 (Creek)	January 29, 2011	0920 H
Sampling Stations within Parañaque City			
Station No. 11	RES 6 (Creek)	January 29, 2011	1005 H
Station No. 12	COM 1 (Creek)	January 29, 2011	1040 H
Station No. 13	IND 1 (Creek)	January 29, 2011	1205 H

In addition, wastewater flow check was conducted at the same sampling stations at 10 times during a particular day.

Figure 1. Location of Effluent Wastewater Sampling Stations at Las Piñas

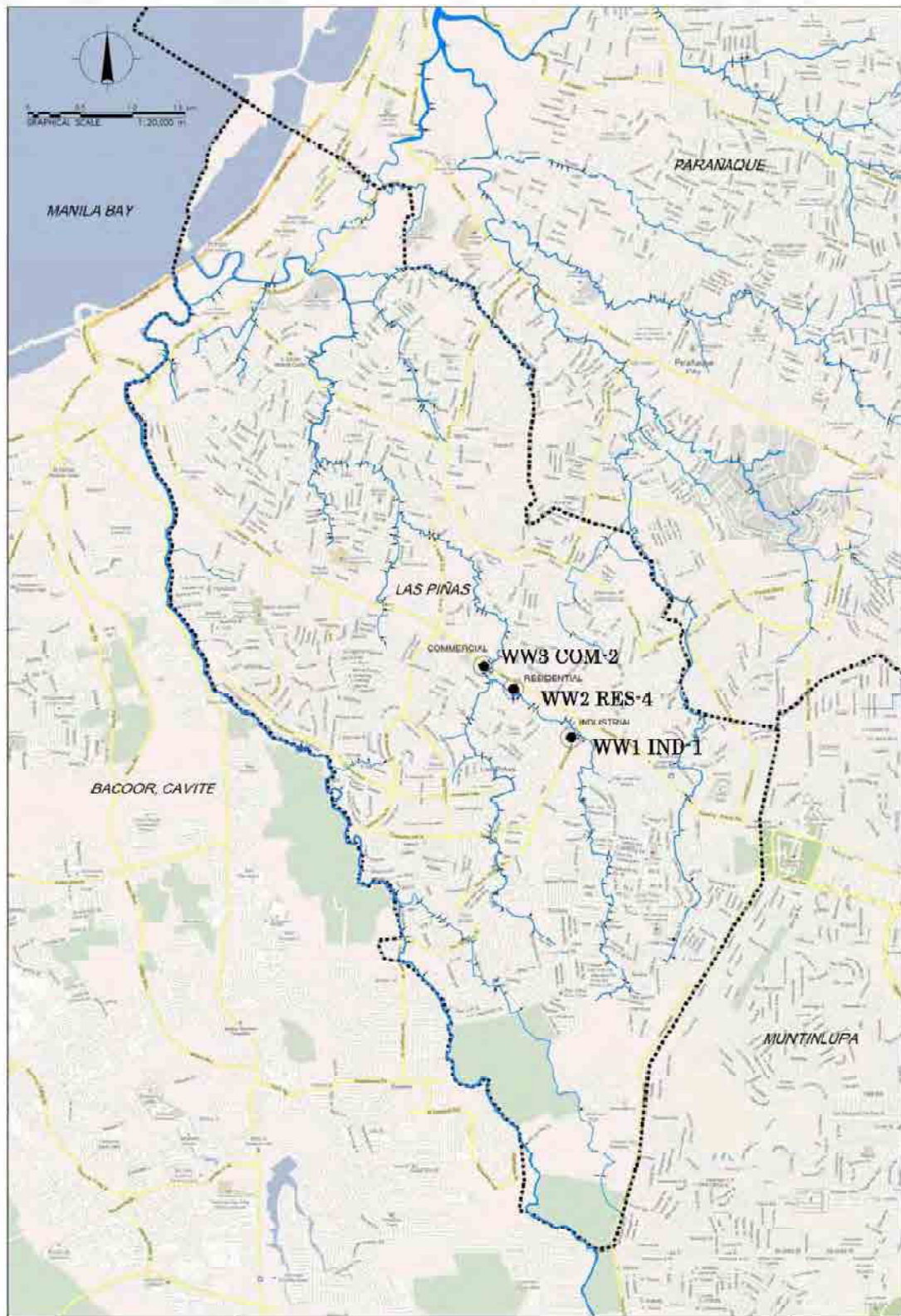


Figure2. Location of Effluent Wastewater Sampling Stations at Parañaque



2. OBJECTIVE OF THE MONITORING

The purpose of the monitoring was to verify the company's compliance with the wastewater quality standards of DENR Administrative Order No. 35 Series of 1990 (*Revised Effluent Regulations of 1990*).

3. METHODS OF SAMPLING AND ANALYSIS

3.1 Wastewater Quality Sampling

Samples were obtained from the sampling stations and were preserved in an ice-filled cooler before shipping to an independent laboratory for analysis. The sampling procedures and analyses were in accordance with DENR's AO 35 and the American Public Health Association or APHA's Standard Methods for the Examination of Water and Wastewater. The methods of analyses were presented in *Table 3*.

3.2 Wastewater Quality Analysis

Table 2. Parameters and Methods of Analyses for Wastewater Quality

Parameter	Methodology
pH	Glass Electrode (in-situ)
Temperature	Digital Thermometer (in-situ)
Total Suspended Solids (TSS)	Gravimetric
Biochemical Oxygen Demand (BOD)	Azide Modification (Dilution Technique)
Chemical Oxygen Demand (COD)	Closed Reflux, Colorimetric
Oil and Grease	Partition – Gravimetric
Total Coliform	Multiple Tube Fermentation Technique

3.3 Water Flow Check

Water from the sampling station was taken at 10 measuring times during a particular day, namely at 0600H, 0700H, 0800H, 1000H, 1300H, 1500H, 1700H, 1800H, 1900H and 2000H. With the use of a bucket, the time it took for the water to reach 5 to 6 liters and the exact volume obtained was recorded.

4. RESULTS AND DISCUSSIONS

4.1 Wastewater Quality Monitoring for Stations Located at Las Piñas City

Tables 3 to 8 present the results of the analysis and wastewater flow check for the wastewater samples taken from creeks confined within Las Piñas City.

Table 3. Station No. 1 Wastewater Quality Monitoring Results

Parameters	WW 1 IND 1 (Creek) 29 Jan 11 / 0800 H	DENR EFFLUENT STANDARD for Class C Waters
pH (In situ)	7.6	6.5 to 9.0
Temperature, °C (In situ)	25.0	3°C max rise
TSS, mg/L	12.0	70
BOD, mg/L	33.0	50
COD, mg/L	60.0	100
Oil and Grease, mg/L	1.6	5.0
Total Coliform, MPN/100mL	17 x 10 ⁶	10,000

Note: MPN – Most Probable Number

Station No. 1 (IND 1) results of analysis on pH, TSS, BOD, COD, and oil and grease were within the wastewater quality criteria, with reference to DENR AO 35 Effluent Standards for Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C. However, total coliform was unable to comply with the DENR effluent standards.

Table 4. Station No. 1 Wastewater Flow Check Results

Time of Sampling	Volume collected (Liter)	Duration of Collection (Second)
0625 H	5.2	4.48
0710 H	5.0	4.50
0805 H	5.2	3.43
1003 H	5.2	3.46
1305 H	5.6	3.89
1500 H	5.4	3.44
1700 H	5.6	3.91
1810 H	5.7	3.47
1905 H	5.6	3.38
2003 H	5.4	3.51

* Date of Sampling: February 1, 2011

Table 5. Station No. 2 Wastewater Quality Monitoring Results

Parameters	WW 2 RES 4 (Creek) 29 Jan 11 / 0850 H	DENR EFFLUENT STANDARD for Class C Waters
pH	7.9	6.5 to 9.0
Temperature, °C (In situ)	25.0	3°C max rise
TSS, mg/L	136	70
BOD, mg/L	215	50
COD, mg/L	382	100
Oil and Grease, mg/L	2.0	5.0
Total Coliform, MPN/100mL	54 x 10 ⁶	10,000

Note: MPN – Most Probable Number

Station No. 2 (RES 4) result of analysis on pH and oil and grease were within the wastewater quality criteria, with reference to DENR AO 35 Effluent Standards for Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C. However, TSS, BOD, COD and total coliform were unable to comply with the DENR effluent standards.

Table 6. Station No. 2 Wastewater Flow Check Results

Time of Sampling	Volume collected (Liter)	Duration of Collection (Second)
0635 H	5.4	3.50
0705 H	5.6	2.49
0802 H	5.6	2.25
1009 H	5.4	2.15
1332 H	5.6	2.80
1504 H	5.5	2.45
1702 H	5.4	2.56
1806 H	5.2	2.58
1903 H	5.4	2.69
2002 H	5.5	2.55

* Date of Sampling: February 1, 2011

Table 7. Station No. 3 Wastewater Quality Monitoring Results

Parameters	WW3 COM 2 (Creek) 29 Jan 11 / 0920 H	DENR EFFLUENT STANDARD for Class C Waters
pH	7.9	6.5 to 9.0
Temperature, °C (In situ)	25.0	3°C max rise
TSS, mg/L	1.0	70
BOD, mg/L	3.0	50
COD, mg/L	6.0	100
Oil and Grease, mg/L	<0.1	5.0
Total Coliform, MPN/100mL	23 x 10 ⁶	10,000

Note: MPN – Most Probable Number

Station No. 3 (COM 2) results of analysis on pH, TSS, BOD, COD, and oil and grease were within the wastewater quality criteria, with reference DENR AO 35 Effluent Standards for Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C. However total coliform was unable to comply with the DENR effluent standards.

Table 8. Station No. 3 Wastewater Flow Check Results

Time of Sampling	Volume collected (Liter)	Duration of Collection (Second)
0640 H	5.2	7.47
0704 H	5.1	7.75
0800 H	5.2	9.86
1002 H	5.1	11.71
1300 H	5.6	12.13
1500 H	5.6	13.81
1702 H	5.1	15.24
1800 H	5.4	16.12
1902 H	5.2	15.37
2000 H	5.1	14.02

* Date of Sampling: February 1, 2011

4.2 Wastewater Quality Monitoring for Stations Located at Parañaque City

Table 9. Station No. 11 Wastewater Quality Monitoring Results

Parameters	WW11 RES 6 (Creek) 29 Jan 11 / 1005 H	DENR EFFLUENT STANDARD for Class C Waters
pH	7.5	6.5 to 9.0
Temperature, °C (In situ)	25.0	3°C max rise
TSS, mg/L	102	70
BOD, mg/L	100	50
COD, mg/L	174	100
Oil and Grease, mg/L	3.0	5.0
Total Coliform, MPN/100mL	35 x 10 ⁶	10,000

Note: MPN – Most Probable Number

Station No. 11 (RES 6) results of analysis on pH and oil and grease were within the wastewater quality criteria, with reference to DENR AO 35 Effluent Standards for Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C. However, TSS, BOD, COD, and total coliform were unable to comply with the DENR effluent standards.

Table 10. Station No. 11 Wastewater Flow Check Results

Time of Sampling	Volume collected (Liter)	Duration of Collection (Second)
0615 H	5.2	10.09
0710 H	5.2	8.75
0807 H	5.4	7.00
1000 H	5.4	7.68
1320 H	5.6	8.60
1506 H	5.8	10.05
1705 H	5.4	14.66
1808 H	5.6	12.50
1905 H	5.6	15.19
2010 H	5.8	12.68

* Date of Sampling, February 2, 2011

Table 11. Station No. 12 Wastewater Quality Monitoring Results

Parameters	WW12 COM 1 (Creek) 29 Jan 11 / 1040 H	DENR EFFLUENT STANDARD for Class C Waters
pH	7.6	6.5 to 9.0
Temperature, °C (In situ)	25.0	3°C max rise
TSS, mg/L	20.0	70
BOD, mg/L	152	50
COD, mg/L	266	100
Oil and Grease, mg/L	<0.1	5.0
Total Coliform, MPN/100mL	35 x 10 ⁶	10,000

Note: MPN – Most Probable Number

Station No. 12 (COM 1) results of analysis on pH, TSS, and oil and grease were within the wastewater quality criteria, with reference to DENR AO 35 Effluent Standards for Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C. However, BOD, COD and total coliform were unable to comply with the DENR effluent standards.

Table 12. Station No. 12 Wastewater Flow Check Results

Time of Sampling	Volume collected (Liter)	Duration of Collection (Second)
0640 H	5.4	6.91
0701 H	5.2	6.13
0802 H	5.4	5.46
1001 H	5.1	6.44
1301 H	5.4	5.28
1500 H	5.1	5.97
1701 H	5.6	6.47
1802 H	5.1	5.47
1902 H	5.2	5.18
2001 H	5.9	5.14

* Date of Sampling: February 2, 2011

Table 13. Station No. 13 Wastewater Quality Monitoring Results

Parameters	WI3 IND 1 (Creek) 29 Jan 11 / 1205 H	DENR EFFLUENT STANDARD for Class C Waters
pH	7.3	6.5 to 9.0
Temperature, °C (In situ)	25	3°C max rise
TSS, mg/L	20.0	70
BOD, mg/L	92.0	50
COD, mg/L	134	100
Oil and Grease, mg/L	<0.1	5.0
Total Coliform, MPN/100mL	24 x 10 ⁶	10,000

Note: MPN – Most Probable Number

Station No. 13 (WW13) results of analysis on pH, TSS, and oil and grease were within the wastewater quality criteria, with reference to DENR AO 35 Effluent Standards for Conventional and Other Pollutants in Protected Waters Category I and II and in Inland Waters Class C. However, BOD, COD, and total coliform were unable to comply with the DENR effluent standards.

Table 14. Station No. 13 Wastewater Flow Check Results

Time of Sampling	Volume collected (Liter)	Duration of Collection (Second)
0620 H	5.2	25.61
0705 H	5.1	50.81
0803 H	5.2	42.43
1001 H	5.3	14.24
1306 H	5.4	21.46
1503 H	5.2	56.75
1702 H	5.4	59.67
1809 H	5.3	72.60
1905 H	5.2	84.0
2001 H	5.2	95.4

* Date of Sampling: February 2, 2011

ANNEX A

LABORATORY CERTIFICATES



Unit 201-202 Rizalina Annex Bldg. 1677 Quezon Avenue, Quezon City
Tel. No. 927-77-15 Fax No. 929-48-24 Email: info@elarsi.com

CLIENT : **BERKMAN SYSTEMS, INC.** Lab. Report No. : 110137
 ADDRESS : 3rd Flr., VAG Bldg Ortigas Ave. Greenhills Date Sampled : 01-29-11
 San Juan, Metro Manila Date Received : 01-29-11
 Nature of Sample/s : Wastewater Date Analyzed : 01-29-11 to 02-09-11
 No. of Sample/s Submitted : Six (6) Date Reported : 02-09-11

[R E P O R T O F A N A L Y S E S]

Sample No. Sample ID
 1100825 = PJ 11 039 WW1

Parameters	Concentration	Method	Detection Limit
Total Suspended Solids (TSS), mg/L	12.0	Gravimetric	0.1
Oil and Grease (O&G), mg/L	1.6	Partition-Gravimetric	0.1
Biochemical Oxygen Demand (BOD), mg/L	33.0	Azide Modification (Dilution Technique)	1.0
Chemical Oxygen Demand (COD), mg/L	60.0	Closed Reflux - Colorimetric	1.0

Reference
 Standard Methods for Examination of Water and Wastewater, APHA-AWWA, 21st ed., 2005

Checked By:

RENATO M. GOFREDO JR.
 Chemist

Certified By:

RESSAN K. ARBUTANTE
 Laboratory Manager



Unit 201-202 Rizalina Annex Bldg. 1677 Quezon Avenue, Quezon City
Tel. No. 927-77-15 Fax No. 929-48-24 Email: info@elarsi.com

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 ADDRESS : 3rd Flr., VAG Bldg Ortigas Ave. Greenhills Date Sampled : 01-29-11
 San Juan, Metro Manila Date Received : 01-29-11
 Nature of Sample/s : Wastewater Date Analyzed : 01-29-11 to 02-09-11
 No. of Sample/s Submitted : Six (6) Date Reported : 02-09-11


[R E P O R T O F A N A L Y S E S]

Sample No. Sample ID
 1100826 = PJ 11 039 WW2


Parameters	Concentration	Method	Detection Limit
Total Suspended Solids (TSS), mg/L	136	Gravimetric	0.1
Oil and Grease (O&G), mg/L	2.0	Partition-Gravimetric	0.1
Biochemical Oxygen Demand (BOD), mg/L	215	Azide Modification (Dilution Technique)	1.0
Chemical Oxygen Demand (COD), mg/L	382	Closed Reflux - Colorimetric	1.0

Reference:
 Standard Methods for Examination of Water and Wastewater. APHA-AWWA. 21st ed., 2005

Checked By:


RENATO M. GOFREDO JR.
 Chemist

Certified By:


RESSAN K. ARBUTANTE
 Laboratory Manager



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 Tel. No. 927-77-15 Fax No. 929-48-24 Email: info@earsi.com

CLIENT	: BERKMAN SYSTEMS, INC.	Lab. Report No.	: 110137
ADDRESS	: 3 rd Flr., VAG Bldg Ortigas Ave. Greenhills	Date Sampled	: 01-29-11
	: San Juan, Metro Manila	Date Received	: 01-29-11
Nature of Sample/s	: Wastewater	Date Analyzed	: 01-29-11 to 02-09-11
No. of Sample/s Submitted	: Six (6)	Date Reported	: 02-09-11

[R E P O R T O F A N A L Y S E S]

Sample No. Sample ID
 1100827 = PJ 11 039 WW3

Parameters	Concentration	Method	Detection Limit
Total Suspended Solids (TSS), mg/L	1.0	Gravimetric	0.1
Oil and Grease (O&G), mg/L	< 0.1	Partition-Gravimetric	0.1
Biochemical Oxygen Demand (BOD), mg/L	3.0	Azide Modification (Dilution Technique)	1.0
Chemical Oxygen Demand (COD), mg/L	6.0	closed Reflux Colorimetric	1.0

Reference
 Standard Methods for Examination of Water and Wastewater, APHA-AWWA, 21st ed., 2005

Checked By:

RENATO M. GOFREDO JR.
 Chemist

Certified By:

RESSAN K. ARBUTANTE
 Laboratory Manager



ELARSI, INC.

Unit 201-202 Rizalina Annex Bldg. 1677 Quezon Avenue, Quezon City
Tel. No. 927-77-15 Fax No. 929-48-24 Email: info@elarsi.com

CLIENT	: BERKMAN SYSTEMS, INC.	Lab. Report No.	: 110137
ADDRESS	: 3 rd Flr., VAG Bldg Ortigas Ave. Greenhills San Juan, Metro Manila	Date Sampled	: 01-29-11
Nature of Sample/s	: Wastewater	Date Received	: 01-29-11
No. of Sample/s Submitted	: Six (6)	Date Analyzed	: 01-29-11 to 02-09-11
		Date Reported	: 02-09-11

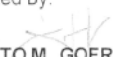
[R E P O R T O F A N A L Y S E S]

<u>Sample No.</u>		<u>Sample ID</u>
1100828	=	PJ 11 039 WW11

Parameters	Concentration	Method	Detection Limit
Total Suspended Solids (TSS), mg/L	102	Gravimetric	0.1
Oil and Grease (O&G), mg/L	3.0	Partition-Gravimetric	0.1
Biochemical Oxygen Demand (BOD), mg/L	100	Azide Modification (Dilution Technique)	1.0
Chemical Oxygen Demand (COD), mg/L	174	Closed Reflux - Colorimetric	1.0

Reference
Standard Methods for Examination of Water and Wastewater, APHA-AWWA, 21st ed., 2005

Checked By:


RENATO M. GOFREDO JR.
Chemist

Certified By:


RESSAN K. ARBUTANTE
Laboratory Manager



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CLIENT : **BERKMAN SYSTEMS, INC.** Lab. Report No. : 110137
 ADDRESS : 3rd Flr., VAG Bldg Ortigas Ave. Greenhills Date Sampled : 01-29-11
 San Juan, Metro Manila Date Received : 01-29-11
 Nature of Sample/s : Wastewater Date Analyzed : 01-29-11 to 02-09-11
 No. of Sample/s Submitted : Six (6) Date Reported : 02-09-11

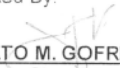
[R E P O R T O F A N A L Y S E S]

Sample No. Sample ID
 1100829 = PJ 11 039 WW12


Parameters	Concentration	Method	Detection Limit
Total Suspended Solids (TSS), mg/L	20.0	Gravimetric	0.1
Oil and Grease (O&G), mg/L	< 0.1	Partition-Gravimetric	0.1
Biochemical Oxygen Demand (BOD), mg/L	152	Azide Modification (Dilution Technique)	1.0
Chemical Oxygen Demand (COD), mg/L	266	Closed Reflux - Colorimetric	1.0

Reference
 Standard Methods for Examination of Water and Wastewater, APHA-AWWA, 21st ed., 2005

Checked By:


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Certified By:


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 Laboratory Manager



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CLIENT : **BERKMAN SYSTEMS, INC.** Lab. Report No. : 110137
 ADDRESS : 3rd Flr., VAG Bldg Ortigas Ave. Greenhills Date Sampled : 01-29-11
 San Juan, Metro Manila Date Received : 01-29-11
 Nature of Sample/s : Wastewater Date Analyzed : 01-29-11 to 02-09-11
 No. of Sample/s Submitted : Six (6) Date Reported : 02-09-11

[R E P O R T O F A N A L Y S E S]

Sample No. Sample ID
 1100830 = PJ 11 039 WW13

Parameters	Concentration	Method	Detection Limit
Total Suspended Solids (TSS), mg/L	20.0	Gravimetric	0.1
Oil and Grease (O&G), mg/L	< 0.1	Partition-Gravimetric	0.1
Biochemical Oxygen Demand (BOD), mg/L	92.0	Azide Modification (Dilution Technique)	1.0
Chemical Oxygen Demand (COD), mg/L	134	Closed Reflux - Colorimetric	1.0

Reference:
 Standard Methods for Examination of Water and Wastewater, APHA-AWWA, 21st ed., 2005

Checked By:

RENATO M. GOFREDO JR.
 Chemist

Certified By:

RESSAN K. ARBUTANTE
 Laboratory Manager



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Tel. No. 927-77-15 Fax No. 929-48-24 Email: info@elarsi.com

CLIENT	: BERKMAN SYSTEMS, INC.	Lab. Report No.	: 110137
ADDRESS	: 3 rd Flr., VAG Bldg Ortigas Ave. Greenhills San Juan, Metro Manila	Date Sampled	: 01-29-11
Nature of Sample/s	: Wastewater	Date Received	: 01-29-11
No. of Sample/s Submitted	: Six (6)	Date Analyzed	: 01-29-11 to 02-09-11
		Date Reported	: 02-09-11

[R E P O R T O F A N A L Y S E S]

Sample No.	Sample ID	Total Coliform, MPN/100 ml
1100825	PJ 11 039 WW1	17 x 10 ⁶
1100826	PJ 11 039 WW2	54 x 10 ⁶
1100827	PJ 11 039 WW3	23 x 10 ⁶
1100828	PJ 11 039 WW11	35 x 10 ⁶
1100829	PJ 11 039 WW12	17 x 10 ⁶
1100830	PJ 11 039 WW13	24 x 10 ⁶


Method	Multiple Tube Fermentation Technique
Detection Limit	1.8

Reference:
Standard Methods for Examination of Water and Wastewater, APHA-AWWA, 21st ed., 2005

Checked By:


RYAN G. CLAMOR
Microbiologist

Certified By:


RESSAN K. ARBUTANTE
Laboratory Manager

ANNEX B

PHOTODOCUMENTATION



Station No.1 : IND 1 (Creek)



Station No. 2 : RES 4 (Creek)



Station No. 3 ; COM 2 (Creek)



Station No. 11 : RES 6 (Creek)



Station No. 12 : COM 1 (Creek)



Station No. 13 : IND 1 (Creek)

Annex 2-2

FRESH WATER QUALITY MONITORING REPORT (July 29 and 30, 2010) Parañaque and Las Piñas City

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1. INTRODUCTION

This report presents the procedures and results of fresh water quality monitoring conducted on July 29 and 30, 2010 for Original Engineering Consultants Co., Ltd. (OEC), with sampling stations confined in the rivers and creeks of Las Piñas and Parañaque City. Berkman Systems, Inc. (BSI) was commissioned to conduct the monitoring wherein Mr. Rolando S. Salazar led the team that administered the sampling.

A total of eighteen (18) stations were monitored for fresh surface water quality, eleven (11) stations were located at Parañaque City and seven (7) stations at Las Piñas City. The parameters monitored were pH, Temperature, Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Total Coliform.

The summary of sampling dates and time of monitoring each station were presented in *Table 1* while the Global Positioning System (GPS) coordinates of each station were presented in *Table 2*. Map locations of the all sampling stations were presented in *Figure 1*. Meanwhile, locations of the stations found in the Las Piñas City and Parañaque City are shown in Tables 2 and 3, respectively.

Table 1. Summary of Sampling Dates and Time of Monitoring

Station Number	Location	Date Sampled	Time Sampled
<i>Sampling Stations within Las Piñas City</i>			
<i>Station No. 1</i>	Gold Stone Doña Pilar Aguirre Avenue	30 July 2010	10:44 AM
<i>Station No. 2</i>	Talon Bridge; Alabang-Zapote Road	30 July 2010	09:20 AM
<i>Station No. 3</i>	Palanyag	29 July 2010	11:14 AM
<i>Station No. 4</i>	Alido Bridge	29 July 2010	10:29 AM
<i>Station No. 5</i>	Dongalo Santo Niño	29 July 2010	07:58 AM
<i>Station No. 6</i>	Naga – Pulang Lupa	29 July 2010	10:41 AM
<i>Station No. 7</i>	Talon Singko	30 July 2010	10:06 AM
<i>Sampling Stations within Parañaque City</i>			
<i>Station No. 8</i>	Cut – Cut Bridge	29 July 2010	06:53 AM
<i>Station No. 9</i>	Tambo Bridge	29 July 2010	06:35 AM
<i>Station No. 10</i>	Santo Niño Bridge	29 July 2010	07:14 AM
<i>Station No. 11</i>	La Huerta	29 July 2010	10:08 AM

Station No. 12	Kintetsu World Express	29 July 2010	07:28 AM
Station No. 13	Merville Access Road	29 July 2010	12:45 PM
Station No. 14	Ibayo Airport View Subdivision	30 July 2010	12:42 PM
Station No. 15	Doña Soledad	29 July 2010	11:49 AM
Station No. 16	SAV II Bridge	29 July 2010	09:42 AM
Station No. 17	Aberdee	29 July 2010	09:25 AM
Station No. 18	Parañaque National High School	29 July 2010	08:20 AM

Table 2. Summary of GPS Coordinates

Station Number	Location	GPS Coordinates	
		Latitude	Longitude
<i>Sampling Stations within Las Piñas City</i>			
Station No. 1	Gold Stone Doña Pilar Aguirre Avenue	14°25'31.1"N	121°00'31.8"E
Station No. 2	Talon Bridge; Alabang-Zapote Road	14°26'29.6"N;	120°59'54.8"E
Station No. 3	Palanyag	14°28'18.3"N	120°59'52.5"E
Station No. 4	Alido Bridge	14°28'28.9"N	120°58'40.6"E
Station No. 5	Dongalo Santo Niño	14°28'09.6"N	120°58'09.9"E
Station No. 6	Naga – Pulang Lupa	14°27'35.7"N	120°58'40.6"E
Station No. 7	Talon Singko	14°35'04.2"N	120°59'27.2"E
<i>Sampling Stations within Parañaque City</i>			
Station No. 8	Cut – Cut Bridge	14°31'01.5"N	120°59'53.9"E
Station No. 9	Tambo Bridge	14°30'34.6"N	121°00'09.8"E
Station No. 10	Santo Niño Bridge	14°30'17.1"N	120°59'40.8"E
Station No. 11	La Huerta	14°29'52.3"N	120°59'35.9"E
Station No. 12	Kintetsu World Express	14°29'33.3"N	120°59'33.0"E
Station No. 13	Merville Access Road	14°30'20.0"N	121°01'41.4"E
Station No. 14	Ibayo Airport View Subdivision	14°29'58.8"N	121°00'31.7"E
Station No.	Doña Soledad	14°29'06.6"N	121°01'49.2"E

15			E
Station No. 16	SAV II Bridge	14°28'21.4"N	121°01'20.0" E
Station No. 17	Aberdee	14°27'59.4"N	121°00'38.2" E
Station No. 18	Parañaque National High School	14°28'49.6"N	120°59'58.4" E



Figure 1. Location of All Fresh Surface Water Sampling Stations



Figure 2. Location of Fresh Surface Water Sampling Stations at Las Piñas City



Figure 3. Location of Fresh Surface Water Sampling Stations at Parañaque City

2. OBJECTIVE OF THE MONITORING

The purpose of the monitoring was to verify the company's compliance with the water quality standards of Department of Environment and Natural Resources (DENR) Administrative Order No. 34 Series of 1990 (*Revised Water Usage and Classifications of 1990*) with stations classified as Class C fresh surface waters.

3. METHODS OF SAMPLING AND ANALYSIS

Samples were obtained from the sampling stations and were preserved in an ice-filled cooler before shipping to an independent laboratory for analysis. The sampling procedures and analyses were in accordance with DENR's AO 34 and the American Public Health Association or APHA's Standard Methods for the Examination of Water and Wastewater. The methods of analyses were presented in *Table 3*.

Table 3. Parameters and Methods of Analyses for Fresh Surface Water Quality

Parameter	Methodology
pH	Glass Electrode (in-situ)
Temperature	Digital Thermometer (in-situ)
Total Suspended Solids (TSS)	Gravimetric
Biochemical Oxygen Demand (BOD)	Azide Modification (Dilution Technique)
Chemical Oxygen Demand (COD)	Closed Reflux, Colorimetric
Total Coliform	Multiple Tube Fermentation Technique

4. RESULTS AND DISCUSSIONS

4.1 Fresh Surface Water Quality Monitoring for Stations Located at Las Piñas City

Tables 4 to 10 present the results of the analysis for the fresh surface water samples taken from rivers and creeks confined within Las Piñas City.

Table 4. Station No. 1 Fresh Surface Water Quality Monitoring Results

Parameters	W1 Gold Stone corner Doña Pilar Aguirre Avenue 30 July 2010 / 10:44 AM	Water Quality Criteria for Class C Waters
pH	7.40	6.5 – 8.5
Temperature, °C	27.6	3°C max rise ^a
TSS, mg/L	5.6	^b
BOD, mg/L	44.0	7 (10) ^c
COD, mg/L	91.0	No Criteria
Total Coliform, MPN/100mL	22 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 1 (Gold Stone corner Doña Pilar Aguirre Avenue) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 4*.



Figure 4. Location of Station No. 1 (Gold Stone corner Doña Pilar Aguirre Avenue)

Table 5. Station No. 2 Fresh Surface Water Quality Monitoring Results

Parameters	W2 Talon Bridge at Alabang- Zapote Road 30 July 2010 / 09:20 AM	Water Quality Criteria for Class C Waters
pH	7.50	6.5 – 8.5
Temperature, °C	28.9	3°C max rise ^a
TSS, mg/L	9.2	^b
BOD, mg/L	20.0	7 (10) ^c
COD, mg/L	38.0	No Criteria
Total Coliform, MPN/100mL	14 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 2 (Talon Bridge at Alabang Zapote Road) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 5*.

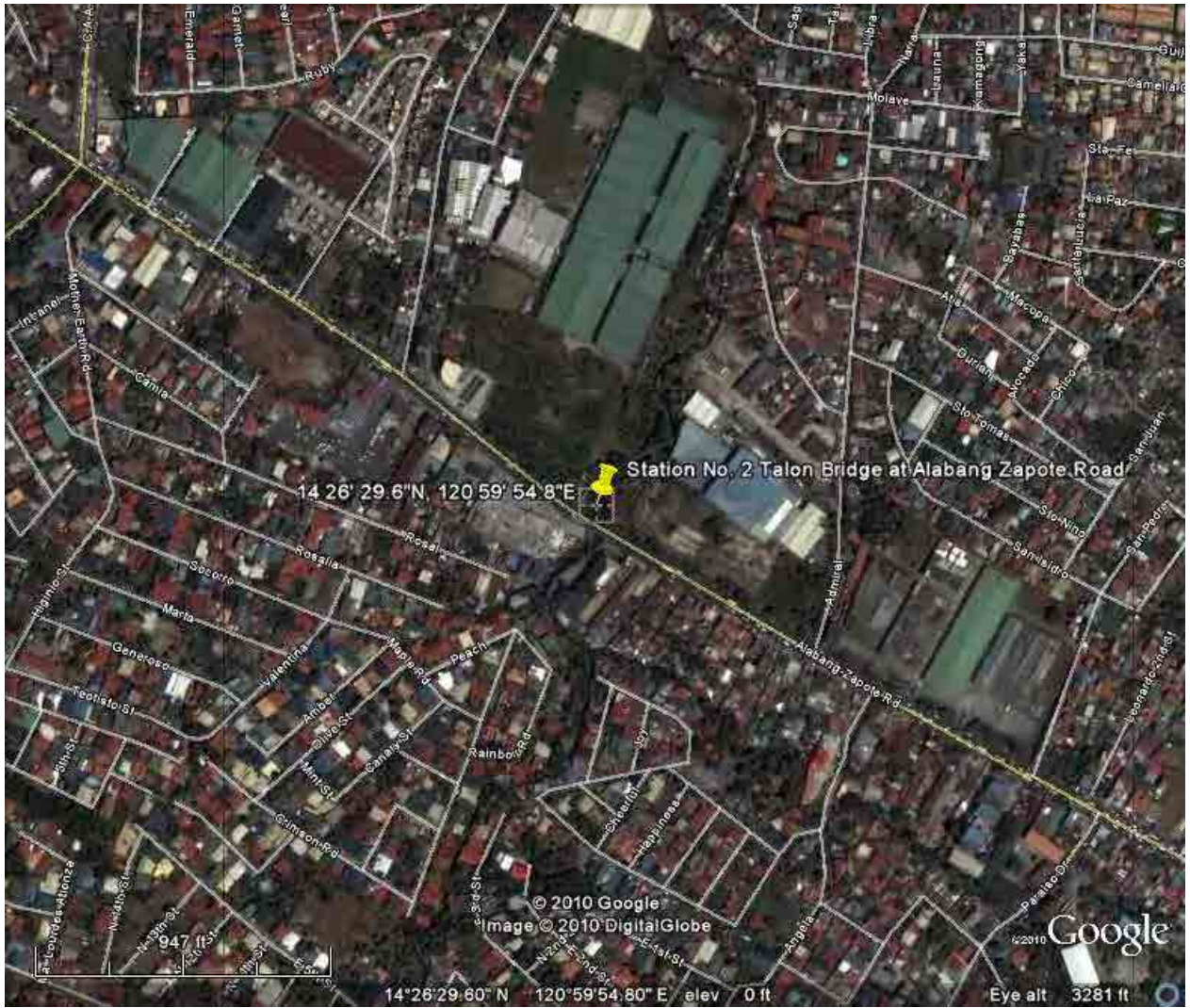


Figure 5. Location of Station No. 2 (Talon Bridge at Alabang-Zapote Road)

Table 6. Station No. 3 Fresh Surface Water Quality Monitoring Results

Parameters	W3 Palanyag 29 July 2010 / 11:14 AM	Water Quality Criteria for Class C Waters
pH	7.15	6.5 – 8.5
Temperature, °C	28.7	3°C max rise ^a
TSS, mg/L	5.7	^b
BOD, mg/L	17.0	7 (10) ^c
COD, mg/L	27.0	No Criteria
Total Coliform, MPN/100mL	49 x 10 ⁵	5000 ^d

Notes: *a – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month*
b – Not more than 30 mg/L increase
c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values
d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period
 MPN – Most Probable Number

Station No. 3 (Palanyag) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 6*.

Table 7. Station No. 4 Fresh Surface Water Quality Monitoring Results

Parameters	W4 Alido Bridge 29 July 2010 / 10:29 AM	Water Quality Criteria for Class C Waters
pH	7.25	6.5 – 8.5
Temperature, °C	27.1	3°C max rise ^a
TSS, mg/L	218	^b
BOD, mg/L	46.0	7 (10) ^c
COD, mg/L	80.0	No Criteria
Total Coliform, MPN/100mL	79 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 4 (Alido Bridge) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 7*.

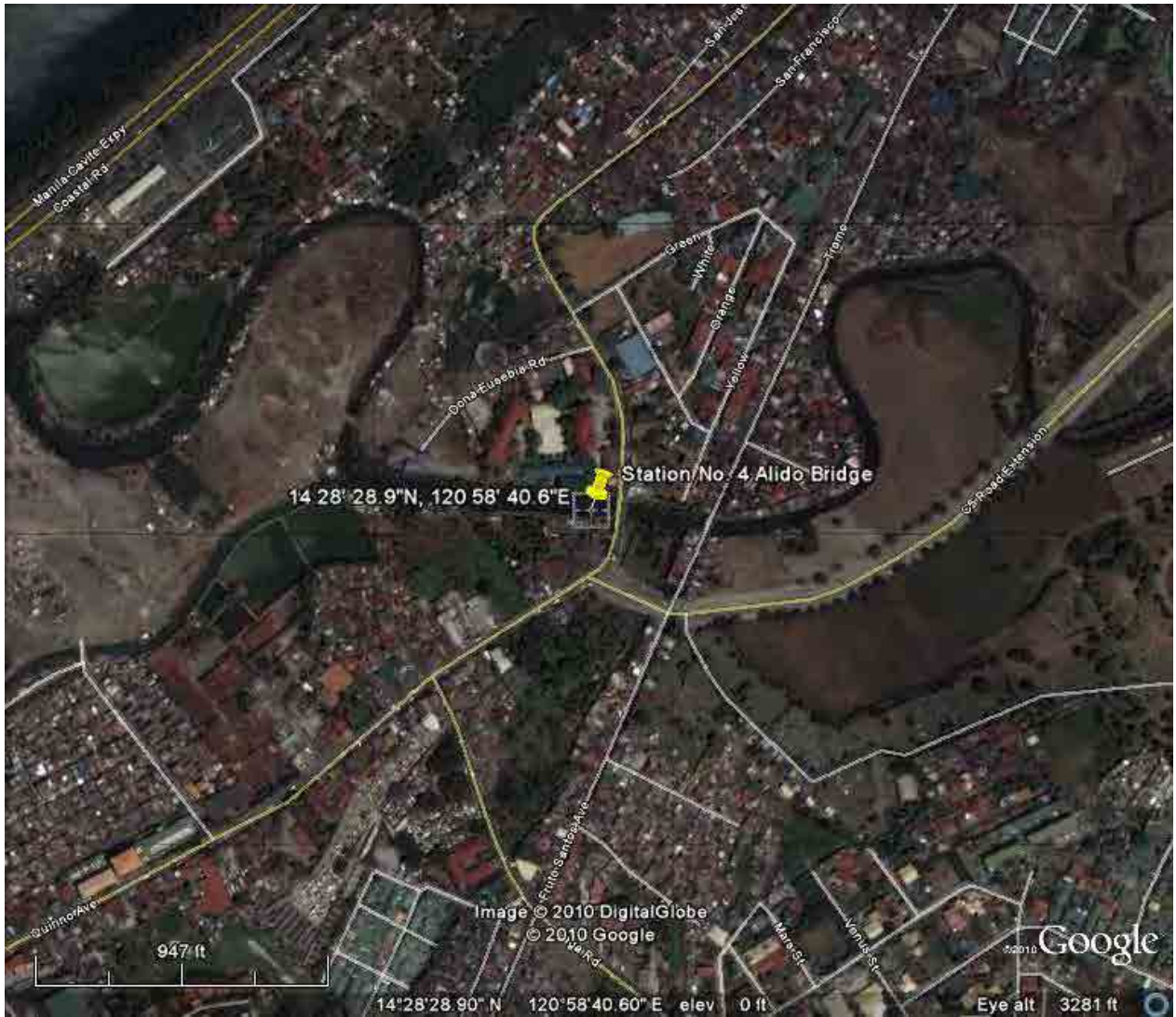


Figure 7. Location of Station No. 4 (Alido Bridge)

Table 8. Station No. 5 Fresh Surface Water Quality Monitoring Results

Parameters	W5 Dongalo Santo Niño 29 July 2010 / 07:58 AM	Water Quality Criteria for Class C Waters
pH	7.30	6.5 – 8.5
Temperature, °C	25.9	3°C max rise ^a
TSS, mg/L	23.3	^b
BOD, mg/L	13.0	7 (10) ^c
COD, mg/L	25.0	No Criteria
Total Coliform, MPN/100mL	35 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 5 (Dongalo Santo Niño) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 8*.



Figure 8. Location of Station No. 5 (Dongalo Santo Niño)

Table 9. Station No. 6 Fresh Surface Water Quality Monitoring Results

Parameters	W6 Naga – Pulang Lupa 29 July 2010 / 10:41 AM	Water Quality Criteria for Class C Waters
pH	7.20	6.5 – 8.5
Temperature, °C	27.9	3°C max rise ^a
TSS, mg/L	1.1	^b
BOD, mg/L	22.0	7 (10)
COD, mg/L	51.0	No Criteria
Total Coliform, MPN/100mL	33 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 6 (Naga – Pulang Lupa) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 9*.

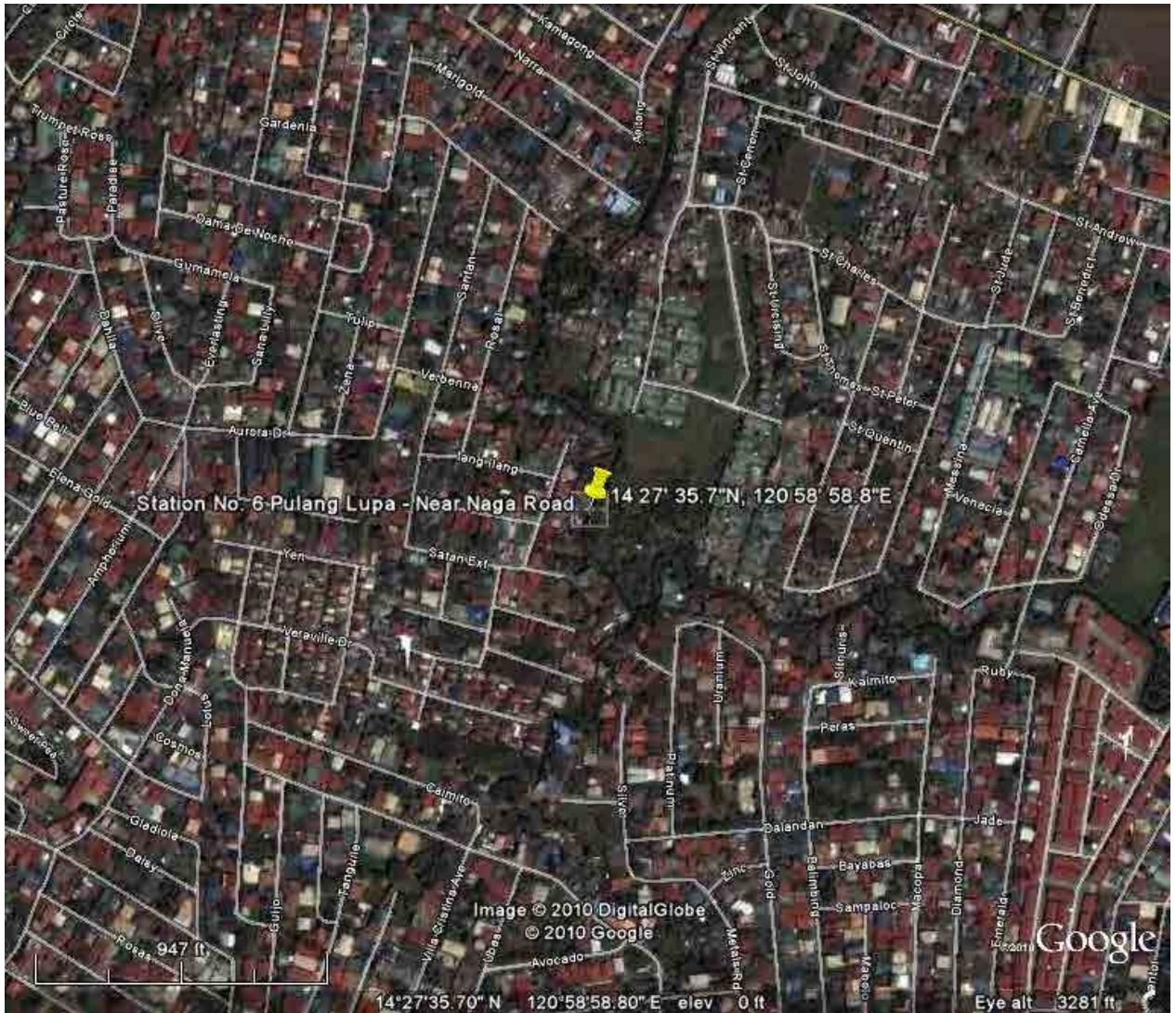


Figure 9. Location of Station No. 6 (Naga – Pulang Lupa)

Table 10. Station No. 7 Fresh Surface Water Quality Monitoring Results

Parameters	W7 Talon Singko 30 July 2010 / 10:44 AM	Water Quality Criteria for Class C Waters
pH	7.60	6.5 – 8.5
Temperature, °C	26.5	3°C max rise ^a
TSS, mg/L	14.4	^b
BOD, mg/L	13.0	7 (10) ^c
COD, mg/L	22.0	No Criteria
Total Coliform, MPN/100mL	23 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 7 (Talon Singko) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 10*.

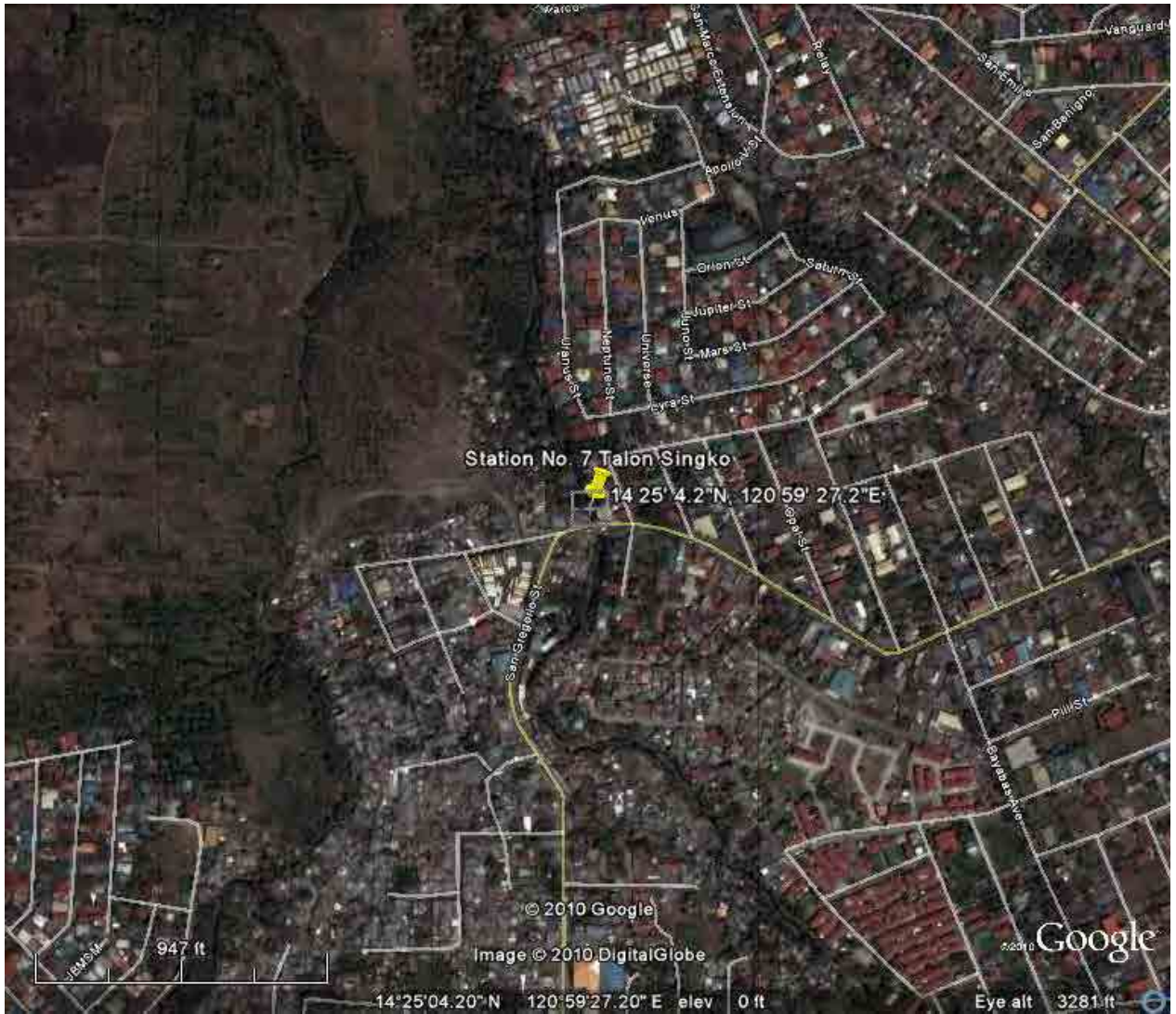


Figure 10. Location of Station No. 7 (Talon Singko)

4.2 Fresh Surface Water Quality Monitoring for Stations Located at Parañaque City

Tables 11 to 21 present the results of the analysis for the fresh surface water samples taken from rivers and creeks confined within Parañaque City.

Table 11. Station No. 8 Fresh Surface Water Quality Monitoring Results

Parameters	W8 Cut – Cut Bridge 29 July 2010 / 06:53 AM	Water Quality Criteria for Class C Waters
pH	7.00	6.5 – 8.5
Temperature, °C	26.8	3°C max rise ^a
TSS, mg/L	12.2	^b
BOD, mg/L	15.0	7 (10) ^c
COD, mg/L	31.0	No Criteria
Total Coliform, MPN/100mL	49 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 8 (Cut – Cut Bridge) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 11*.

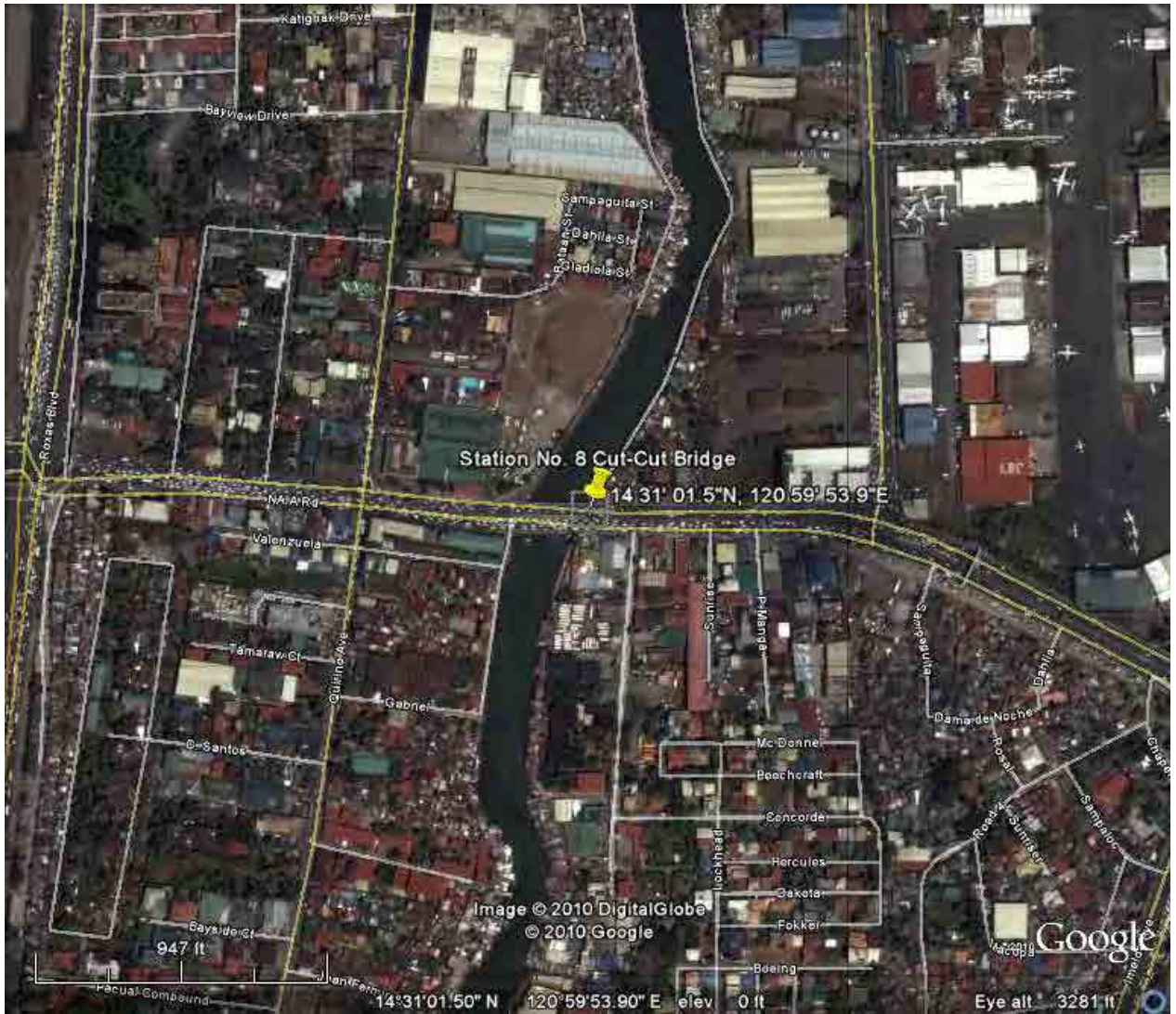


Figure 11. Location of Station No. 8 (Cut – Cut Bridge)

Table 12. Station No. 9 Fresh Surface Water Quality Monitoring Results

Parameters	W9 Tambo Bridge 29 July 2010 / 06:35 AM	Water Quality Criteria for Class C Waters
pH	7.00	6.5 – 8.5
Temperature, °C	27.4	3°C max rise ^a
TSS, mg/L	17.2	^b
BOD, mg/L	14.0	7 (10)
COD, mg/L	26.0	No Criteria
Total Coliform, MPN/100mL	33 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 9 (Tambo Bridge) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 12*.

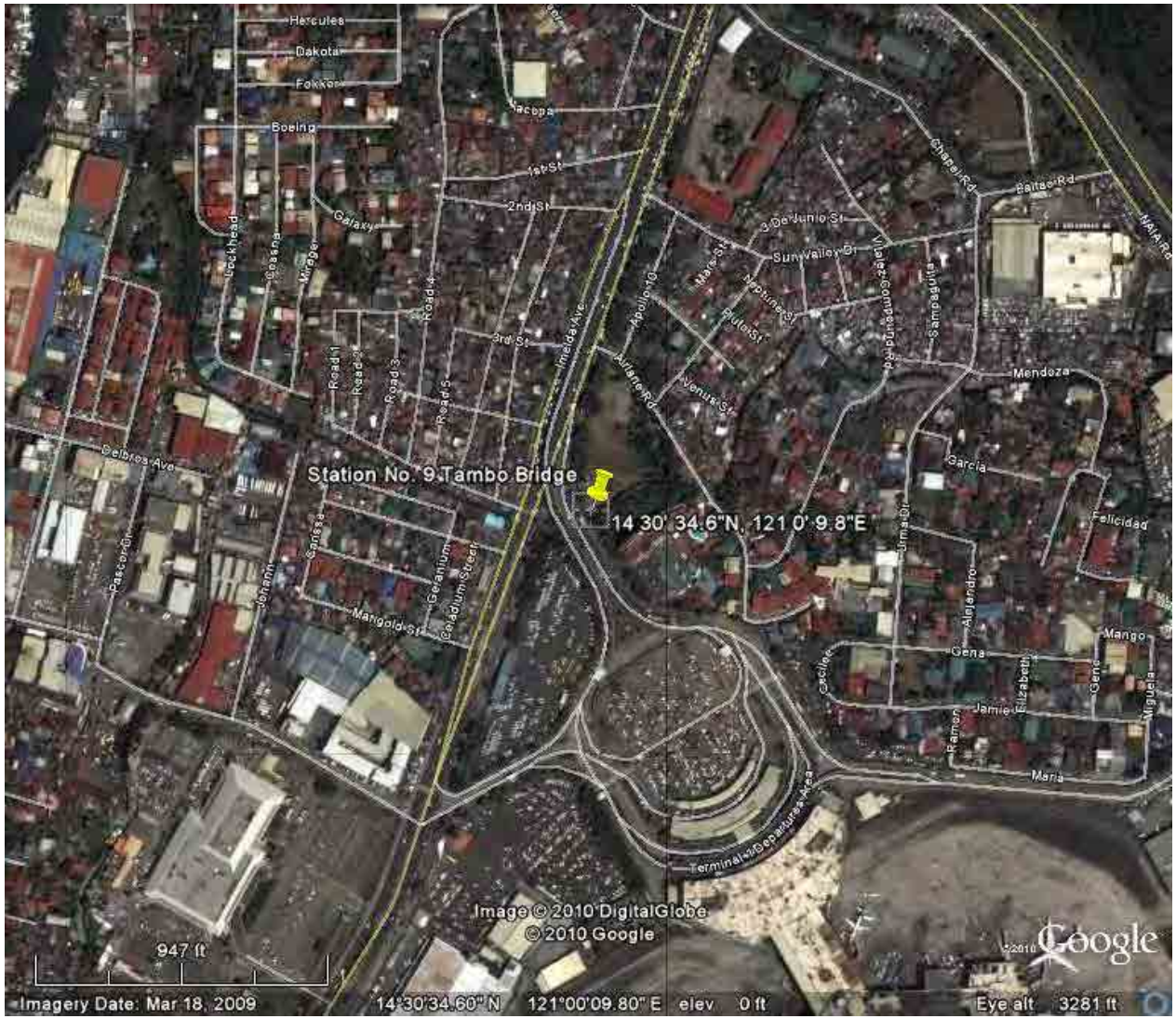


Figure 12. Location of Station No. 9 (Tambo Bridge)

Table 13. Station No. 10 Fresh Surface Water Quality Monitoring Results

Parameters	W10 Santo Niño Bridge 29 July 2010 / 07:14 AM	Water Quality Criteria for Class C Waters
pH	7.30	6.5 – 8.5
Temperature, °C	26.3	3°C max rise ^a
TSS, mg/L	8.2	^b
BOD, mg/L	19.0	7 (10) ^c
COD, mg/L	28.0	No Criteria
Total Coliform, MPN/100mL	35 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 10 (Santo Niño Bridge) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 13*.

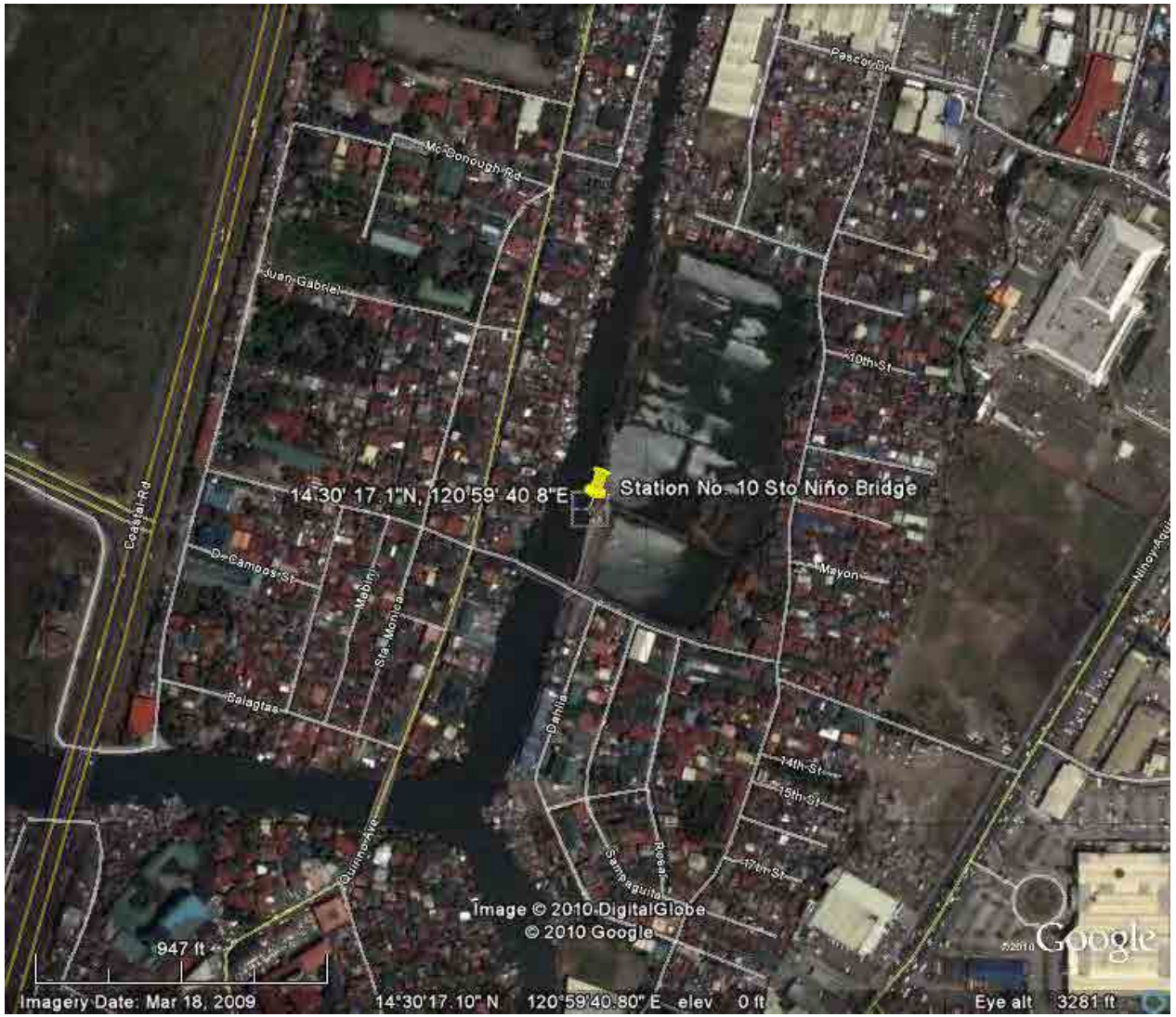


Figure 13. Location of Station No. 10 (Santo Niño Bridge)

Table 14. Station No. 11 Fresh Surface Water Quality Monitoring Results

Parameters	W11 La Huerta 29 July 2010 / 10:08 AM	Water Quality Criteria for Class C Waters
pH	7.25	6.5 – 8.5
Temperature, °C	26.6	3°C max rise ^a
TSS, mg/L	3.3	^b
BOD, mg/L	17.0	7 (10) ^c
COD, mg/L	36.0	No Criteria
Total Coliform, MPN/100mL	49 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 11 (La Huerta) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 14*.

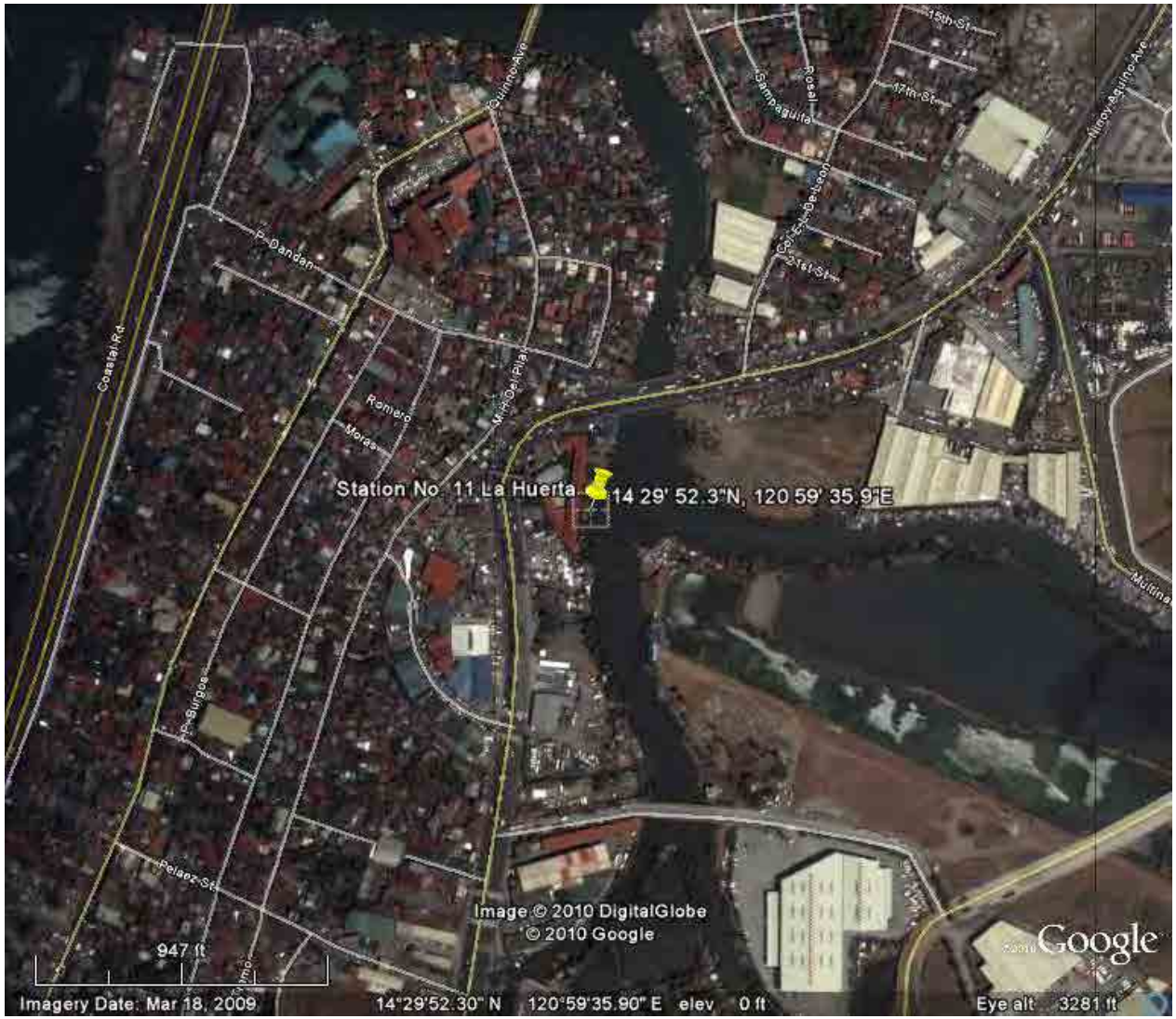


Figure 14. Location of Station No. 11 (La Huerta)

Table 15. Station No. 12 Fresh Surface Water Quality Monitoring Results

Parameters	W12 Kintetsu World Express 29 July 2010 / 07:28 AM	Water Quality Criteria for Class C Waters
pH	7.50	6.5 – 8.5
Temperature, °C	27.0	3°C max rise ^a
TSS, mg/L	9.4	^b
BOD, mg/L	16.0	7 (10) ^c
COD, mg/L	30.0	No Criteria
Total Coliform, MPN/100mL	17 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 12 (Kintetsu World Express) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 15*.

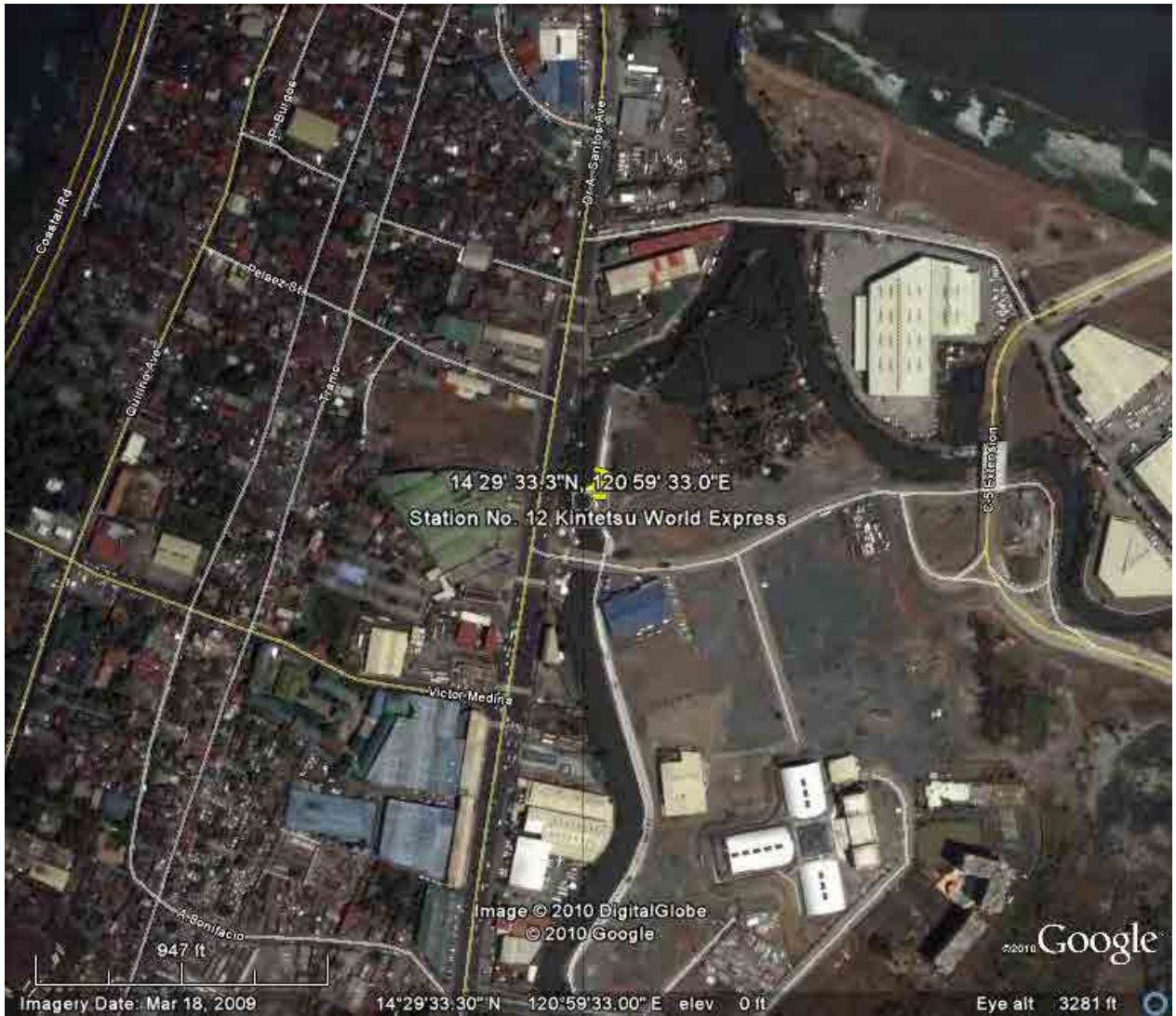


Figure 15. Location of Station No. 12 (Kintetsu World Express)

Table 16. Station No. 13 Fresh Surface Water Quality Monitoring Results

Parameters	W13 Merville Access Road 29 July 2010 / 12:45 PM	Water Quality Criteria for Class C Waters
pH	7.50	6.5 – 8.5
Temperature, °C	30.6	3°C max rise ^a
TSS, mg/L	25.0	^b
BOD, mg/L	39.0	7 (10) ^c
COD, mg/L	71.0	No Criteria
Total Coliform, MPN/100mL	92 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 13 (Merville Access Road) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 16*.

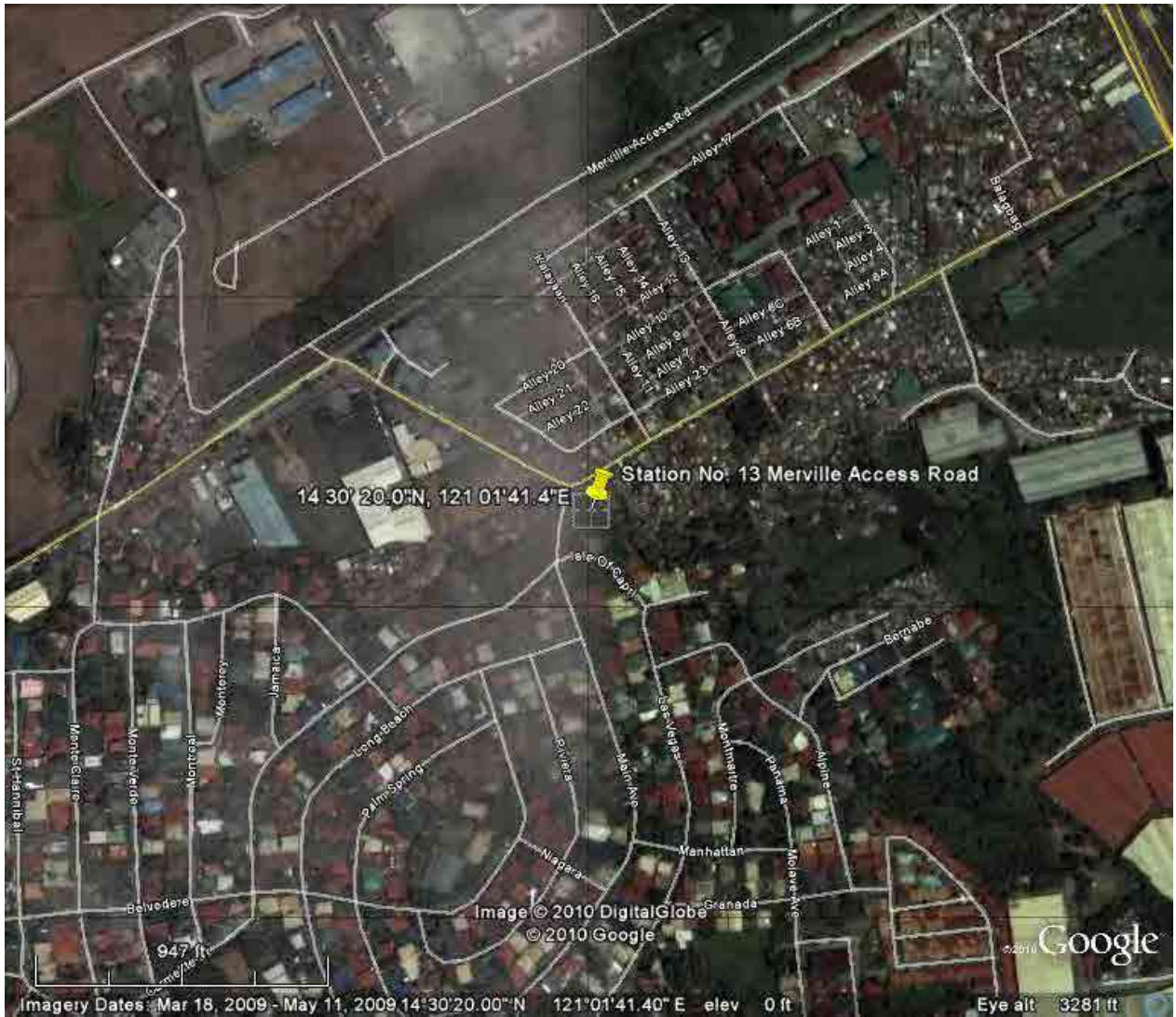


Figure 16. Location of Station No. 13 (Merville Access Road)

Table 17. Station No. 14 Fresh Surface Water Quality Monitoring Results

Parameters	W14 Ibayo Airport View Subdivision 30 July 2010 / 12:42 PM	Water Quality Criteria for Class C Waters
pH	7.30	6.5 – 8.5
Temperature, °C	30.0	3°C max rise ^a
TSS, mg/L	7.0	^b
BOD, mg/L	12.0	7 (10) ^c
COD, mg/L	28.0	No Criteria
Total Coliform, MPN/100mL	46 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 14 (Ibayo Airport View Subdivision) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 17*.

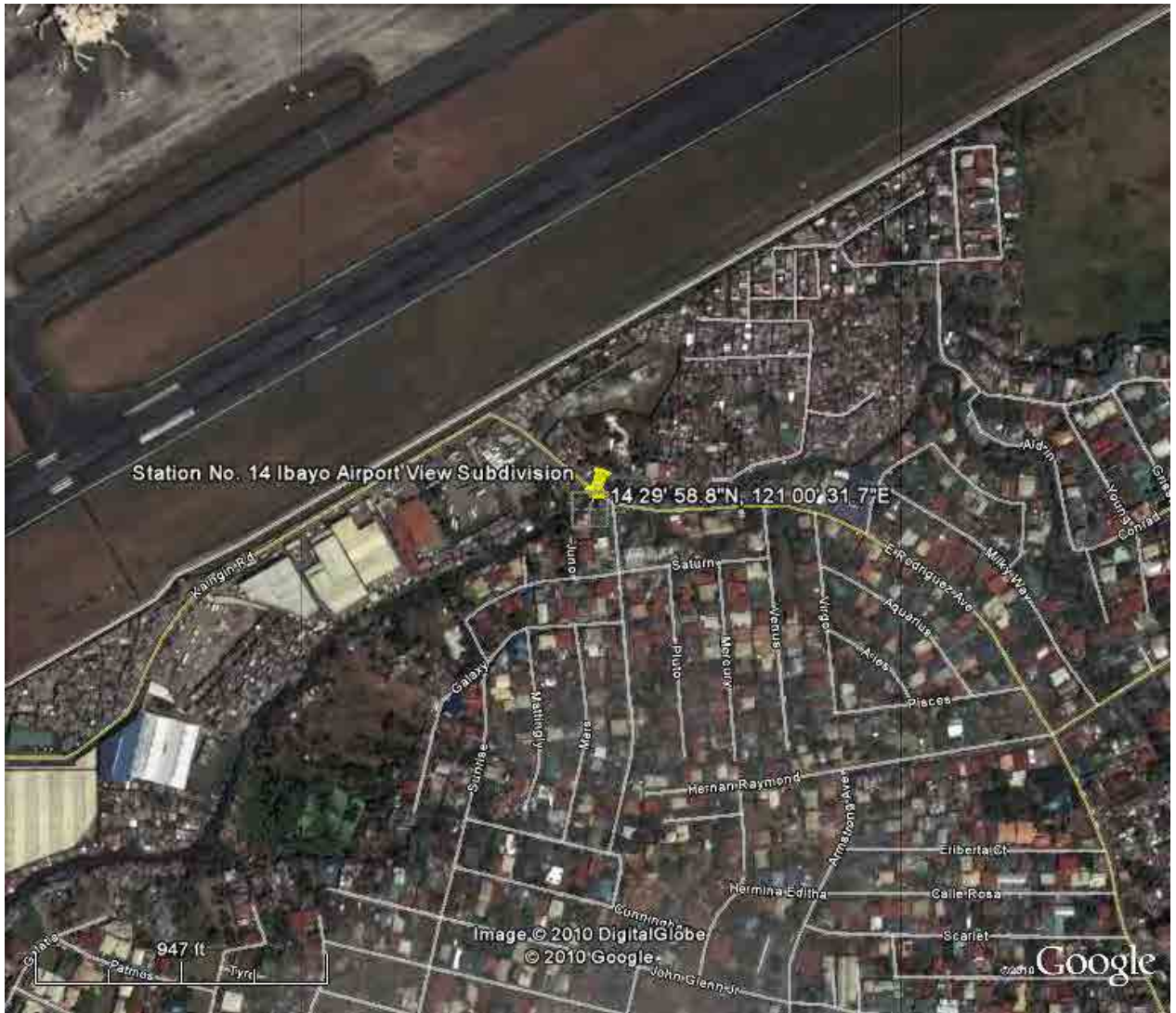


Figure 17. Location of Station No. 14 (Ibayo Airport View Subdivision)

Table 18. Station No. 15 Fresh Surface Water Quality Monitoring Results

Parameters	W15 Doña Soledad 29 July 2010 / 11:49 AM	Water Quality Criteria for Class C Waters
pH	7.20	6.5 – 8.5
Temperature, °C	29.7	3°C max rise ^a
TSS, mg/L	12.9	^b
BOD, mg/L	22.0	7 (10) ^c
COD, mg/L	38.0	No Criteria
Total Coliform, MPN/100mL	33 x 10 ⁵	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 15 (Doña Soledad) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 18*.

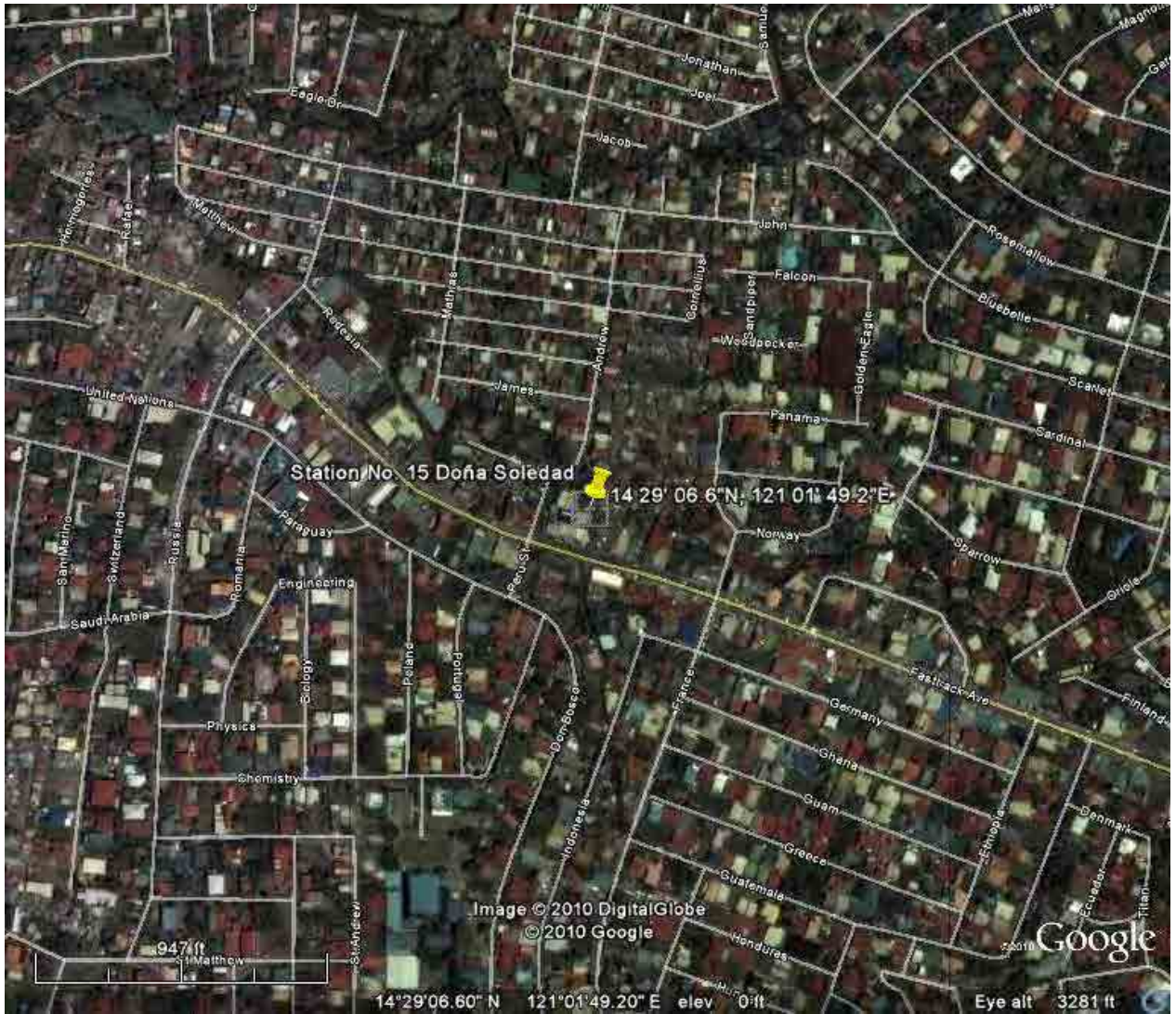


Figure 18. Location of Station No. 15 (Doña Soledad)

Table 19. Station No. 16 Fresh Surface Water Quality Monitoring Results

Parameters	W16 SAV II Bridge 29 July 2010 / 09:42 AM	Water Quality Criteria for Class C Waters
pH	7.20	6.5 – 8.5
Temperature, °C	26.9	3°C max rise ^a
TSS, mg/L	< 0.1	^b
BOD, mg/L	12.0	7 (10) ^c
COD, mg/L	26.0	No Criteria
Total Coliform, MPN/100mL	35 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 16 (SAV II Bridge) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 19*.

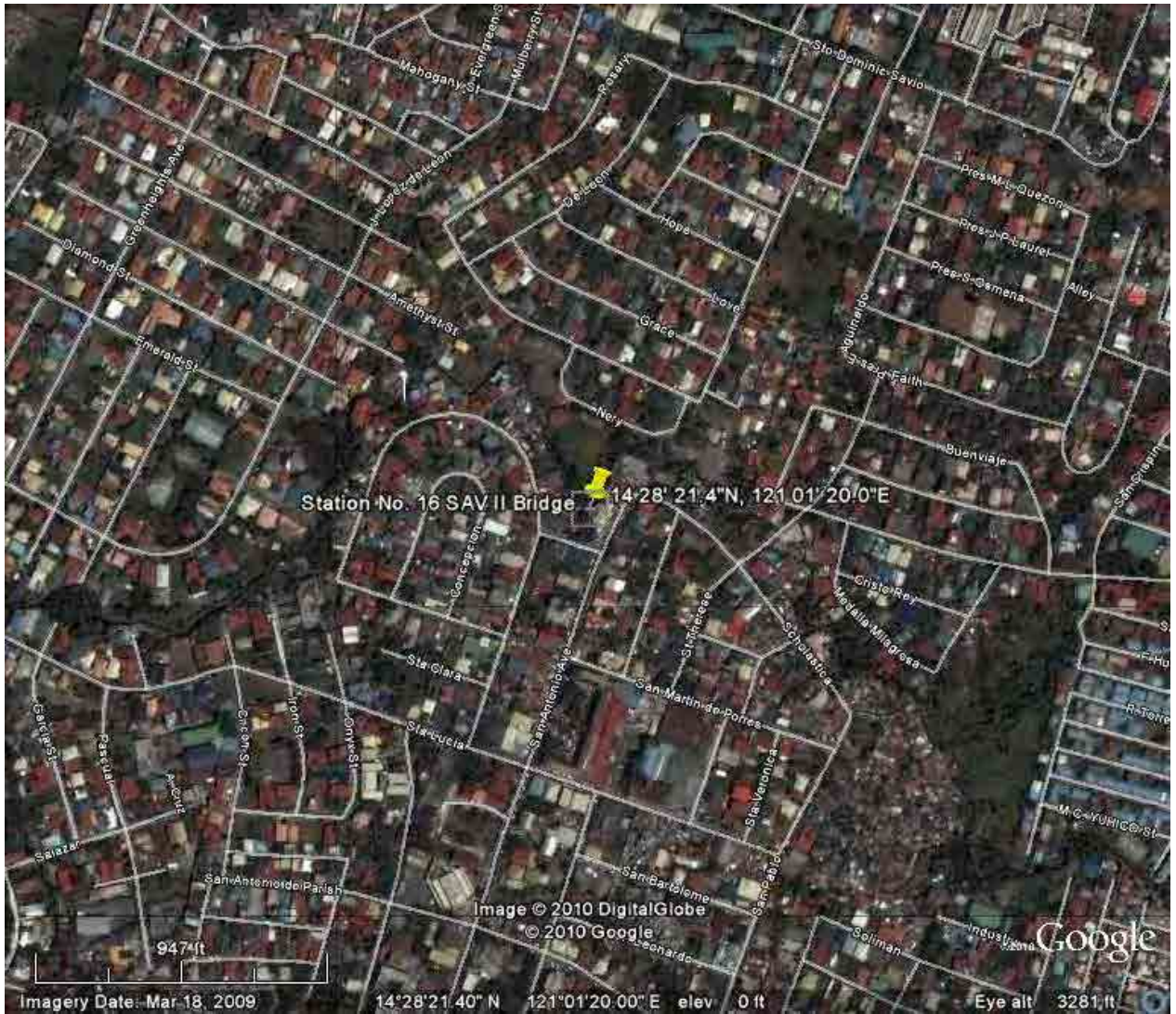


Figure 19. Location of Station No. 16 (SAV II Bridge)

Table 20. Station No. 17 Fresh Surface Water Quality Monitoring Results

Parameters	W17 Aberdee 29 July 2010 / 09:25 AM	Water Quality Criteria for Class C Waters
pH	7.05	6.5 – 8.5
Temperature, °C	26.4	3°C max rise ^a
TSS, mg/L	16.0	^b
BOD, mg/L	33.0	7 (10) ^c
COD, mg/L	46.0	No Criteria
Total Coliform, MPN/100mL	35 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 17 (Aberdee) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 20*.

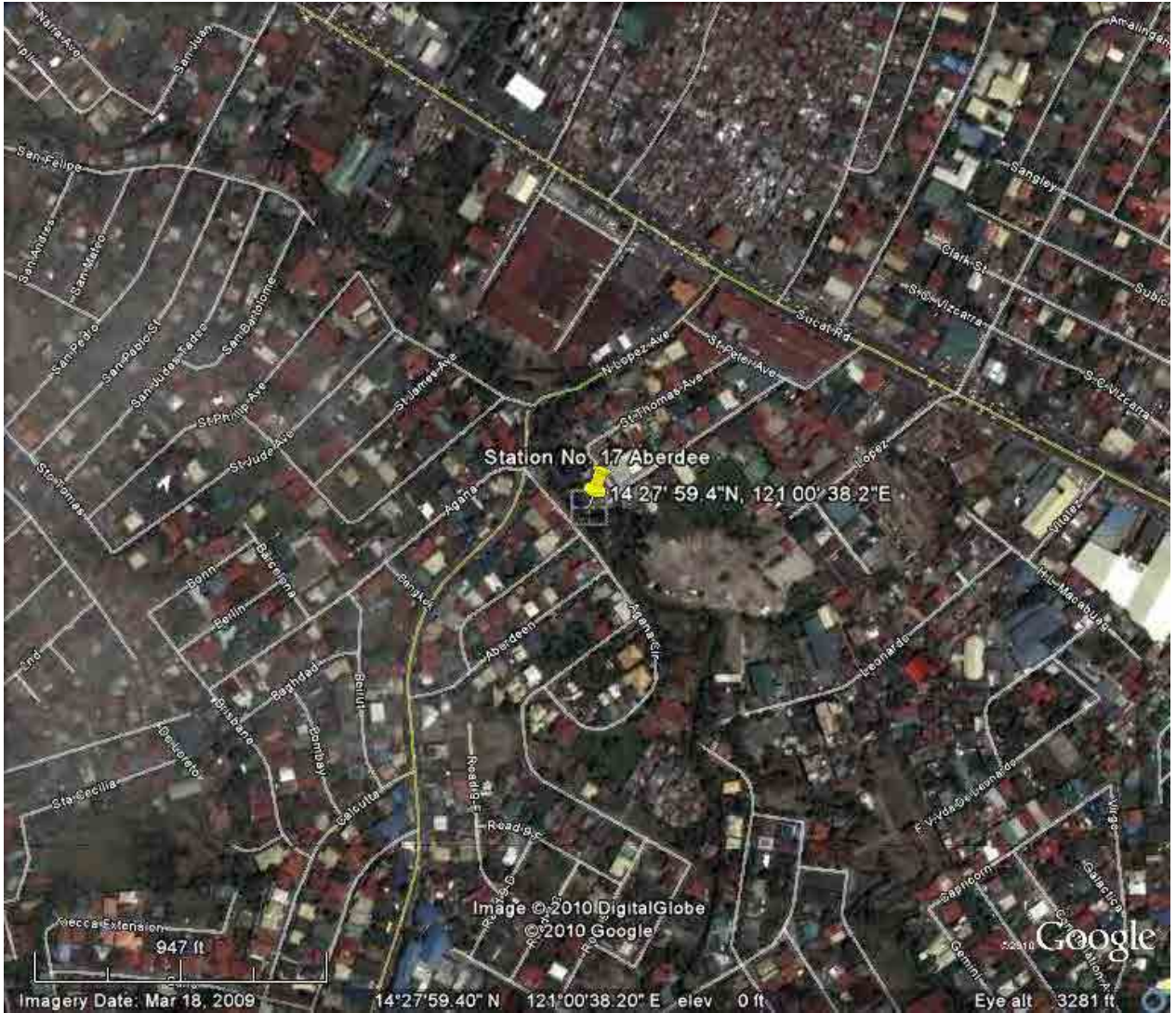


Figure 20. Location of Station No. 17 (Aberdee)

Table 21. Station No. 18 Fresh Surface Water Quality Monitoring Results

Parameters	W18 Parañaque National High School 29 July 2010 / 08:20 AM	Water Quality Criteria for Class C Waters
pH	7.40	6.5 – 8.5
Temperature, °C	26.7	3°C max rise ^a
TSS, mg/L	< 0.1	^b
BOD, mg/L	16.0	7 (10)
COD, mg/L	48.0	No Criteria
Total Coliform, MPN/100mL	13 x 10 ⁶	5000 ^d

Notes: *a* – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

b – Not more than 30 mg/L increase

c – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

d – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

Station No. 18 (Parañaque National High School) result of analysis on pH is within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However BOD and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there is no water quality criteria concentration for COD. The location of the sampling station along with its GPS coordinates was presented in *Figure 21*.



Figure 21. Location of Station No. 18 (Parañaque National High School)

FRESH WATER QUALITY ANALYSIS
of
UPSTREAM OF PARAÑAQUE RIVER
(MARICABAN CREEK AND RETARDING POND IN PASAY CITY)
(May 25, 26 2010)

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A. SAMPLING PROCEDURE

Representative samples of water were collected and preserved in an ice-filled cooler before sending to an independent laboratory for analysis. The parameters and methods of analyses used to determine the wastewater characteristics were presented in the table below. The sampling procedures and analyses were in accordance with the prescribed methods in DENR AO 34 and American Public Health Association's (APHA's) Standard Methods for the Examination of Water and Wastewater.

Table 1. Parameters and Methods of Analyses

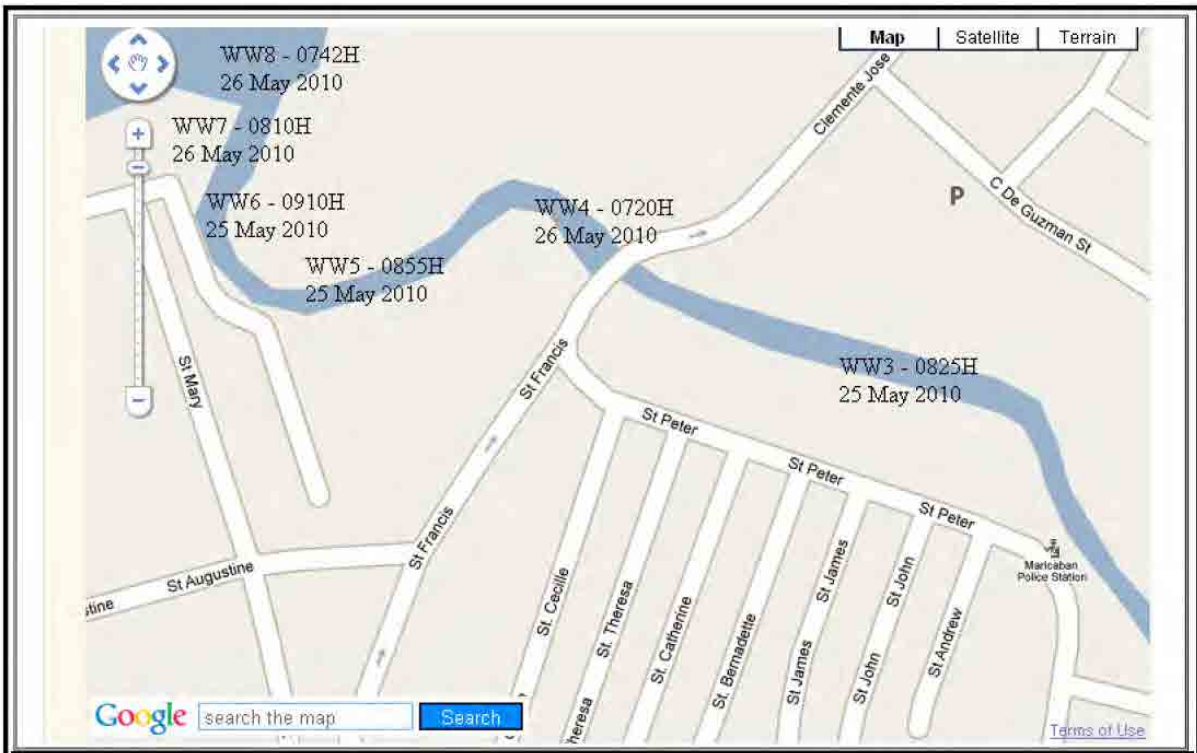
Parameters	Methodology
pH	Glass Electrode (in-situ)
Color	Platinum Cobalt-Colometric
Temperature	Digital Thermometer (in-situ)
Total Suspended Solids (TSS)	Gravimetric
Total Dissolved Solids (TDS)	Gravimetric
Oil and Grease (O&G)	Partition-Gravimetric
Biochemical Oxygen Demand (BOD)	Azide Modification (Dilution Technique)
Chemical Oxygen Demand (COD)	Closed Reflux, Colorimetric
Dissolved Oxygen (DO)	Membrane Electrode (DO Meter / in-situ)
Surfactants (MBAS)	Methylene Blue
Chloride	Argentometric
Nitrogen (N)	Palintest
Phosphorus (P)	Stannous Chloride
Fecal Coliform	Multiple Tube Fermentation
Total Coliform	Multiple Tube Fermentation

Sampling points and locations are shown in Figure 1 and Figure 2.

Figure 1 Location of Water Sampling Station WW1, WW2, WW9, WW10



Figure 2 Location of Water Sampling Stations WW3, WW8



B. SUMMARY OF RESULTS

The results of the water sampling and analysis were presented in *Tables 2 to 8*. Also attached are the maps of the sampling stations.

Table 2. Upstream and Mouth of Tripa De Gallina Sampling Results

Parameters	WW1 Upstream of Tripa De Gallina 26 May 2010 / 0942H	WW2 Mouth of Tripa De Gallina 26 May 2010 / 1012H	Water Quality Criteria for Class C Waters
pH	7.52	7.49	6.5 – 8.5
Color (Apparent), PCU	25	40	^b
Temperature, °C	30.1	30.3	3°C max rise ^c
TSS, mg/L	12.2	38.0	^d
TDS, mg/L	262	290	No Criteria
Oil and Grease, mg/L	0.8	0.8	2.0
BOD, mg/L	66.0	76.0	7 (10)
COD, mg/L	82.0	118	No Criteria
DO, mg/L	0.5	0.4	5.0 (Minimum)
Surfactants (MBAS)	2.3	2.6	0.5
Chloride, mg/L	75	73	350
Nitrogen (N), mg/L	0.18	0.26	10 ^e
Phosphorus (P), mg/L	0.163	0.203	0.4 ^f
Fecal Coliform, MPN/100mL	46 x 10 ⁶	46 x 10 ⁶	No Criteria
Total Coliform, MPN/100mL	46 x 10 ⁶	70 x 10 ⁶	5000 ^g

Notes: a – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

b – No abnormal discoloration from unnatural causes

c – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

d – Not more than 30 mg/L increase

e – Applicable only to lakes or reservoirs, and similarly impounded water

f – When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L

g – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

The Upstream and Mouth of Tripa De Gallina results of analysis on pH, oil and grease, Chloride, Nitrogen and Phosphorus are within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However, BOD, DO, Surfactants, and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there are no water quality criteria concentration for TDS, COD, and Fecal Coliform.

Table 3. Creek near the Magallanes STP / Village Sampling Results

Parameters	WW3 Creek near the Magallanes STP / Village 25 May 2010 / 0825H	Water Quality Criteria for Class C Waters
pH	7.59	6.5 – 8.5
Color (Apparent), PCU	40	^b
Temperature, °C	30.8	3°C max rise ^c
TSS, mg/L	88.4	^d
TDS, mg/L	305	No Criteria
Oil and Grease, mg/L	13.6	2.0
BOD, mg/L	52.0	7 (10)
COD, mg/L	156	No Criteria
DO, mg/L	0.5	5.0 (Minimum)
Surfactants (MBAS)	4.0	0.5
Chloride, mg/L	60	350
Nitrogen (N), mg/L	0.18	10 ^e
Phosphorus (P), mg/L	0.419	0.4 ^f
Fecal Coliform, MPN/100mL	46 x 10 ⁶	No Criteria
Total Coliform, MPN/100mL	46 x 10 ⁶	5000 ^g

Notes: a – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

b – No abnormal discoloration from unnatural causes

c – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

d – Not more than 30 mg/L increase

e – Applicable only to lakes or reservoirs, and similarly impounded water

f – When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L

g – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

The creek near the Magallanes STP / Village results of analysis on pH, Chloride, and Nitrogen are within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However, oil and grease, BOD, DO, Surfactants, Phosphorus, and total coliform did were unable to comply the Water Quality Criteria. On the other hand, there are no water quality criteria concentration for TDS, COD, and Fecal Coliform.

Table 4. Pipe Outfall via Maricaban Creek (Left Side) Sampling Results

Parameters	WW4 Pipe Outfall via Maricaban Creek (Left Side) 26 May 2010 / 0720H	WW5 Pipe Outfall via Maricaban Creek (Left Side) 25 May 2010 / 0855H	Water Quality Criteria for Class C Waters
pH	7.50	7.44	6.5 – 8.5
Color (Apparent), PCU	25	25	^b
Temperature, °C	30.2	30.3	3°C max rise ^c
TSS, mg/L	55.0	22.5	^d
TDS, mg/L	331	299	No Criteria
Oil and Grease, mg/L	1.2	0.8	2.0
BOD, mg/L	63.0	23.0	7 (10)
COD, mg/L	84.0	61.0	No Criteria
DO, mg/L	0.5	0.5	5.0 (Minimum)
Surfactants (MBAS)	2.6	5.9	0.5
Chloride, mg/L	81	60	350
Nitrogen (N), mg/L	0.16	0.33	10 ^e
Phosphorus (P), mg/L	0.285	0.203	0.4 ^f
Fecal Coliform, MPN/100mL	24 x 10 ⁵	13 x 10 ⁶	No Criteria
Total Coliform, MPN/100mL	24 x 10 ⁵	24 x 10 ⁶	5000 ^g

Notes: *a* – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

b – No abnormal discoloration from unnatural causes

c – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

d – Not more than 30 mg/L increase

e – Applicable only to lakes or reservoirs, and similarly impounded water

f – When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L

g – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

The Pipe Outfall via Maricaban Creek (Left Side) results of analysis on pH, oil and grease, Chloride, Nitrogen, and Phosphorus are within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However, BOD, DO, Surfactants, and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there are no water quality criteria concentration for TDS, COD, and Fecal Coliform.

Table 5. Pipe Outfall via Maricaban Creek (Right Side) Sampling Results

Parameters	WW6 Pipe Outfall via Maricaban Creek (Right Side) 25 May 2010 / 0910H	WW7 Pipe Outfall via Maricaban Creek (Right Side) 26 May 2010 / 0810H	Water Quality Criteria for Class C Waters
pH	7.44	7.51	6.5 – 8.5
Color (Apparent), PCU	30	25	^b
Temperature, °C	30.1	30.5	3°C max rise ^c
TSS, mg/L	23.8	32.0	^d
TDS, mg/L	287	308	No Criteria
Oil and Grease, mg/L	< 0.1	2.0	2.0
BOD, mg/L	32.0	43.0	7 (10)
COD, mg/L	67.0	78.0	No Criteria
DO, mg/L	0.4	0.4	5.0 (Minimum)
Surfactants (MBAS)	4.7	5.1	0.5
Chloride, mg/L	66	62	350
Nitrogen (N), mg/L	0.29	0.32	10 ^e
Phosphorus (P), mg/L	0.815	0.230	0.4 ^f
Fecal Coliform, MPN/100mL	13 x 10 ⁶	46 x 10 ⁶	No Criteria
Total Coliform, MPN/100mL	13 x 10 ⁶	46 x 10 ⁶	5000 ^g

Notes: *a* – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

b – No abnormal discoloration from unnatural causes

c – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

d – Not more than 30 mg/L increase

e – Applicable only to lakes or reservoirs, and similarly impounded water

f – When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L

g – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

The Pipe Outfall via Maricaban Creek (Right Side) results of analysis on pH, oil and grease, Chloride, Nitrogen, and WW7 Phosphorus are within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However, BOD, DO, Surfactants, WW6 Phosphorus and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there are no water quality criteria concentration for TDS, COD, and Fecal Coliform.

Table 6. Inlet of Maricaban Creek to the Pond Sampling Results

Parameters	WW8 Inlet of Maricaban Creek to the Pond 26 May 2010 / 0742H	Water Quality Criteria for Class C Waters
pH	7.44	6.5 – 8.5
Color (Apparent), PCU	35	^b
Temperature, °C	30.3	3°C max rise ^c
TSS, mg/L	77.5	^d
TDS, mg/L	308	No Criteria
Oil and Grease, mg/L	0.8	2.0
BOD, mg/L	46.0	7 (10)
COD, mg/L	93.0	No Criteria
DO, mg/L	0.4	5.0 (Minimum)
Surfactants (MBAS)	2.3	0.5
Chloride, mg/L	65	350
Nitrogen (N), mg/L	0.29	10 ^e
Phosphorus (P), mg/L	0.227	0.4 ^f
Fecal Coliform, MPN/100mL	13 x 10 ⁷	No Criteria
Total Coliform, MPN/100mL	24 x 10 ⁷	5000 ^g

Notes: *a* – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

b – No abnormal discoloration from unnatural causes

c – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

d – Not more than 30 mg/L increase

e – Applicable only to lakes or reservoirs, and similarly impounded water

f – When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L

g – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

The Inlet of Maricaban Creek to the Pond results of analysis on pH, oil and grease, Chloride, Nitrogen, and Phosphorus are within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However, BOD, DO, Surfactants, and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there are no water quality criteria concentration for TDS, COD, and Fecal Coliform.

Table 7. At the Farthest Point of the Pond Sampling Results

Parameters	WW9 At the Farthest Point of the Pond 26 May 2010 / 0910H	Water Quality Criteria for Class C Waters
pH	7.54	6.5 – 8.5
Color (Apparent), PCU	35	^b
Temperature, °C	30.1	3°C max rise ^c
TSS, mg/L	28.8	^d
TDS, mg/L	299	No Criteria
Oil and Grease, mg/L	0.8	2.0
BOD, mg/L	69.0	7 (10)
COD, mg/L	102	No Criteria
DO, mg/L	0.5	5.0 (Minimum)
Surfactants (MBAS)	2.7	0.5
Chloride, mg/L	64	350
Nitrogen (N), mg/L	0.26	10 ^e
Phosphorus (P), mg/L	0.176	0.4 ^f
Fecal Coliform, MPN/100mL	49 x 10 ⁶	No Criteria
Total Coliform, MPN/100mL	49 x 10 ⁶	5000 ^g

Notes: *a* – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

b – No abnormal discoloration from unnatural causes

c – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

d – Not more than 30 mg/L increase

e – Applicable only to lakes or reservoirs, and similarly impounded water

f – When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L

g – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

The station at the Farthest Point of the Pond results of analysis on pH, oil and grease, Chloride, Nitrogen, and Phosphorus are within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However, BOD, DO, Surfactants, and total coliform were unable to comply with the Water Quality Criteria. On the other hand, there are no water quality criteria concentration for TDS, COD, and Fecal Coliform.

Table 8. Outlet of Parañaque River Sampling Results

Parameters	WW10 Outlet of Parañaque River 26 May 2010 / 1049H	Water Quality Criteria for Class C Waters
pH	7.36	6.5 – 8.5
Color (Apparent), PCU	25	^b
Temperature, °C	30.0	3°C max rise ^c
TSS, mg/L	20.0	^d
TDS, mg/L	317	No Criteria
Oil and Grease, mg/L	0.4	2.0
BOD, mg/L	38.0	7 (10)
COD, mg/L	98.0	No Criteria
DO, mg/L	0.4	5.0 (Minimum)
Surfactants (MBAS)	6.0	0.5
Chloride, mg/L	13	350
Nitrogen (N), mg/L	0.08	10 ^e
Phosphorus (P), mg/L	0.157	0.4 ^f
Fecal Coliform, MPN/100mL	54 x 10 ⁶	No Criteria
Total Coliform, MPN/100mL	54 x 10 ⁶	5000 ^g

Notes: *a* – Except as otherwise indicated, the numerical limits are yearly average values. Values enclosed in parentheses are maximum values

b – No abnormal discoloration from unnatural causes

c – The allowable temperature increases over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one (1) month

d – Not more than 30 mg/L increase

e – Applicable only to lakes or reservoirs, and similarly impounded water

f – When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L

g – These values refer to the geometric mean of the most probable number of coliform organism during a three (3) month period and that the limit indicated shall not be exceeded in 20 percent of the samples taken during the same period

MPN – Most Probable Number

The Outlet of Parañaque River results of analysis on pH, oil and grease, Chloride, Nitrogen, and Phosphorus are within the water quality criteria, with reference to DENR AO 34 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters for Class C Waters. However, BOD, DO, Surfactants, and total coliform were not able to comply with the Water Quality Criteria. On the other hand, there are no water quality criteria concentration for TDS, COD, and Fecal Coliform.

ANNEX 3

Financial Analysis

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1. Base Cost

1.1 By Phase

PHASE 1 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	0	5,598,625,500	5,598,625,500
A.2 Consulting Services			
Base Cost for JICA Financing	205,884,650	155,003,200	360,887,850
Total Eligible Portion	205,884,650	5,753,628,700	5,959,513,350
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	-	573,692,500	573,692,500
B. 2 Land Acquisition			
Base Cost for Equity	-	89,603,580	89,603,580
B. 3 Admin Cost			
Base Cost for Equity	-	375,108,511	375,108,511
Total Non-Eligible Portion	-	1,038,404,591	1,038,404,591
Total A+B	205,884,650	6,792,033,291	6,997,917,941
% of ODA (Eligible Portion)	85%		
% of Ecuity (Non-Eligible Portion)	15%		

PHASE 2 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	-	4,549,143,000	4,549,143,000
A.2 Consulting Services			
Base Cost for JICA Financing	206,520,577	154,960,030	361,480,607
Total Eligible Portion	206,520,577	4,704,103,030	4,910,623,607
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	-	773,806,000	773,806,000
B. 2 Land Acquisition			
Base Cost for Equity	-	420,972,200	420,972,200
B. 3 Admin Cost			
Base Cost for Equity	-	340,106,790	340,106,790
Total Non-Eligible Portion	-	1,534,884,990	1,534,884,990
Total A+B	206,520,577	6,238,988,020	6,445,508,597
% of ODA (Eligible Portion)	76%		
% of Ecuity (Non-Eligible Portion)	24%		

PHASE 3 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	-	5,416,480,000	5,416,480,000
A.2 Consulting Services			
Base Cost for JICA Financing	206,520,561	154,960,000	361,480,561
Total Eligible Portion	206,520,561	5,571,440,000	5,777,960,561
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	-	-	-
B. 2 Land Acquisition			
Base Cost for Equity	-	1,526,318,200	1,526,318,200
B. 3 Admin Cost			
Base Cost for Equity	-	390,052,801	390,052,801
Total Non-Eligible Portion	-	1,916,371,001	1,916,371,001
Total A+B	206,520,561	7,487,811,001	7,694,331,562
% of ODA (Eligible Portion)	75%		
% of Ecuity (Non-Eligible Portion)	25%		

PHASE 4 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	–	3,040,276,000	3,040,276,000
A.2 Consulting Services			
Base Cost for JICA Financing	206,520,561	154,960,000	361,480,561
Total Eligible Portion	206,520,561	3,195,236,000	3,401,756,561
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	–	–	–
B. 2 Land Acquisition			
Base Cost for Equity	–	–	–
B. 3 Admin Cost			
Base Cost for Equity	–	235,743,419	235,743,419
Total Non-Eligible Portion	–	235,743,419	235,743,419
Total A+B	206,520,561	3,430,979,419	3,637,499,980
% of ODA (Eligible Portion)		94%	235,743,419
% of Equity (Non-Eligible Portion)		6%	

OVERALL PROJECT in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	–	18,604,524,500	18,604,524,500
A.2 Consulting Services			
Base Cost for JICA Financing	825,446,350	619,883,230	1,445,329,580
Total Eligible Portion	825,446,350	19,224,407,730	20,049,854,080
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	–	1,347,498,500	1,347,498,500
B. 2 Land Acquisition			
Base Cost for Equity	–	2,036,893,980	2,036,893,980
B. 3 Admin Cost			
Base Cost for Equity	–	1,341,011,520	1,341,011,520
Total Non-Eligible Portion	–	4,725,404,000	4,725,404,000
Total A+B	825,446,350	23,949,811,730	24,775,258,080
% of ODA (Eligible Portion)		81%	
% of Equity (Non-Eligible Portion)		19%	

Note: Eligible Portion = Procurement/Costs + Consulting Services

Non-Eligible = Procurement/Construction+Land Acquisition+Admin Cost

1.2 Cost Breakdown

Financial Cost on CAPEX

Phase	TOTAL CAPEX In Php	Year	Annual CAPEX in Php
Phase 1	6,997,917,941	2013	229,532,457
		2014	1,217,337,541
		2015	4,508,231,353
		2016	1,042,816,590
Phase 2	6,445,508,597	2017	574,376,057
		2018	965,567,132
		2019	3,960,207,346
		2020	945,358,062
Phase 3	7,694,331,562	2021	1,724,506,137
		2022	883,696,518
		2023	4,121,083,638
		2024	965,045,270
Phase 4	3,637,499,980	2025	181,022,934
		2026	537,265,678
		2027	2,328,584,166
		2028	590,627,202
TOTAL	24,775,258,080		24,775,258,080

Base Cost Table

ODA Loan in Php			Equity in Php				TOTAL INVESTMENT (K)	Annual OM (L)
Procurement/ Construction (D)	Consulting Services (E)	Total ODA (F)	Procurement/ Construction (G)	Land Procurement (H)	Admin Cost (I)	Total Equity (J)		
5,598,625,500	360,887,850	5,959,513,350	573,692,500	89,603,580	375,108,511	1,038,404,591	6,997,917,941	70,000,000.00
4,549,143,000	361,480,607	4,910,623,607	773,806,000	420,972,200	340,106,790	1,534,884,990	6,445,508,597	60,000,000.00
5,416,480,000	361,480,561	5,777,960,561	-	1,526,318,200	390,052,801	1,916,371,001	7,694,331,562	54,000,000.00
3,040,276,000	361,480,561	3,401,756,561	-	-	235,743,419	235,743,419	3,637,499,980	30,000,000.00
18,604,524,500	1,445,329,580	20,049,854,080	1,347,498,500	2,036,893,980	1,341,011,520	4,725,404,000	24,775,258,080	214,000,000.00
93%	G 29%		I 28%			ODA 81%		
7%	H 43%					Equity 19%		

563,074,047.28 in US Dollar @ Php44=1USD

	Loan Agreement	Const. Sked	Service Commitment	Pay Period (30 yrs) under Direct Loan
Phase 1	2012	2014-2016	2017	2013-2043
Phase 2	2016	2018-2020	2021	2017-2046
Phase 3	2020	2022-2024	2025	2021-2051
Phase 4	2024	2026-2028	2029	2025-2054

Economic Costs Computation on CAPEX (in PhP)

Year	Material (Imported)	Material Local	Total Material	Skilled Labor	Unskilled Labor	Total Labor	Total Investment Cost
2013	49,579,011	96,403,632	145,982,643	36,725,193	33,052,674	69,777,867	215,760,510
2014	262,944,909	511,281,767	774,226,676	194,774,007	175,296,606	370,070,613	1,144,297,289
2015	973,777,972	1,893,457,168	2,867,235,140	721,317,016	649,185,315	1,370,502,331	4,237,737,471
2016	225,248,383	437,982,968	663,231,351	166,850,654	150,165,589	317,016,243	980,247,595
2017	124,065,228	241,237,944	365,303,172	91,900,169	82,710,152	174,610,321	539,913,493
2018	208,562,501	405,538,196	614,100,696	154,490,741	139,041,667	293,532,408	907,633,104
2019	855,404,787	1,663,287,085	2,518,691,872	633,633,175	570,269,858	1,203,903,033	3,722,594,905
2020	204,197,341	397,050,386	601,247,727	151,257,290	136,131,561	287,388,851	888,636,578
2021	372,493,326	724,292,577	1,096,785,903	275,920,982	248,328,884	524,249,866	1,621,035,768
2022	190,878,448	371,152,538	562,030,985	141,391,443	127,252,299	268,643,741	830,674,727
2023	890,154,066	1,730,855,128	2,621,009,193	659,373,382	593,436,044	1,252,809,426	3,873,818,619
2024	208,449,778	405,319,013	613,768,792	154,407,243	138,966,519	293,373,762	907,142,554
2025	39,100,954	76,029,632	115,130,586	28,963,669	26,067,302	55,030,972	170,161,558
2026	116,049,386	225,651,585	341,700,971	85,962,508	77,366,258	163,328,766	505,029,737
2027	502,974,180	978,005,350	1,480,979,530	372,573,467	335,316,120	707,889,587	2,188,869,116
2028	127,575,476	248,063,425	375,638,901	94,500,352	85,050,317	179,550,669	555,189,570
	5,351,455,745	10,405,608,394	15,757,064,139	3,964,041,293	3,567,637,164	7,531,678,456	23,288,742,595

Shadow Exchange Rate = 1.2

Material Component = 60%

Imported Material Component = 30%

Shadow Wage Rate = 0.6

Labor Component = 40%

Unskilled Labor = 60%

Economic Cost Computations on OM (in Php)

Year	Annual OM	Material (Imported)	Material Local	Total Material	Skilled Labor	Unskilled Labor	Total Labor	Total OM Cost
2013		-	-	-	-	-	-	-
2014		-	-	-	-	-	-	-
2015		-	-	-	-	-	-	-
2016	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2017	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2018	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2019	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2020	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2021	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2022	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2023	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2024	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2025	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2026	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2027	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2028	214,000,000	30,816,000	59,920,000	90,736,000	51,360,000	46,224,000	97,584,000	188,320,000

2. Summary of Analysis

	Without Interest and Payments					
	Phase 1	Phase 2	Phase 3	Phase 4	Overall	
FINANCIAL ANALYSIS						
JICA Direct Loan						
Option 1 FIRR	16%	15%	13%	10%	13%	
NPV at 9.3% ADR (in Php)	4,292,571,132	3,245,829,035	2,941,713,179	263,794,074	7,360,837,177	
Option 2 FIRR	15%	15%	12%	9%	14%	
NPV at 9.3% ADR (in Php)	3,257,588,833	2,835,215,203	1,927,693,700	(86,461,935)	7,585,522,128	
Option 3 FIRR	14%	14%	11%	7%	14%	
NPV at 9.3% ADR (in Php)	219282827373%	1,868,100,824	923,732,483	(433,243,683)	6,421,902,604	
Two Step Loan						
LBP FIRR	14%	14%	11%	7%	14%	
NPV at 9.3% ADR (in Php)	4,589,190,410	4,044,699,366	3,183,258,933	347,227,236	9,040,757,845	
DBP FIRR	14%	14%	11%	7%	14%	
NPV at 9.3% ADR (in Php)	4589190410	4044699366	3183258933	347227236	9040757845	
	With Interest and Payments					
	Phase 1	Phase 2	Phase 3	Phase 4	Overall	
FINANCIAL ANALYSIS						
JICA Direct Loan						
Option 1 FIRR	14%	13%	11%	5%	12%	
NPV at 9.3% ADR (in Php)	2,691,417,251	1,951,571,981	1,121,765,221	(1,659,786,568)	4,817,969,118	
Option 2 FIRR	11%	11%	8%	3%	10%	
NPV at 9.3% ADR (in Php)	839,442,770	769,675,849	(502,670,726)	(1,518,927,682)	1,631,799,478	
Option 3 FIRR	8%	8%	5%	-0.027	9%	
NPV at 9.3% ADR (in Php)	(673,846,197)	(494,031,535)	(1,855,610,570)	(2,071,754,116)	(28,039,446)	
Two Step Loan						
LBP FIRR	9%	9%	7%	0.04717371	10%	
NPV at 9.3% ADR (in Php)	(211,647,151)	107,824,727	(1,923,171,251)	844,841,405	844,841,405	
DBP FIRR	6%	10%	8%	0.039607878	9%	
NPV at 9.3% ADR (in Php)	-1461794400	539439682.8	-941115856.6	-2080985773	(529,447,733.30)	

3. Two Step Loan Through Government Finance Institutes

3.1 Through LDP

	Govt Gurantee Fee	1%	Foreign Exchange Fee	0%	Admin Fee	3%	Interest + Commitment	0.50%	Total	4.75%
	Grace	10								
	Repay	40								
Year	Phase 1				Principal	Interest	Repayment	Total		
2012										
2013	5,959,513,350					283,076,884		283,076,884		
2014						283,076,884		283,076,884		
2015						283,076,884		283,076,884		
2016						283,076,884		283,076,884		
2017						283,076,884		283,076,884		
2018						283,076,884		283,076,884		
2019						283,076,884		283,076,884		
2020						283,076,884		283,076,884		
2021						283,076,884		283,076,884		
2022						283,076,884		283,076,884		
2023		5,810,525,517				275,999,962	148,987,834	424,987,796		
2024		5,661,537,683				268,923,040	148,987,834	417,910,874		
2025		5,512,549,849				261,846,118	148,987,834	410,833,952		
2026		5,363,562,015				254,769,196	148,987,834	403,757,029		
2027		5,214,574,182				247,692,274	148,987,834	396,680,107		
2028		5,065,586,348				240,615,352	148,987,834	389,603,185		
2029		4,916,598,514				233,538,429	148,987,834	382,526,263		
2030		4,767,610,680				226,461,507	148,987,834	375,449,341		
2031		4,618,622,846				219,384,585	148,987,834	368,372,419		
2032		4,469,635,013				212,307,663	148,987,834	361,295,497		
2033		4,320,647,179				205,230,741	148,987,834	354,218,575		
2034		4,171,659,345				198,153,819	148,987,834	347,141,653		
2035		4,022,671,511				191,076,897	148,987,834	340,064,731		
2036		3,873,683,678				183,999,975	148,987,834	332,987,808		
2037		3,724,695,844				176,923,053	148,987,834	325,910,886		
2038		3,575,708,010				169,846,130	148,987,834	318,833,964		
2039		3,426,720,176				162,769,208	148,987,834	311,757,042		
2040		3,277,732,343				155,692,286	148,987,834	304,680,120		
2041		3,128,744,509				148,615,364	148,987,834	297,603,198		
2042		2,979,756,675				141,538,442	148,987,834	290,526,276		
2043		2,830,768,841				134,461,520	148,987,834	283,449,354		
2044		2,681,781,008				127,384,598	148,987,834	276,372,432		
2045		2,532,793,174				120,307,676	148,987,834	269,295,510		
2046		2,383,805,340				113,230,754	148,987,834	262,218,587		
2047		2,234,817,506				106,153,832	148,987,834	255,141,665		
2048		2,085,829,673				99,076,909	148,987,834	248,064,743		
2049		1,936,841,839				91,999,987	148,987,834	240,987,821		
2050		1,787,854,005				84,923,065	148,987,834	233,910,899		
2051		1,638,866,171				77,846,143	148,987,834	226,833,977		
2052		1,489,878,338				70,769,221	148,987,834	219,757,055		
2053		1,340,890,504				63,692,299	148,987,834	212,680,133		
2054		1,191,902,670				56,615,377	148,987,834	205,603,211		
2055		1,042,914,836				49,538,455	148,987,834	198,526,288		
2056		893,927,003				42,461,533	148,987,834	191,449,366		
2057		744,939,169				35,384,611	148,987,834	184,372,444		
2058		595,951,335				28,307,688	148,987,834	177,295,522		
2059		446,963,501				21,230,766	148,987,834	170,218,600		
2060		297,975,668				14,153,844	148,987,834	163,141,678		
2061		148,987,834				7,076,922	148,987,834	156,064,756		
2062		0				0	148,987,834	148,987,834		

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	233,254,621		233,254,621
2018		233,254,621		233,254,621
2019		233,254,621		233,254,621
2020		233,254,621		233,254,621
2021		233,254,621		233,254,621
2022		233,254,621		233,254,621
2023		233,254,621		233,254,621
2024		233,254,621		233,254,621
2025		233,254,621		233,254,621
2026	4,787,858,017	227,423,256	122,765,590	350,188,846
2027	4,665,092,427	221,591,890	122,765,590	344,357,480
2028	4,542,326,837	215,760,525	122,765,590	338,526,115
2029	4,419,561,246	209,929,159	122,765,590	332,694,749
2030	4,296,795,656	204,097,794	122,765,590	326,863,384
2031	4,174,030,066	198,266,428	122,765,590	321,032,018
2032	4,051,264,476	192,435,063	122,765,590	315,200,653
2033	3,928,498,886	186,603,697	122,765,590	309,369,287
2034	3,805,733,296	180,772,332	122,765,590	303,537,922
2035	3,682,967,705	174,940,966	122,765,590	297,706,556
2036	3,560,202,115	169,109,600	122,765,590	291,875,191
2037	3,437,436,525	163,278,235	122,765,590	286,043,825
2038	3,314,670,935	157,446,869	122,765,590	280,212,460
2039	3,191,905,345	151,615,504	122,765,590	274,381,094
2040	3,069,139,754	145,784,138	122,765,590	268,549,729
2041	2,946,374,164	139,952,773	122,765,590	262,718,363
2042	2,823,608,574	134,121,407	122,765,590	256,886,997
2043	2,700,842,984	128,290,042	122,765,590	251,055,632
2044	2,578,077,394	122,458,676	122,765,590	245,224,266
2045	2,455,311,804	116,627,311	122,765,590	239,392,901
2046	2,332,546,213	110,795,945	122,765,590	233,561,535
2047	2,209,780,623	104,964,580	122,765,590	227,730,170
2048	2,087,015,033	99,133,214	122,765,590	221,898,804
2049	1,964,249,443	93,301,849	122,765,590	216,067,439
2050	1,841,483,853	87,470,483	122,765,590	210,236,073
2051	1,718,718,263	81,639,117	122,765,590	204,404,708
2052	1,595,952,672	75,807,752	122,765,590	198,573,342
2053	1,473,187,082	69,976,386	122,765,590	192,741,977
2054	1,350,421,492	64,145,021	122,765,590	186,910,611
2055	1,227,655,902	58,313,655	122,765,590	181,079,246
2056	1,104,890,312	52,482,290	122,765,590	175,247,880
2057	982,124,721	46,650,924	122,765,590	169,416,514
2058	859,359,131	40,819,559	122,765,590	163,585,149
2059	736,593,541	34,988,193	122,765,590	157,753,783
2060	613,827,951	29,156,828	122,765,590	151,922,418
2061	491,062,361	23,325,462	122,765,590	146,091,052
2062	368,296,771	17,494,097	122,765,590	140,259,687
2063	245,531,180	11,662,731	122,765,590	134,428,321
2064	122,765,590	5,831,366	122,765,590	128,596,956
2065	0	0	122,765,590	122,765,590

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	274,453,127		274,453,127
2022		274,453,127		274,453,127
2023		274,453,127		274,453,127
2024		274,453,127		274,453,127
2025		274,453,127		274,453,127
2026		274,453,127		274,453,127
2027		274,453,127		274,453,127
2028		274,453,127		274,453,127
2029		274,453,127		274,453,127
2030		274,453,127		274,453,127
2031	5,633,511,547	267,591,799	144,449,014	412,040,813
2032	5,489,062,533	260,730,470	144,449,014	405,179,484
2033	5,344,613,519	253,869,142	144,449,014	398,318,156
2034	5,200,164,505	247,007,814	144,449,014	391,456,828
2035	5,055,715,491	240,146,486	144,449,014	384,595,500
2036	4,911,266,477	233,285,158	144,449,014	377,734,172
2037	4,766,817,463	226,423,830	144,449,014	370,872,844
2038	4,622,368,449	219,562,501	144,449,014	364,011,515
2039	4,477,919,435	212,701,173	144,449,014	357,150,187
2040	4,333,470,421	205,839,845	144,449,014	350,288,859
2041	4,189,021,407	198,978,517	144,449,014	343,427,531
2042	4,044,572,393	192,117,189	144,449,014	336,566,203
2043	3,900,123,379	185,255,861	144,449,014	329,704,875
2044	3,755,674,365	178,394,532	144,449,014	322,843,546
2045	3,611,225,351	171,533,204	144,449,014	315,982,218
2046	3,466,776,337	164,671,876	144,449,014	309,120,890
2047	3,322,327,323	157,810,548	144,449,014	302,259,562
2048	3,177,878,309	150,949,220	144,449,014	295,398,234
2049	3,033,429,295	144,087,892	144,449,014	288,536,906
2050	2,888,980,281	137,226,563	144,449,014	281,675,577
2051	2,744,531,267	130,365,235	144,449,014	274,814,249
2052	2,600,082,253	123,503,907	144,449,014	267,952,921
2053	2,455,633,239	116,642,579	144,449,014	261,091,593
2054	2,311,184,225	109,781,251	144,449,014	254,230,265
2055	2,166,735,211	102,919,923	144,449,014	247,368,937
2056	2,022,286,196	96,058,594	144,449,014	240,507,608
2057	1,877,837,182	89,197,266	144,449,014	233,646,280
2058	1,733,388,168	82,335,938	144,449,014	226,784,952
2059	1,588,939,154	75,474,610	144,449,014	219,923,624
2060	1,444,490,140	68,613,282	144,449,014	213,062,296
2061	1,300,041,126	61,751,954	144,449,014	206,200,968
2062	1,155,592,112	54,890,625	144,449,014	199,339,639
2063	1,011,143,098	48,029,297	144,449,014	192,478,311
2064	866,694,084	41,167,969	144,449,014	185,616,983
2065	722,245,070	34,306,641	144,449,014	178,755,655
2066	577,796,056	27,445,313	144,449,014	171,894,327
2067	433,347,042	20,583,985	144,449,014	165,032,999
2068	288,898,028	13,722,656	144,449,014	158,171,670
2069	144,449,014	6,861,328	144,449,014	151,310,342
2070	0	0	144,449,014	144,449,014

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	161,583,437		161,583,437
2026		161,583,437		161,583,437
2027		161,583,437		161,583,437
2028		161,583,437		161,583,437
2029		161,583,437		161,583,437
2030		161,583,437		161,583,437
2031		161,583,437		161,583,437
2032		161,583,437		161,583,437
2033		161,583,437		161,583,437
2034		161,583,437		161,583,437
2035	3,316,712,647	157,543,851	85,043,914	242,587,765
2036	3,231,668,733	153,504,265	85,043,914	238,548,179
2037	3,146,624,819	149,464,679	85,043,914	234,508,593
2038	3,061,580,905	145,425,093	85,043,914	230,469,007
2039	2,976,536,991	141,385,507	85,043,914	226,429,421
2040	2,891,493,077	137,345,921	85,043,914	222,389,835
2041	2,806,449,163	133,306,335	85,043,914	218,350,249
2042	2,721,405,249	129,266,749	85,043,914	214,310,663
2043	2,636,361,335	125,227,163	85,043,914	210,271,077
2044	2,551,317,421	121,187,578	85,043,914	206,231,492
2045	2,466,273,507	117,147,992	85,043,914	202,191,906
2046	2,381,229,593	113,108,406	85,043,914	198,152,320
2047	2,296,185,679	109,068,820	85,043,914	194,112,734
2048	2,211,141,765	105,029,234	85,043,914	190,073,148
2049	2,126,097,851	100,989,648	85,043,914	186,033,562
2050	2,041,053,937	96,950,062	85,043,914	181,993,976
2051	1,956,010,023	92,910,476	85,043,914	177,954,390
2052	1,870,966,109	88,870,890	85,043,914	173,914,804
2053	1,785,922,195	84,831,304	85,043,914	169,875,218
2054	1,700,878,281	80,791,718	85,043,914	165,835,632
2055	1,615,834,367	76,752,132	85,043,914	161,796,046
2056	1,530,790,453	72,712,547	85,043,914	157,756,461
2057	1,445,746,539	68,672,961	85,043,914	153,716,875
2058	1,360,702,625	64,633,375	85,043,914	149,677,289
2059	1,275,658,711	60,593,789	85,043,914	145,637,703
2060	1,190,614,796	56,554,203	85,043,914	141,598,117
2061	1,105,570,882	52,514,617	85,043,914	137,558,531
2062	1,020,526,968	48,475,031	85,043,914	133,518,945
2063	935,483,054	44,435,445	85,043,914	129,479,359
2064	850,439,140	40,395,859	85,043,914	125,439,773
2065	765,395,226	36,356,273	85,043,914	121,400,187
2066	680,351,312	32,316,687	85,043,914	117,360,601
2067	595,307,398	28,277,101	85,043,914	113,321,015
2068	510,263,484	24,237,516	85,043,914	109,281,430
2069	425,219,570	20,197,930	85,043,914	105,241,844
2070	340,175,656	16,158,344	85,043,914	101,202,258
2071	255,131,742	12,118,758	85,043,914	97,162,672
2072	170,087,828	8,079,172	85,043,914	93,123,086
2073	85,043,914	4,039,586	85,043,914	89,083,500
2074	0	0	85,043,914	85,043,914

Year	TOTAL				
	Principal	Interest	Repayment	Total	
2012					
2013	5,959,513,350	–	283,076,884	–	283,076,884
2014		–	283,076,884	–	283,076,884
2015		–	283,076,884	–	283,076,884
2016		–	283,076,884	–	283,076,884
2017	4,910,623,607	–	516,331,505	–	516,331,505
2018		–	516,331,505	–	516,331,505
2019		–	516,331,505	–	516,331,505
2020		–	516,331,505	–	516,331,505
2021	5,777,960,561	–	790,784,632	–	790,784,632
2022		–	790,784,632	–	790,784,632
2023		5,810,525,517	783,707,710	148,987,834	932,695,544
2024		5,661,537,683	776,630,788	148,987,834	925,618,622
2025	3,401,756,561	5,512,549,849	931,137,303	148,987,834	1,080,125,136
2026		10,151,420,032	918,229,015	271,753,424	1,189,982,439
2027		9,879,666,608	905,320,727	271,753,424	1,177,074,151
2028		9,607,913,184	892,412,440	271,753,424	1,164,165,864
2029		9,336,159,760	879,504,152	271,753,424	1,151,257,576
2030		9,064,406,337	866,595,864	271,753,424	1,138,349,288
2031		14,426,164,460	846,826,249	416,202,438	1,263,028,686
2032		14,009,962,022	827,056,633	416,202,438	1,243,259,071
2033		13,593,759,584	807,287,017	416,202,438	1,223,489,455
2034		13,177,557,146	787,517,401	416,202,438	1,203,719,839
2035		16,078,067,355	763,708,199	501,246,352	1,264,954,551
2036		15,576,821,003	739,898,998	501,246,352	1,241,145,350
2037		15,075,574,651	716,089,796	501,246,352	1,217,336,148
2038		14,574,328,299	692,280,594	501,246,352	1,193,526,946
2039		14,073,081,947	668,471,393	501,246,352	1,169,717,745
2040		13,571,835,595	644,662,191	501,246,352	1,145,908,543
2041		13,070,589,243	620,852,989	501,246,352	1,122,099,341
2042		12,569,342,891	597,043,787	501,246,352	1,098,290,139
2043		12,068,096,539	573,234,586	501,246,352	1,074,480,938
2044		11,566,850,187	549,425,384	501,246,352	1,050,671,736
2045		11,065,603,835	525,616,182	501,246,352	1,026,862,534
2046		10,564,357,483	501,806,980	501,246,352	1,003,053,332
2047		10,063,111,131	477,997,779	501,246,352	979,244,131
2048		9,561,864,779	454,188,577	501,246,352	955,434,929
2049		9,060,618,427	430,379,375	501,246,352	931,625,727
2050		8,559,372,075	406,570,174	501,246,352	907,816,526
2051		8,058,125,723	382,760,972	501,246,352	884,007,324
2052		7,556,879,371	358,951,770	501,246,352	860,198,122
2053		7,055,633,019	335,142,568	501,246,352	836,388,920
2054		6,554,386,667	311,333,367	501,246,352	812,579,719
2055		6,053,140,315	287,524,165	501,246,352	788,770,517
2056		5,551,893,963	263,714,963	501,246,352	764,961,315
2057		5,050,647,611	239,905,762	501,246,352	741,152,114
2058		4,549,401,259	216,096,560	501,246,352	717,342,912
2059		4,048,154,907	192,287,358	501,246,352	693,533,710
2060		3,546,908,555	168,478,156	501,246,352	669,724,508
2061		3,045,662,203	144,668,955	501,246,352	645,915,307
2062		2,544,415,851	120,859,753	501,246,352	622,106,105
2063		2,192,157,333	104,127,473	352,258,518	456,385,992
2064		1,839,898,815	87,395,194	352,258,518	439,653,712
2065		1,487,640,296	70,662,914	352,258,518	422,921,432
2066		1,258,147,368	59,762,000	229,492,928	289,254,928
2067		1,028,654,440	48,861,086	229,492,928	278,354,014
2068		799,161,512	37,960,172	229,492,928	267,453,100
2069		569,668,584	27,059,258	229,492,928	256,552,186
2070		340,175,656	16,158,344	229,492,928	245,651,272
2071		255,131,742	12,118,758	85,043,914	97,162,672
2072		170,087,828	8,079,172	85,043,914	93,123,086
2073		85,043,914	4,039,586	85,043,914	89,083,500
2074		0	0	85,043,914	85,043,914
	20,049,854,080		27,861,603,409	20,049,854,080	47,911,457,489 27,861,603,409

% increase of interest charges 58%

3.2 Through DBP

Govt Gurantee Fee 1% Front Exchange Fee 0% Admin Fee 3% Interest + Commitment 0.75% Front End Fee 1.0% Total 5.75%
 Grace 10
 Repay 40

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	342,672,018		342,672,018
2014		342,672,018		342,672,018
2015		342,672,018		342,672,018
2016		342,672,018		342,672,018
2017		342,672,018		342,672,018
2018		342,672,018		342,672,018
2019		342,672,018		342,672,018
2020		342,672,018		342,672,018
2021		342,672,018		342,672,018
2022		342,672,018		342,672,018
2023	5,810,525,517	334,105,217	148,987,834	483,093,051
2024	5,661,537,683	325,538,417	148,987,834	474,526,251
2025	5,512,549,849	316,971,616	148,987,834	465,959,450
2026	5,363,562,015	308,404,816	148,987,834	457,392,650
2027	5,214,574,182	299,838,015	148,987,834	448,825,849
2028	5,065,586,348	291,271,215	148,987,834	440,259,049
2029	4,916,598,514	282,704,415	148,987,834	431,692,248
2030	4,767,610,680	274,137,614	148,987,834	423,125,448
2031	4,618,622,846	265,570,814	148,987,834	414,558,647
2032	4,469,635,013	257,004,013	148,987,834	405,991,847
2033	4,320,647,179	248,437,213	148,987,834	397,425,047
2034	4,171,659,345	239,870,412	148,987,834	388,858,246
2035	4,022,671,511	231,303,612	148,987,834	380,291,446
2036	3,873,683,678	222,736,811	148,987,834	371,724,645
2037	3,724,695,844	214,170,011	148,987,834	363,157,845
2038	3,575,708,010	205,603,211	148,987,834	354,591,044
2039	3,426,720,176	197,036,410	148,987,834	346,024,244
2040	3,277,732,343	188,469,610	148,987,834	337,457,443
2041	3,128,744,509	179,902,809	148,987,834	328,890,643
2042	2,979,756,675	171,336,009	148,987,834	320,323,843
2043	2,830,768,841	162,769,208	148,987,834	311,757,042
2044	2,681,781,008	154,202,408	148,987,834	303,190,242
2045	2,532,793,174	145,635,607	148,987,834	294,623,441
2046	2,383,805,340	137,068,807	148,987,834	286,056,641
2047	2,234,817,506	128,502,007	148,987,834	277,489,840
2048	2,085,829,673	119,935,206	148,987,834	268,923,040
2049	1,936,841,839	111,368,406	148,987,834	260,356,239
2050	1,787,854,005	102,801,605	148,987,834	251,789,439
2051	1,638,866,171	94,234,805	148,987,834	243,222,639
2052	1,489,878,338	85,668,004	148,987,834	234,655,838
2053	1,340,890,504	77,101,204	148,987,834	226,089,038
2054	1,191,902,670	68,534,404	148,987,834	217,522,237
2055	1,042,914,836	59,967,603	148,987,834	208,955,437
2056	893,927,003	51,400,803	148,987,834	200,388,636
2057	744,939,169	42,834,002	148,987,834	191,821,836
2058	595,951,335	34,267,202	148,987,834	183,255,036
2059	446,963,501	25,700,401	148,987,834	174,688,235
2060	297,975,668	17,133,601	148,987,834	166,121,435
2061	148,987,834	8,566,800	148,987,834	157,554,634
2062	0	0	148,987,834	148,987,834

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	282,360,857		282,360,857
2018		282,360,857		282,360,857
2019		282,360,857		282,360,857
2020		282,360,857		282,360,857
2021		282,360,857		282,360,857
2022		282,360,857		282,360,857
2023		282,360,857		282,360,857
2024		282,360,857		282,360,857
2025		282,360,857		282,360,857
2026		282,360,857		282,360,857
2027	4,787,858,017	275,301,836	122,765,590	398,067,426
2028	4,665,092,427	268,242,815	122,765,590	391,008,405
2029	4,542,326,837	261,183,793	122,765,590	383,949,383
2030	4,419,561,246	254,124,772	122,765,590	376,890,362
2031	4,296,795,656	247,065,750	122,765,590	369,831,340
2032	4,174,030,066	240,006,729	122,765,590	362,772,319
2033	4,051,264,476	232,947,707	122,765,590	355,713,298
2034	3,928,498,886	225,888,686	122,765,590	348,654,276
2035	3,805,733,296	218,829,664	122,765,590	341,595,255
2036	3,682,967,705	211,770,643	122,765,590	334,536,233
2037	3,560,202,115	204,711,622	122,765,590	327,477,212
2038	3,437,436,525	197,652,600	122,765,590	320,418,190
2039	3,314,670,935	190,593,579	122,765,590	313,359,169
2040	3,191,905,345	183,534,557	122,765,590	306,300,147
2041	3,069,139,754	176,475,536	122,765,590	299,241,126
2042	2,946,374,164	169,416,514	122,765,590	292,182,105
2043	2,823,608,574	162,357,493	122,765,590	285,123,083
2044	2,700,842,984	155,298,472	122,765,590	278,064,062
2045	2,578,077,394	148,239,450	122,765,590	271,005,040
2046	2,455,311,804	141,180,429	122,765,590	263,946,019
2047	2,332,546,213	134,121,407	122,765,590	256,886,997
2048	2,209,780,623	127,062,386	122,765,590	249,827,976
2049	2,087,015,033	120,003,364	122,765,590	242,768,955
2050	1,964,249,443	112,944,343	122,765,590	235,709,933
2051	1,841,483,853	105,885,322	122,765,590	228,650,912
2052	1,718,718,263	98,826,300	122,765,590	221,591,890
2053	1,595,952,672	91,767,279	122,765,590	214,532,869
2054	1,473,187,082	84,708,257	122,765,590	207,473,847
2055	1,350,421,492	77,649,236	122,765,590	200,414,826
2056	1,227,655,902	70,590,214	122,765,590	193,355,805
2057	1,104,890,312	63,531,193	122,765,590	186,296,783
2058	982,124,721	56,472,171	122,765,590	179,237,762
2059	859,359,131	49,413,150	122,765,590	172,178,740
2060	736,593,541	42,354,129	122,765,590	165,119,719
2061	613,827,951	35,295,107	122,765,590	158,060,697
2062	491,062,361	28,236,086	122,765,590	151,001,676
2063	368,296,771	21,177,064	122,765,590	143,942,654
2064	245,531,180	14,118,043	122,765,590	136,883,633
2065	122,765,590	7,059,021	122,765,590	129,824,612
2066	0	0	122,765,590	122,765,590

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	332,232,732		332,232,732
2022		332,232,732		332,232,732
2023		332,232,732		332,232,732
2024		332,232,732		332,232,732
2025		332,232,732		332,232,732
2026		332,232,732		332,232,732
2027		332,232,732		332,232,732
2028		332,232,732		332,232,732
2029		332,232,732		332,232,732
2030		332,232,732		332,232,732
2031	5,633,511,547	323,926,914	144,449,014	468,375,928
2032	5,489,062,533	315,621,096	144,449,014	460,070,110
2033	5,344,613,519	307,315,277	144,449,014	451,764,291
2034	5,200,164,505	299,009,459	144,449,014	443,458,473
2035	5,055,715,491	290,703,641	144,449,014	435,152,655
2036	4,911,266,477	282,397,822	144,449,014	426,846,836
2037	4,766,817,463	274,092,004	144,449,014	418,541,018
2038	4,622,368,449	265,786,186	144,449,014	410,235,200
2039	4,477,919,435	257,480,368	144,449,014	401,929,382
2040	4,333,470,421	249,174,549	144,449,014	393,623,563
2041	4,189,021,407	240,868,731	144,449,014	385,317,745
2042	4,044,572,393	232,562,913	144,449,014	377,011,927
2043	3,900,123,379	224,257,094	144,449,014	368,706,108
2044	3,755,674,365	215,951,276	144,449,014	360,400,290
2045	3,611,225,351	207,645,458	144,449,014	352,094,472
2046	3,466,776,337	199,339,639	144,449,014	343,788,653
2047	3,322,327,323	191,033,821	144,449,014	335,482,835
2048	3,177,878,309	182,728,003	144,449,014	327,177,017
2049	3,033,429,295	174,422,184	144,449,014	318,871,198
2050	2,888,980,281	166,116,366	144,449,014	310,565,380
2051	2,744,531,267	157,810,548	144,449,014	302,259,562
2052	2,600,082,253	149,504,730	144,449,014	293,953,744
2053	2,455,633,239	141,198,911	144,449,014	285,647,925
2054	2,311,184,225	132,893,093	144,449,014	277,342,107
2055	2,166,735,211	124,587,275	144,449,014	269,036,289
2056	2,022,286,196	116,281,456	144,449,014	260,730,470
2057	1,877,837,182	107,975,638	144,449,014	252,424,652
2058	1,733,388,168	99,669,820	144,449,014	244,118,834
2059	1,588,939,154	91,364,001	144,449,014	235,813,015
2060	1,444,490,140	83,058,183	144,449,014	227,507,197
2061	1,300,041,126	74,752,365	144,449,014	219,201,379
2062	1,155,592,112	66,446,546	144,449,014	210,895,560
2063	1,011,143,098	58,140,728	144,449,014	202,589,742
2064	866,694,084	49,834,910	144,449,014	194,283,924
2065	722,245,070	41,529,092	144,449,014	185,978,106
2066	577,796,056	33,223,273	144,449,014	177,672,287
2067	433,347,042	24,917,455	144,449,014	169,366,469
2068	288,898,028	16,611,637	144,449,014	161,060,651
2069	144,449,014	8,305,818	144,449,014	152,754,832
2070	0	0	144,449,014	144,449,014

Year	Phase 4			
	Principal	Interest	Repayment	Total
2022				
2023				
2024				
2025	3,401,756,561	195,601,002		195,601,002
2026		195,601,002		195,601,002
2027		195,601,002		195,601,002
2028		195,601,002		195,601,002
2029		195,601,002		195,601,002
2030		195,601,002		195,601,002
2031		195,601,002		195,601,002
2032		195,601,002		195,601,002
2033		195,601,002		195,601,002
2034		195,601,002		195,601,002
2035	3,316,712,647	190,710,977	85,043,914	275,754,891
2036	3,231,668,733	185,820,952	85,043,914	270,864,866
2037	3,146,624,819	180,930,927	85,043,914	265,974,841
2038	3,061,580,905	176,040,902	85,043,914	261,084,816
2039	2,976,536,991	171,150,877	85,043,914	256,194,791
2040	2,891,493,077	166,260,852	85,043,914	251,304,766
2041	2,806,449,163	161,370,827	85,043,914	246,414,741
2042	2,721,405,249	156,480,802	85,043,914	241,524,716
2043	2,636,361,335	151,590,777	85,043,914	236,634,691
2044	2,551,317,421	146,700,752	85,043,914	231,744,666
2045	2,466,273,507	141,810,727	85,043,914	226,854,641
2046	2,381,229,593	136,920,702	85,043,914	221,964,616
2047	2,296,185,679	132,030,677	85,043,914	217,074,591
2048	2,211,141,765	127,140,651	85,043,914	212,184,566
2049	2,126,097,851	122,250,626	85,043,914	207,294,540
2050	2,041,053,937	117,360,601	85,043,914	202,404,515
2051	1,956,010,023	112,470,576	85,043,914	197,514,490
2052	1,870,966,109	107,580,551	85,043,914	192,624,465
2053	1,785,922,195	102,690,526	85,043,914	187,734,440
2054	1,700,878,281	97,800,501	85,043,914	182,844,415
2055	1,615,834,367	92,910,476	85,043,914	177,954,390
2056	1,530,790,453	88,020,451	85,043,914	173,064,365
2057	1,445,746,539	83,130,426	85,043,914	168,174,340
2058	1,360,702,625	78,240,401	85,043,914	163,284,315
2059	1,275,658,711	73,350,376	85,043,914	158,394,290
2060	1,190,614,796	68,460,351	85,043,914	153,504,265
2061	1,105,570,882	63,570,326	85,043,914	148,614,240
2062	1,020,526,968	58,680,301	85,043,914	143,724,215
2063	935,483,054	53,790,276	85,043,914	138,834,190
2064	850,439,140	48,900,251	85,043,914	133,944,165
2065	765,395,226	44,010,226	85,043,914	129,054,140
2066	680,351,312	39,120,200	85,043,914	124,164,114
2067	595,307,398	34,230,175	85,043,914	119,274,089
2068	510,263,484	29,340,150	85,043,914	114,384,064
2069	425,219,570	24,450,125	85,043,914	109,494,039
2070	340,175,656	19,560,100	85,043,914	104,604,014
2071	255,131,742	14,670,075	85,043,914	99,713,989
2072	170,087,828	9,780,050	85,043,914	94,823,964
2073	85,043,914	4,890,025	85,043,914	89,933,939
2074	0	0	85,043,914	85,043,914

Year	TOTAL			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	-	342,672,018	-
2014	-	-	342,672,018	-
2015	-	-	342,672,018	-
2016	-	-	342,672,018	-
2017	4,910,623,607	-	625,032,875	-
2018	-	-	625,032,875	-
2019	-	-	625,032,875	-
2020	-	-	625,032,875	-
2021	5,777,960,561	-	957,265,607	-
2022	-	-	957,265,607	-
2023	-	5,810,525,517	948,698,807	148,987,834
2024	-	5,661,537,683	940,132,006	148,987,834
2025	3,401,756,561	5,512,549,849	1,127,166,208	148,987,834
2026	-	5,363,562,015	1,118,599,408	148,987,834
2027	-	10,002,432,199	1,102,973,586	271,753,424
2028	-	9,730,678,775	1,087,347,764	271,753,424
2029	-	9,458,925,351	1,071,721,942	271,753,424
2030	-	9,187,171,927	1,056,096,120	271,753,424
2031	-	14,548,930,050	1,032,164,480	416,202,438
2032	-	14,132,727,612	1,008,232,840	416,202,438
2033	-	13,716,525,174	984,301,200	416,202,438
2034	-	13,300,322,736	960,369,560	416,202,438
2035	-	16,200,832,946	931,547,894	501,246,352
2036	-	15,699,586,594	902,726,229	501,246,352
2037	-	15,198,340,241.6	873,904,563.9	501,246,352.0
2038		14,697,093,890	845,082,899	501,246,352
2039		14,195,847,538	816,261,233	501,246,352
2040		13,694,601,186	787,439,568	501,246,352
2041		13,193,354,834	758,617,903	501,246,352
2042		12,692,108,482	729,796,238	501,246,352
2043		12,190,862,130	700,974,572	501,246,352
2044		11,689,615,778	672,152,907	501,246,352
2045		11,188,369,426	643,331,242	501,246,352
2046		10,687,123,074	614,509,577	501,246,352
2047		10,185,876,722	585,687,911	501,246,352
2048		9,684,630,370	556,866,246	501,246,352
2049		9,183,384,018	528,044,581	501,246,352
2050		8,682,137,666	499,222,916	501,246,352
2051		8,180,891,314	470,401,251	501,246,352
2052		7,679,644,961	441,579,585	501,246,352
2053		7,178,398,609	412,757,920	501,246,352
2054		6,677,152,257	383,936,255	501,246,352
2055		6,175,905,905	355,114,590	501,246,352
2056		5,674,659,553	326,292,924	501,246,352
2057		5,173,413,201	297,471,259	501,246,352
2058		4,672,166,849	268,649,594	501,246,352
2059		4,170,920,497	239,827,929	501,246,352
2060		3,669,674,145	211,006,263	501,246,352
2061		3,168,427,793	182,184,598	501,246,352
2062		2,667,181,441	153,362,933	501,246,352
2063		2,314,922,923	133,108,068	352,258,518
2064		1,962,664,405	112,853,203	352,258,518
2065		1,610,405,887	92,598,338	352,258,518
2066		1,258,147,368	72,343,474	352,258,518
2067		1,028,654,440	59,147,630	229,492,928
2068		799,161,512	45,951,787	229,492,928
2069		569,668,584	32,755,944	229,492,928
2070		340,175,656	19,560,100	229,492,928
2071		255,131,742	14,670,075	85,043,914
2072		170,087,828	9,780,050	85,043,914
2073		85,043,914	4,890,025	85,043,914
2074		0	0	85,043,914
			34,009,564,984	20,049,854,080
				54,059,419,064
				20,049,854,080

% increase in interest charges 37%

4. JICA Direct Loan

4.1 Option 1

Interest 0.65% Commitment Charge 0.10% Govt. Gurantee Fee 1% TOTAL 1.75%
 Grace 10
 Repay 40

Year	Phase 1			Total
	Principal	Interest	Repayment	
2012				
2013	5,959,513,350	104,291,484		104,291,484
2014		104,291,484		104,291,484
2015		104,291,484		104,291,484
2016		104,291,484		104,291,484
2017		104,291,484		104,291,484
2018		104,291,484		104,291,484
2019		104,291,484		104,291,484
2020		104,291,484		104,291,484
2021		104,291,484		104,291,484
2022		104,291,484		104,291,484
2023	5,944,614,567	104,030,755	14,898,783	118,929,538
2024	5,929,715,784	103,770,026	14,898,783	118,668,810
2025	5,914,817,000	103,509,298	14,898,783	118,408,081
2026	5,899,918,217	103,248,569	14,898,783	118,147,352
2027	5,885,019,433	102,987,840	14,898,783	117,886,623
2028	5,870,120,650	102,727,111	14,898,783	117,625,895
2029	5,855,221,867	102,466,383	14,898,783	117,365,166
2030	5,840,323,083	102,205,654	14,898,783	117,104,437
2031	5,825,424,300	101,944,925	14,898,783	116,843,709
2032	5,810,525,517	101,684,197	14,898,783	116,582,980
2033	5,795,626,733	101,423,468	14,898,783	116,322,251
2034	5,780,727,950	101,162,739	14,898,783	116,061,522
2035	5,765,829,166	100,902,010	14,898,783	115,800,794
2036	5,750,930,383	100,641,282	14,898,783	115,540,065
2037	5,736,031,600	100,380,553	14,898,783	115,279,336
2038	5,721,132,816	100,119,824	14,898,783	115,018,608
2039	5,706,234,033	99,859,096	14,898,783	114,757,879
2040	5,691,335,250	99,598,367	14,898,783	114,497,150
2041	5,676,436,466	99,337,638	14,898,783	114,236,422
2042	5,661,537,683	99,076,909	14,898,783	113,975,693
2043	5,646,638,899	98,816,181	14,898,783	113,714,964
2044	5,631,740,116	98,555,452	14,898,783	113,454,235
2045	5,616,841,333	98,294,723	14,898,783	113,193,507
2046	5,601,942,549	98,033,995	14,898,783	112,932,778
2047	5,587,043,766	97,773,266	14,898,783	112,672,049
2048	5,572,144,983	97,512,537	14,898,783	112,411,321
2049	5,557,246,199	97,251,808	14,898,783	112,150,592
2050	5,542,347,416	96,991,080	14,898,783	111,889,863
2052	5,527,448,632	96,730,351	14,898,783	111,629,134
2051	5,512,549,849	96,469,622	14,898,783	111,368,406
2053	5,497,651,066	96,208,894	14,898,783	111,107,677
2054	5,482,752,282	95,948,165	14,898,783	110,846,948
2055	5,467,853,499	95,687,436	14,898,783	110,586,220
2056	5,452,954,716	95,426,708	14,898,783	110,325,491
2057	5,438,055,932	95,165,979	14,898,783	110,064,762
2058	5,423,157,149	94,905,250	14,898,783	109,804,033
2059	5,408,258,365	94,644,521	14,898,783	109,543,305
2060	5,393,359,582	94,383,793	14,898,783	109,282,576
2061	5,378,460,799	94,123,064	14,898,783	109,021,847
2062	5,363,562,015	93,862,335	14,898,783	108,761,119
2063				
to				
2074				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	85,935,913		85,935,913
2018		85,935,913		85,935,913
2019		85,935,913		85,935,913
2020		85,935,913		85,935,913
2021		85,935,913		85,935,913
2022		85,935,913		85,935,913
2023		85,935,913		85,935,913
2024		85,935,913		85,935,913
2025		85,935,913		85,935,913
2026		85,935,913		85,935,913
2027	4,787,858,017	83,787,515	122,765,590	206,553,105
2028	4,665,092,427	81,639,117	122,765,590	204,404,708
2029	4,542,326,837	79,490,720	122,765,590	202,256,310
2030	4,419,561,246	77,342,322	122,765,590	200,107,912
2031	4,296,795,656	75,193,924	122,765,590	197,959,514
2032	4,174,030,066	73,045,526	122,765,590	195,811,116
2033	4,051,264,476	70,897,128	122,765,590	193,662,719
2034	3,928,498,886	68,748,731	122,765,590	191,514,321
2035	3,805,733,296	66,600,333	122,765,590	189,365,923
2036	3,682,967,705	64,451,935	122,765,590	187,217,525
2037	3,560,202,115	62,303,537	122,765,590	185,069,127
2038	3,437,436,525	60,155,139	122,765,590	182,920,729
2039	3,314,670,935	58,006,741	122,765,590	180,772,332
2040	3,191,905,345	55,858,344	122,765,590	178,623,934
2041	3,069,139,754	53,709,946	122,765,590	176,475,536
2042	2,946,374,164	51,561,548	122,765,590	174,327,138
2043	2,823,608,574	49,413,150	122,765,590	172,178,740
2044	2,700,842,984	47,264,752	122,765,590	170,030,342
2045	2,578,077,394	45,116,354	122,765,590	167,881,945
2046	2,455,311,804	42,967,957	122,765,590	165,733,547
2047	2,332,546,213	40,819,559	122,765,590	163,585,149
2048	2,209,780,623	38,671,161	122,765,590	161,436,751
2049	2,087,015,033	36,522,763	122,765,590	159,288,353
2050	1,964,249,443	34,374,365	122,765,590	157,139,955
2052	1,841,483,853	32,225,967	122,765,590	154,991,558
2051	1,718,718,263	30,077,570	122,765,590	152,843,160
2053	1,595,952,672	27,929,172	122,765,590	150,694,762
2054	1,473,187,082	25,780,774	122,765,590	148,546,364
2055	1,350,421,492	23,632,376	122,765,590	146,397,966
2056	1,227,655,902	21,483,978	122,765,590	144,249,568
2057	1,104,890,312	19,335,580	122,765,590	142,101,171
2058	982,124,721	17,187,183	122,765,590	139,952,773
2059	859,359,131	15,038,785	122,765,590	137,804,375
2060	736,593,541	12,890,387	122,765,590	135,655,977
2061	613,827,951	10,741,989	122,765,590	133,507,579
2062	491,062,361	8,593,591	122,765,590	131,359,181
2063	368,296,771	6,445,193	122,765,590	129,210,784
2064	245,531,180	4,296,796	122,765,590	127,062,386
2065	122,765,590	2,148,398	122,765,590	124,913,988
2066	0	0	122,765,590	122,765,590
2067				
to				
2074				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	101,114,310		101,114,310
2022		101,114,310		101,114,310
2023		101,114,310		101,114,310
2024		101,114,310		101,114,310
2025		101,114,310		101,114,310
2026		101,114,310		101,114,310
2027		101,114,310		101,114,310
2028		101,114,310		101,114,310
2029		101,114,310		101,114,310
2030		101,114,310		101,114,310
2031	5,633,511,547	98,586,452	144,449,014	243,035,466
2032	5,489,062,533	96,058,594	144,449,014	240,507,608
2033	5,344,613,519	93,530,737	144,449,014	237,979,751
2034	5,200,164,505	91,002,879	144,449,014	235,451,893
2035	5,055,715,491	88,475,021	144,449,014	232,924,035
2036	4,911,266,477	85,947,163	144,449,014	230,396,177
2037	4,766,817,463	83,419,306	144,449,014	227,868,320
2038	4,622,368,449	80,891,448	144,449,014	225,340,462
2039	4,477,919,435	78,363,590	144,449,014	222,812,604
2040	4,333,470,421	75,835,732	144,449,014	220,284,746
2041	4,189,021,407	73,307,875	144,449,014	217,756,889
2042	4,044,572,393	70,780,017	144,449,014	215,229,031
2043	3,900,123,379	68,252,159	144,449,014	212,701,173
2044	3,755,674,365	65,724,301	144,449,014	210,173,315
2045	3,611,225,351	63,196,444	144,449,014	207,645,458
2046	3,466,776,337	60,668,586	144,449,014	205,117,600
2047	3,322,327,323	58,140,728	144,449,014	202,589,742
2048	3,177,878,309	55,612,870	144,449,014	200,061,884
2049	3,033,429,295	53,085,013	144,449,014	197,534,027
2050	2,888,980,281	50,557,155	144,449,014	195,006,169
2052	2,744,531,267	48,029,297	144,449,014	192,478,311
2051	2,600,082,253	45,501,439	144,449,014	189,950,453
2053	2,455,633,239	42,973,582	144,449,014	187,422,596
2054	2,311,184,225	40,445,724	144,449,014	184,894,738
2055	2,166,735,211	37,917,866	144,449,014	182,366,880
2056	2,022,286,196	35,390,008	144,449,014	179,839,022
2057	1,877,837,182	32,862,151	144,449,014	177,311,165
2058	1,733,388,168	30,334,293	144,449,014	174,783,307
2059	1,588,939,154	27,806,435	144,449,014	172,255,449
2060	1,444,490,140	25,278,577	144,449,014	169,727,591
2061	1,300,041,126	22,750,720	144,449,014	167,199,734
2062	1,155,592,112	20,222,862	144,449,014	164,671,876
2063	1,011,143,098	17,695,004	144,449,014	162,144,018
2064	866,694,084	15,167,146	144,449,014	159,616,161
2065	722,245,070	12,639,289	144,449,014	157,088,303
2066	577,796,056	10,111,431	144,449,014	154,560,445
2067	433,347,042	7,583,573	144,449,014	152,032,587
2068	288,898,028	5,055,715	144,449,014	149,504,730
2069	144,449,014	2,527,858	144,449,014	146,976,872
2070	0	0	144,449,014	144,449,014
2071				
to				
2074				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	59,530,740		59,530,740
2026		59,530,740		59,530,740
2027		59,530,740		59,530,740
2028		59,530,740		59,530,740
2029		59,530,740		59,530,740
2030		59,530,740		59,530,740
2031		59,530,740		59,530,740
2032		59,530,740		59,530,740
2033		59,530,740		59,530,740
2034		59,530,740		59,530,740
2035	3,316,712,647	58,042,471	85,043,914	143,086,385
2036	3,231,668,733	56,554,203	85,043,914	141,598,117
2037	3,146,624,819	55,065,934	85,043,914	140,109,848
2038	3,061,580,905	53,577,666	85,043,914	138,621,580
2039	2,976,536,991	52,089,397	85,043,914	137,133,311
2040	2,891,493,077	50,601,129	85,043,914	135,645,043
2041	2,806,449,163	49,112,860	85,043,914	134,156,774
2042	2,721,405,249	47,624,592	85,043,914	132,668,506
2043	2,636,361,335	46,136,323	85,043,914	131,180,237
2044	2,551,317,421	44,648,055	85,043,914	129,691,969
2045	2,466,273,507	43,159,786	85,043,914	128,203,700
2046	2,381,229,593	41,671,518	85,043,914	126,715,432
2047	2,296,185,679	40,183,249	85,043,914	125,227,163
2048	2,211,141,765	38,694,981	85,043,914	123,738,895
2049	2,126,097,851	37,206,712	85,043,914	122,250,626
2050	2,041,053,937	35,718,444	85,043,914	120,762,358
2052	1,956,010,023	34,230,175	85,043,914	119,274,089
2051	1,870,966,109	32,741,907	85,043,914	117,785,821
2053	1,785,922,195	31,253,638	85,043,914	116,297,552
2054	1,700,878,281	29,765,370	85,043,914	114,809,284
2055	1,615,834,367	28,277,101	85,043,914	113,321,015
2056	1,530,790,453	26,788,833	85,043,914	111,832,747
2057	1,445,746,539	25,300,564	85,043,914	110,344,478
2058	1,360,702,625	23,812,296	85,043,914	108,856,210
2059	1,275,658,711	22,324,027	85,043,914	107,367,941
2060	1,190,614,796	20,835,759	85,043,914	105,879,673
2061	1,105,570,882	19,347,490	85,043,914	104,391,404
2062	1,020,526,968	17,859,222	85,043,914	102,903,136
2063	935,483,054	16,370,953	85,043,914	101,414,867
2064	850,439,140	14,882,685	85,043,914	99,926,599
2065	765,395,226	13,394,416	85,043,914	98,438,330
2066	680,351,312	11,906,148	85,043,914	96,950,062
2067	595,307,398	10,417,879	85,043,914	95,461,794
2068	510,263,484	8,929,611	85,043,914	93,973,525
2069	425,219,570	7,441,342	85,043,914	92,485,257
2070	340,175,656	5,953,074	85,043,914	90,996,988
2071	255,131,742	4,464,805	85,043,914	89,508,720
2072	170,087,828	2,976,537	85,043,914	88,020,451
2073	85,043,914	1,488,268	85,043,914	86,532,183
2074	0	0	85,043,914	85,043,914

Year	TOTAL				
	Principal	Interest	Repayment	Total	
2012					
2013	5,959,513,350	-	104,291,484	-	104,291,484
2014	-	-	104,291,484	-	104,291,484
2015	-	-	104,291,484	-	104,291,484
2016	-	-	104,291,484	-	104,291,484
2017	4,910,623,607	-	190,227,397	-	190,227,397
2018	-	-	190,227,397	-	190,227,397
2019	-	-	190,227,397	-	190,227,397
2020	-	-	190,227,397	-	190,227,397
2021	5,777,960,561	-	291,341,707	-	291,341,707
2022	-	-	291,341,707	-	291,341,707
2023	-	5,944,614,567	291,080,978	14,898,783	305,979,761
2024	-	5,929,715,784	290,820,249	14,898,783	305,719,033
2025	3,401,756,561	5,914,817,000	350,090,260	14,898,783	364,989,044
2026	-	5,899,918,217	349,829,532	14,898,783	364,728,315
2027	-	10,672,877,450	347,420,405	137,664,374	485,084,779
2028	-	10,535,213,077	345,011,278	137,664,374	482,675,652
2029	-	10,397,548,703	342,602,152	137,664,374	480,266,526
2030	-	10,259,884,330	340,193,025	137,664,374	477,857,399
2031	-	15,755,731,504	335,256,041	282,113,388	617,369,429
2032	-	15,473,618,116	330,319,057	282,113,388	612,432,444
2033	-	15,191,504,728	325,382,073	282,113,388	607,495,460
2034	-	14,909,391,341	320,445,088	282,113,388	602,558,476
2035	-	17,943,990,601	314,019,836	367,157,302	681,177,137
2036	-	17,576,833,299	307,594,583	367,157,302	674,751,884
2037	-	17,209,675,997	301,169,330	367,157,302	668,326,632
2038	-	16,842,518,696	294,744,077	367,157,302	661,901,379
2039	-	16,475,361,394	288,318,824	367,157,302	655,476,126
2040	-	16,108,204,092	281,893,572	367,157,302	649,050,873
2041	-	15,741,046,791	275,468,319	367,157,302	642,625,620
2042	-	15,373,889,489	269,043,066	367,157,302	636,200,368
2043	-	15,006,732,188	262,617,813	367,157,302	629,775,115
2044	-	14,639,574,886	256,192,561	367,157,302	623,349,862
2045	-	14,272,417,584	249,767,308	367,157,302	616,924,609
2046	-	13,905,260,283	243,342,055	367,157,302	610,499,357
2047	-	13,538,102,981	236,916,802	367,157,302	604,074,104
2048	-	13,170,945,679	230,491,549	367,157,302	597,648,851
2049	-	12,803,788,378	224,066,297	367,157,302	591,223,598
2050	-	12,436,631,076	217,641,044	367,157,302	584,798,345
2052	-	12,069,473,775	211,215,791	367,157,302	578,373,093
2051	-	11,702,316,473	204,790,538	367,157,302	571,947,840
2053	-	11,335,159,171	198,365,285	367,157,302	565,522,587
2054	-	10,968,001,870	191,940,033	367,157,302	559,097,334
2055	-	10,600,844,568	185,514,780	367,157,302	552,672,082
2056	-	10,233,687,266	179,089,527	367,157,302	546,246,829
2057	-	9,866,529,965	172,664,274	367,157,302	539,821,576
2058	-	9,499,372,663	166,239,022	367,157,302	533,396,323
2059	-	9,132,215,362	159,813,769	367,157,302	526,971,070
2060	-	8,765,058,060	153,388,516	367,157,302	520,545,818
2061	-	8,397,900,758	146,963,263	367,157,302	514,120,565
2062	-	8,030,743,457	140,538,010	367,157,302	507,695,312
2063	-	2,314,922,923	40,511,151	352,258,518	392,769,669
2064	-	1,962,664,405	34,346,627	352,258,518	386,605,145
2065	-	1,610,405,887	28,182,103	352,258,518	380,440,621
2066	-	1,258,147,368	22,017,579	352,258,518	374,276,097
2067	-	1,028,654,440	18,001,453	229,492,928	247,494,381
2068	-	799,161,512	13,985,326	229,492,928	243,478,255
2069	-	569,668,584	9,969,200	229,492,928	239,462,128
2070	-	340,175,656	5,953,074	229,492,928	235,446,002
2071	-	255,131,742	4,464,805	85,043,914	89,508,720
2072	-	170,087,828	2,976,537	85,043,914	88,020,451
2073	-	85,043,914	1,488,268	85,043,914	86,532,183
2074	20,049,854,080	0	0	85,043,914	85,043,914
			12,274,915,042	14,686,292,065	26,961,207,107
					6,911,353,027

4.2 Option 2

Interest 0.55% Commitment Charge 0.10% Govt. Gurantee Fee 1% TOTAL 1.65%
 Grace 10
 Repay 30

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	98,331,970		98,331,970
2014		98,331,970		98,331,970
2015		98,331,970		98,331,970
2016		98,331,970		98,331,970
2017		98,331,970		98,331,970
2018		98,331,970		98,331,970
2019		98,331,970		98,331,970
2020		98,331,970		98,331,970
2021		98,331,970		98,331,970
2022		98,331,970		98,331,970
2023	5,760,862,905	95,054,238	198,650,445	293,704,683
2024	5,562,212,460	91,776,506	198,650,445	290,426,951
2025	5,363,562,015	88,498,773	198,650,445	287,149,218
2026	5,164,911,570	85,221,041	198,650,445	283,871,486
2027	4,966,261,125	81,943,309	198,650,445	280,593,754
2028	4,767,610,680	78,665,576	198,650,445	277,316,021
2029	4,568,960,235	75,387,844	198,650,445	274,038,289
2030	4,370,309,790	72,110,112	198,650,445	270,760,557
2031	4,171,659,345	68,832,379	198,650,445	267,482,824
2032	3,973,008,900	65,554,647	198,650,445	264,205,092
2033	3,774,358,455	62,276,915	198,650,445	260,927,360
2034	3,575,708,010	58,999,182	198,650,445	257,649,627
2035	3,377,057,565	55,721,450	198,650,445	254,371,895
2036	3,178,407,120	52,443,717	198,650,445	251,094,162
2037	2,979,756,675	49,165,985	198,650,445	247,816,430
2038	2,781,106,230	45,888,253	198,650,445	244,538,698
2039	2,582,455,785	42,610,520	198,650,445	241,260,965
2040	2,383,805,340	39,332,788	198,650,445	237,983,233
2041	2,185,154,895	36,055,056	198,650,445	234,705,501
2042	1,986,504,450	32,777,323	198,650,445	231,427,768
2043	1,787,854,005	29,499,591	198,650,445	228,150,036
2044	1,589,203,560	26,221,859	198,650,445	224,872,304
2045	1,390,553,115	22,944,126	198,650,445	221,594,571
2046	1,191,902,670	19,666,394	198,650,445	218,316,839
2047	993,252,225	16,388,662	198,650,445	215,039,107
2048	794,601,780	13,110,929	198,650,445	211,761,374
2049	595,951,335	9,833,197	198,650,445	208,483,642
2050	397,300,890	6,555,465	198,650,445	205,205,910
2052	198,650,445	3,277,732	198,650,445	201,928,177
2051	0		198,650,445	198,650,445
2053				
to				
2064				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	81,025,290		81,025,290
2018		81,025,290		81,025,290
2019		81,025,290		81,025,290
2020		81,025,290		81,025,290
2021		81,025,290		81,025,290
2022		81,025,290		81,025,290
2023		81,025,290		81,025,290
2024		81,025,290		81,025,290
2025		81,025,290		81,025,290
2026		81,025,290		81,025,290
2027	4,746,936,154	78,324,447	163,687,454	242,011,900
2028	4,583,248,700	75,623,604	163,687,454	239,311,057
2029	4,419,561,246	72,922,761	163,687,454	236,610,214
2030	4,255,873,793	70,221,918	163,687,454	233,909,371
2031	4,092,186,339	67,521,075	163,687,454	231,208,528
2032	3,928,498,886	64,820,232	163,687,454	228,507,685
2033	3,764,811,432	62,119,389	163,687,454	225,806,842
2034	3,601,123,979	59,418,546	163,687,454	223,105,999
2035	3,437,436,525	56,717,703	163,687,454	220,405,156
2036	3,273,749,071	54,016,860	163,687,454	217,704,313
2037	3,110,061,618	51,316,017	163,687,454	215,003,470
2038	2,946,374,164	48,615,174	163,687,454	212,302,627
2039	2,782,686,711	45,914,331	163,687,454	209,601,784
2040	2,618,999,257	43,213,488	163,687,454	206,900,941
2041	2,455,311,804	40,512,645	163,687,454	204,200,098
2042	2,291,624,350	37,811,802	163,687,454	201,499,255
2043	2,127,936,896	35,110,959	163,687,454	198,798,412
2044	1,964,249,443	32,410,116	163,687,454	196,097,569
2045	1,800,561,989	29,709,273	163,687,454	193,396,726
2046	1,636,874,536	27,008,430	163,687,454	190,695,883
2047	1,473,187,082	24,307,587	163,687,454	187,995,040
2048	1,309,499,629	21,606,744	163,687,454	185,294,197
2049	1,145,812,175	18,905,901	163,687,454	182,593,354
2050	982,124,721	16,205,058	163,687,454	179,892,511
2052	818,437,268	13,504,215	163,687,454	177,191,668
2051	654,749,814	10,803,372	163,687,454	174,490,826
2053	491,062,361	8,102,529	163,687,454	171,789,983
2054	327,374,907	5,401,686	163,687,454	169,089,140
2055	163,687,454	2,700,843	163,687,454	166,388,297
2056	0	0	163,687,454	163,687,454
2057				
to				
2064				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	95,336,349		95,336,349
2022		95,336,349		95,336,349
2023		95,336,349		95,336,349
2024		95,336,349		95,336,349
2025		95,336,349		95,336,349
2026		95,336,349		95,336,349
2027		95,336,349		95,336,349
2028		95,336,349		95,336,349
2029		95,336,349		95,336,349
2030		95,336,349		95,336,349
2031	5,585,361,876	92,158,471	192,598,685	284,757,156
2032	5,392,763,191	88,980,593	192,598,685	281,579,278
2033	5,200,164,505	85,802,714	192,598,685	278,401,400
2034	5,007,565,820	82,624,836	192,598,685	275,223,521
2035	4,814,967,135	79,446,958	192,598,685	272,045,643
2036	4,622,368,449	76,269,079	192,598,685	268,867,765
2037	4,429,769,764	73,091,201	192,598,685	265,689,886
2038	4,237,171,078	69,913,323	192,598,685	262,512,008
2039	4,044,572,393	66,735,444	192,598,685	259,334,130
2040	3,851,973,708	63,557,566	192,598,685	256,156,252
2041	3,659,375,022	60,379,688	192,598,685	252,978,373
2042	3,466,776,337	57,201,810	192,598,685	249,800,495
2043	3,274,177,651	54,023,931	192,598,685	246,622,617
2044	3,081,578,966	50,846,053	192,598,685	243,444,738
2045	2,888,980,281	47,668,175	192,598,685	240,266,860
2046	2,696,381,595	44,490,296	192,598,685	237,088,982
2047	2,503,782,910	41,312,418	192,598,685	233,911,103
2048	2,311,184,225	38,134,540	192,598,685	230,733,225
2049	2,118,585,539	34,956,661	192,598,685	227,555,347
2050	1,925,986,854	31,778,783	192,598,685	224,377,468
2052	1,733,388,168	28,600,905	192,598,685	221,199,590
2051	1,540,789,483	25,423,026	192,598,685	218,021,712
2053	1,348,190,798	22,245,148	192,598,685	214,843,834
2054	1,155,592,112	19,067,270	192,598,685	211,665,955
2055	962,993,427	15,889,392	192,598,685	208,488,077
2056	770,394,742	12,711,513	192,598,685	205,310,199
2057	577,796,056	9,533,635	192,598,685	202,132,320
2058	385,197,371	6,355,757	192,598,685	198,954,442
2059	192,598,685	3,177,878	192,598,685	195,776,564
2060	0	0	192,598,685	192,598,685
2061				
to				
2064				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	56,128,983		56,128,983
2026		56,128,983		56,128,983
2027		56,128,983		56,128,983
2028		56,128,983		56,128,983
2029		56,128,983		56,128,983
2030		56,128,983		56,128,983
2031		56,128,983		56,128,983
2032		56,128,983		56,128,983
2033		56,128,983		56,128,983
2034		56,128,983		56,128,983
2035	3,288,364,676	54,258,017	113,391,885	167,649,903
2036	3,174,972,791	52,387,051	113,391,885	165,778,936
2037	3,061,580,905	50,516,085	113,391,885	163,907,970
2038	2,948,189,020	48,645,119	113,391,885	162,037,004
2039	2,834,797,135	46,774,153	113,391,885	160,166,038
2040	2,721,405,249	44,903,187	113,391,885	158,295,072
2041	2,608,013,364	43,032,221	113,391,885	156,424,106
2042	2,494,621,478	41,161,254	113,391,885	154,553,140
2043	2,381,229,593	39,290,288	113,391,885	152,682,174
2044	2,267,837,708	37,419,322	113,391,885	150,811,208
2045	2,154,445,822	35,548,356	113,391,885	148,940,241
2046	2,041,053,937	33,677,390	113,391,885	147,069,275
2047	1,927,662,051	31,806,424	113,391,885	145,198,309
2048	1,814,270,166	29,935,458	113,391,885	143,327,343
2049	1,700,878,281	28,064,492	113,391,885	141,456,377
2050	1,587,486,395	26,193,526	113,391,885	139,585,411
2052	1,474,094,510	24,322,559	113,391,885	137,714,445
2051	1,360,702,625	22,451,593	113,391,885	135,843,479
2053	1,247,310,739	20,580,627	113,391,885	133,972,513
2054	1,133,918,854	18,709,661	113,391,885	132,101,546
2055	1,020,526,968	16,838,695	113,391,885	130,230,580
2056	907,135,083	14,967,729	113,391,885	128,359,614
2057	793,743,198	13,096,763	113,391,885	126,488,648
2058	680,351,312	11,225,797	113,391,885	124,617,682
2059	566,959,427	9,354,831	113,391,885	122,746,716
2060	453,567,542	7,483,864	113,391,885	120,875,750
2061	340,175,656	5,612,898	113,391,885	119,004,784
2062	226,783,771	3,741,932	113,391,885	117,133,818
2063	113,391,885	1,870,966	113,391,885	115,262,851
2064		0	113,391,885	113,391,885

Year	TOTAL				
	Principal	Interest	Repayment	Total	
2012					
2013	5,959,513,350	-	98,331,970	-	98,331,970
2014	-	-	98,331,970	-	98,331,970
2015	-	-	98,331,970	-	98,331,970
2016	-	-	98,331,970	-	98,331,970
2017	4,910,623,607	-	179,357,260	-	179,357,260
2018	-	-	179,357,260	-	179,357,260
2019	-	-	179,357,260	-	179,357,260
2020	-	-	179,357,260	-	179,357,260
2021	5,777,960,561	-	274,693,609	-	274,693,609
2022	-	-	274,693,609	-	274,693,609
2023	-	5,760,862,905	271,415,877	198,650,445	470,066,322
2024	-	5,562,212,460	268,138,144	198,650,445	466,788,589
2025	3,401,756,561	5,363,562,015	320,989,395	198,650,445	519,639,840
2026	-	5,164,911,570	317,711,663	198,650,445	516,362,108
2027	-	9,713,197,279	311,733,088	362,337,899	674,070,986
2028	-	9,350,859,380	305,754,512	362,337,899	668,092,411
2029	-	8,988,521,482	299,775,937	362,337,899	662,113,836
2030	-	8,626,183,583	293,797,362	362,337,899	656,135,260
2031	-	13,849,207,561	284,640,908	554,936,584	839,577,492
2032	-	13,294,270,977	275,484,454	554,936,584	830,421,038
2033	-	12,739,334,393	266,328,001	554,936,584	821,264,585
2034	-	12,184,397,809	257,171,547	554,936,584	812,108,131
2035	-	14,917,825,901	246,144,127	668,328,469	914,472,597
2036	-	14,249,497,431	235,116,708	668,328,469	903,445,177
2037	-	13,581,168,962	224,089,288	668,328,469	892,417,757
2038	-	12,912,840,493	213,061,868	668,328,469	881,390,337
2039	-	12,244,512,023	202,034,448	668,328,469	870,362,918
2040	-	11,576,183,554	191,007,029	668,328,469	859,335,498
2041	-	10,907,855,085	179,979,609	668,328,469	848,308,078
2042	-	10,239,526,615	168,952,189	668,328,469	837,280,658
2043	-	9,571,198,146	157,924,769	668,328,469	826,253,239
2044	-	8,902,869,677	146,897,350	668,328,469	815,225,819
2045	-	8,234,541,207	135,869,930	668,328,469	804,198,399
2046	-	7,566,212,738	124,842,510	668,328,469	793,170,980
2047	-	6,897,884,269	113,815,090	668,328,469	782,143,560
2048	-	6,229,555,799	102,787,671	668,328,469	771,116,140
2049	-	5,561,227,330	91,760,251	668,328,469	760,088,720
2050	-	4,892,898,861	80,732,831	668,328,469	749,061,301
2052	-	4,224,570,391	69,705,411	668,328,469	738,033,881
2051	-	3,556,241,922	58,677,992	668,328,469	727,006,461
2053	-	3,086,563,898	50,928,304	469,678,024	520,606,329
2054	-	2,616,885,873	43,178,617	469,678,024	512,856,641
2055	-	2,147,207,849	35,428,930	469,678,024	505,106,954
2056	-	1,677,529,825	27,679,242	469,678,024	497,357,266
2057	-	1,371,539,254	22,630,398	305,990,571	328,620,968
2058	-	1,065,548,683	17,581,553	305,990,571	323,572,124
2059	-	759,558,112	12,532,709	305,990,571	318,523,280
2060	-	453,567,542	7,483,864	305,990,571	313,474,435
2061	-	340,175,656	5,612,898	113,391,885	119,004,784
2062	-	226,783,771	3,741,932	113,391,885	117,133,818
2063	-	113,391,885	1,870,966	113,391,885	115,262,851
2064	20,049,854,080	0	0	113,391,885	113,391,885
			8,105,153,512	20,049,854,080	28,155,007,592
					8,105,153,512
					29%

4.3 Option 3

Interest 0.50% Commitment Charge 0.10% Govt. Gurantee Fee 1% TOTAL 1.60%
 Grace 6
 Repay 20

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	95,352,214		95,352,214
2014		95,352,214		95,352,214
2015		95,352,214		95,352,214
2016		95,352,214		95,352,214
2017		95,352,214		95,352,214
2018		95,352,214		95,352,214
2019	5,661,537,683	95,352,214	297,975,668	393,327,881
2020	5,363,562,015	95,352,214	297,975,668	393,327,881
2021	5,065,586,348	95,352,214	297,975,668	393,327,881
2022	4,767,610,680	95,352,214	297,975,668	393,327,881
2023	4,469,635,013	22,348,175	297,975,668	320,323,843
2024	4,171,659,345	20,858,297	297,975,668	318,833,964
2025	3,873,683,678	19,368,418	297,975,668	317,344,086
2026	3,575,708,010	17,878,540	297,975,668	315,854,208
2027	3,277,732,343	16,388,662	297,975,668	314,364,329
2028	2,979,756,675	14,898,783	297,975,668	312,874,451
2029	2,681,781,008	13,408,905	297,975,668	311,384,573
2030	2,383,805,340	11,919,027	297,975,668	309,894,694
2031	2,085,829,673	10,429,148	297,975,668	308,404,816
2032	1,787,854,005	8,939,270	297,975,668	306,914,938
2033	1,489,878,338	7,449,392	297,975,668	305,425,059
2034	1,191,902,670	5,959,513	297,975,668	303,935,181
2035	893,927,003	4,469,635	297,975,668	302,445,303
2036	595,951,335	2,979,757	297,975,668	300,955,424
2037	297,975,668	1,489,878	297,975,668	299,465,546
2038	0	0	297,975,668	297,975,668
2039				
to				
2050				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	78,569,978		78,569,978
2018		78,569,978		78,569,978
2019		78,569,978		78,569,978
2020		78,569,978		78,569,978
2021		78,569,978		78,569,978
2022		78,569,978		78,569,978
2023	4,665,092,427	74,641,479	245,531,180	320,172,659
2024	4,419,561,246	70,712,980	245,531,180	316,244,160
2025	4,174,030,066	66,784,481	245,531,180	312,315,661
2026	3,928,498,886	62,855,982	245,531,180	308,387,163
2027	3,682,967,705	58,927,483	245,531,180	304,458,664
2028	3,437,436,525	54,998,984	245,531,180	300,530,165
2029	3,191,905,345	51,070,486	245,531,180	296,601,666
2030	2,946,374,164	47,141,987	245,531,180	292,673,167
2031	2,700,842,984	43,213,488	245,531,180	288,744,668
2032	2,455,311,804	39,284,989	245,531,180	284,816,169
2033	2,209,780,623	35,356,490	245,531,180	280,887,670
2034	1,964,249,443	31,427,991	245,531,180	276,959,171
2035	1,718,718,263	27,499,492	245,531,180	273,030,673
2036	1,473,187,082	23,570,993	245,531,180	269,102,174
2037	1,227,655,902	19,642,494	245,531,180	265,173,675
2038	982,124,721	15,713,996	245,531,180	261,245,176
2039	736,593,541	11,785,497	245,531,180	257,316,677
2040	491,062,361	7,856,998	245,531,180	253,388,178
2041	245,531,180	3,928,499	245,531,180	249,459,679
2042	0	0	245,531,180	245,531,180
2043				
to				
2050				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	92,447,369		92,447,369
2022		92,447,369		92,447,369
2023		92,447,369		92,447,369
2024		92,447,369		92,447,369
2025		92,447,369		92,447,369
2026		92,447,369		92,447,369
2027	5,489,062,533	87,825,001	288,898,028	376,723,029
2028	5,200,164,505	83,202,632	288,898,028	372,100,660
2029	4,911,266,477	78,580,264	288,898,028	367,478,292
2030	4,622,368,449	73,957,895	288,898,028	362,855,923
2031	4,333,470,421	69,335,527	288,898,028	358,233,555
2032	4,044,572,393	64,713,158	288,898,028	353,611,186
2033	3,755,674,365	60,090,790	288,898,028	348,988,818
2034	3,466,776,337	55,468,421	288,898,028	344,366,449
2035	3,177,878,309	50,846,053	288,898,028	339,744,081
2036	2,888,980,281	46,223,684	288,898,028	335,121,713
2037	2,600,082,253	41,601,316	288,898,028	330,499,344
2038	2,311,184,225	36,978,948	288,898,028	325,876,976
2039	2,022,286,196	32,356,579	288,898,028	321,254,607
2040	1,733,388,168	27,734,211	288,898,028	316,632,239
2041	1,444,490,140	23,111,842	288,898,028	312,009,870
2042	1,155,592,112	18,489,474	288,898,028	307,387,502
2043	866,694,084	13,867,105	288,898,028	302,765,133
2044	577,796,056	9,244,737	288,898,028	298,142,765
2045	288,898,028	4,622,368	288,898,028	293,520,397
2046	0	0	288,898,028	288,898,028
2047				
to				
2050				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	54,428,105		
2026		54,428,105		
2027		54,428,105		
2028		54,428,105		
2029		54,428,105		
2030		54,428,105		
2031	3,231,668,733	54,428,105	170,087,828	224,515,933
2032	3,061,580,905	48,985,294	170,087,828	219,073,123
2033	2,891,493,077	46,263,889	170,087,828	216,351,717
2034	2,721,405,249	43,542,484	170,087,828	213,630,312
2035	2,551,317,421	40,821,079	170,087,828	210,908,907
2036	2,381,229,593	38,099,673	170,087,828	208,187,502
2037	2,211,141,765	35,378,268	170,087,828	205,466,096
2038	2,041,053,937	32,656,863	170,087,828	202,744,691
2039	1,870,966,109	29,935,458	170,087,828	200,023,286
2040	1,700,878,281	27,214,052	170,087,828	197,301,881
2041	1,530,790,453	24,492,647	170,087,828	194,580,475
2042	1,360,702,625	21,771,242	170,087,828	191,859,070
2043	1,190,614,796	19,049,837	170,087,828	189,137,665
2044	1,020,526,968	16,328,431	170,087,828	186,416,260
2045	850,439,140	13,607,026	170,087,828	183,694,854
2046	680,351,312	10,885,621	170,087,828	180,973,449
2047	510,263,484	8,164,216	170,087,828	178,252,044
2048	340,175,656	5,442,810	170,087,828	175,530,639
2049	170,087,828	2,721,405	170,087,828	172,809,233
2050	0	0	170,087,828	170,087,828

Year	TOTAL				
	Principal	Interest	Repayment	Total	
2012					
2013	5,959,513,350	-	95,352,214	-	95,352,214
2014	-	-	95,352,214	-	95,352,214
2015	-	-	95,352,214	-	95,352,214
2016	-	-	95,352,214	-	95,352,214
2017	4,910,623,607	-	173,922,191	-	173,922,191
2018	-	-	173,922,191	-	173,922,191
2019	-	5,661,537,683	173,922,191	297,975,668	471,897,859
2020	-	5,363,562,015	173,922,191	297,975,668	471,897,859
2021	5,777,960,561	5,065,586,348	266,369,560	297,975,668	564,345,228
2022	-	4,767,610,680	266,369,560	297,975,668	564,345,228
2023	-	9,134,727,440	189,437,023	543,506,848	732,943,871
2024	-	8,591,220,592	184,018,646	543,506,848	727,525,494
2025	3,401,756,561	8,047,713,744	233,028,373	543,506,848	776,535,221
2026	-	7,504,206,896	227,609,996	543,506,848	771,116,844
2027	-	12,449,762,581	217,569,251	832,404,876	1,049,974,126
2028	-	11,617,357,705	207,528,505	832,404,876	1,039,933,381
2029	-	10,784,952,830	197,487,759	832,404,876	1,029,892,635
2030	-	9,952,547,954	187,447,013	832,404,876	1,019,851,889
2031	-	12,351,811,811	177,406,268	1,002,492,704	1,179,898,972
2032	-	11,349,319,107	161,922,712	1,002,492,704	1,164,415,416
2033	-	10,346,826,403	149,160,561	1,002,492,704	1,151,653,265
2034	-	9,344,333,699	136,398,410	1,002,492,704	1,138,891,114
2035	-	8,341,840,995	123,636,259	1,002,492,704	1,126,128,963
2036	-	7,339,348,291	110,874,108	1,002,492,704	1,113,366,812
2037	-	6,336,855,587	98,111,957	1,002,492,704	1,100,604,661
2038	-	5,334,362,883	85,349,806	1,002,492,704	1,087,842,510
2039	-	4,629,845,846	74,077,534	704,517,037	778,594,570
2040	-	3,925,328,810	62,805,261	704,517,037	767,322,297
2041	-	3,220,811,773	51,532,988	704,517,037	756,050,025
2042	-	2,516,294,737	40,260,716	704,517,037	744,777,752
2043	-	2,057,308,881	32,916,942	458,985,856	491,902,798
2044	-	1,598,323,025	25,573,168	458,985,856	484,559,025
2045	-	1,139,337,168	18,229,395	458,985,856	477,215,251
2046	-	680,351,312	10,885,621	458,985,856	469,871,477
2047	-	510,263,484	8,164,216	170,087,828	178,252,044
2048	-	340,175,656	5,442,810	170,087,828	175,530,639
2049	-	170,087,828	2,721,405	170,087,828	172,809,233
2050	20,049,854,080	0	0	170,087,828	170,087,828
			4,629,433,443	20,049,854,080	24,679,287,523
					4,629,433,443
					19%

4.4 Option 4

Interest 0.40% Commitment Charge 0.10% Govt. Gurantee Fee 1% TOTAL 1.50%
 Grace 5
 Repay 15

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	89,392,700		89,392,700
2014		89,392,700		89,392,700
2015		89,392,700		89,392,700
2016		89,392,700		89,392,700
2017		89,392,700		89,392,700
2018	5,562,212,460	83,433,187	397,300,890	480,734,077
2019	5,164,911,570	77,473,674	397,300,890	474,774,564
2020	4,767,610,680	71,514,160	397,300,890	468,815,050
2021	4,370,309,790	65,554,647	397,300,890	462,855,537
2022	3,973,008,900	59,595,134	397,300,890	456,896,024
2023	3,575,708,010	53,635,620	397,300,890	450,936,510
2024	3,178,407,120	47,676,107	397,300,890	444,976,997
2025	2,781,106,230	41,716,593	397,300,890	439,017,483
2026	2,383,805,340	35,757,080	397,300,890	433,057,970
2027	1,986,504,450	29,797,567	397,300,890	427,098,457
2028	1,589,203,560	23,838,053	397,300,890	421,138,943
2029	1,191,902,670	17,878,540	397,300,890	415,179,430
2030	794,601,780	11,919,027	397,300,890	409,219,917
2031	397,300,890	5,959,513	397,300,890	403,260,403
2032	0	0	397,300,890	397,300,890
2033				
2034				
2035				
2036				
2037				
to				
2044				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	73,659,354		73,659,354
2018		73,659,354		73,659,354
2019		73,659,354		73,659,354
2020		73,659,354		73,659,354
2021		73,659,354		73,659,354
2022	4,583,248,700	68,748,731	327,374,907	396,123,638
2023	4,255,873,793	63,838,107	327,374,907	391,213,014
2024	3,928,498,886	58,927,483	327,374,907	386,302,390
2025	3,601,123,979	54,016,860	327,374,907	381,391,767
2026	3,273,749,071	49,106,236	327,374,907	376,481,143
2027	2,946,374,164	44,195,612	327,374,907	371,570,520
2028	2,618,999,257	39,284,989	327,374,907	366,659,896
2029	2,291,624,350	34,374,365	327,374,907	361,749,272
2030	1,964,249,443	29,463,742	327,374,907	356,838,649
2031	1,636,874,536	24,553,118	327,374,907	351,928,025
2032	1,309,499,629	19,642,494	327,374,907	347,017,402
2033	982,124,721	14,731,871	327,374,907	342,106,778
2034	654,749,814	9,821,247	327,374,907	337,196,154
2035	327,374,907	4,910,624	327,374,907	332,285,531
2036	0	0	327,374,907	327,374,907
2037				
to				
2044				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	86,669,408		86,669,408
2022		86,669,408		86,669,408
2023		86,669,408		86,669,408
2024		86,669,408		86,669,408
2025		86,669,408		86,669,408
2026	5,392,763,191	80,891,448	385,197,371	466,088,819
2027	5,007,565,820	75,113,487	385,197,371	460,310,858
2028	4,622,368,449	69,335,527	385,197,371	454,532,897
2029	4,237,171,078	63,557,566	385,197,371	448,754,937
2030	3,851,973,708	57,779,606	385,197,371	442,976,976
2031	3,466,776,337	52,001,645	385,197,371	437,199,016
2032	3,081,578,966	46,223,684	385,197,371	431,421,055
2033	2,696,381,595	40,445,724	385,197,371	425,643,095
2034	2,311,184,225	34,667,763	385,197,371	419,865,134
2035	1,925,986,854	28,889,803	385,197,371	414,087,174
2036	1,540,789,483	23,111,842	385,197,371	408,309,213
2037	1,155,592,112	17,333,882	385,197,371	402,531,252
2038	770,394,742	11,555,921	385,197,371	396,753,292
2039	385,197,371	5,777,961	385,197,371	390,975,331
2040	0	0	385,197,371	385,197,371
2041				
to				
2044				
Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	51,026,348		51,026,348
2026		51,026,348		51,026,348
2027		51,026,348		51,026,348
2028		51,026,348		51,026,348
2029		51,026,348		51,026,348
2030	3,174,972,791	51,026,348	226,783,771	277,810,119
2031	2,948,189,020	44,222,835	226,783,771	271,006,606
2032	2,721,405,249	40,821,079	226,783,771	267,604,849
2033	2,494,621,478	37,419,322	226,783,771	264,203,093
2034	2,267,837,708	34,017,566	226,783,771	260,801,336
2035	2,041,053,937	30,615,809	226,783,771	257,399,580
2036	1,814,270,166	27,214,052	226,783,771	253,997,823
2037	1,587,486,395	23,812,296	226,783,771	250,596,067
2038	1,360,702,625	20,410,539	226,783,771	247,194,310
2039	1,133,918,854	17,008,783	226,783,771	243,792,554
2040	907,135,083	13,607,026	226,783,771	240,390,797
2041	680,351,312	10,205,270	226,783,771	236,989,040
2042	453,567,542	6,803,513	226,783,771	233,587,284
2043	226,783,771	3,401,757	226,783,771	230,185,527
2044	0	0	226,783,771	226,783,771

Year	TOTAL				
	Principal		Interest	Repayment	Total
2012					
2013	5,959,513,350	-	89,392,700	-	89,392,700
2014	-	-	89,392,700	-	89,392,700
2015	-	-	89,392,700	-	89,392,700
2016	-	-	89,392,700	-	89,392,700
2017	4,910,623,607	-	163,052,054	-	163,052,054
2018	-	5,562,212,460	157,092,541	397,300,890	554,393,431
2019	-	5,164,911,570	151,133,028	397,300,890	548,433,918
2020	-	4,767,610,680	145,173,514	397,300,890	542,474,404
2021	5,777,960,561	4,370,309,790	225,883,409	397,300,890	623,184,299
2022	-	8,556,257,600	215,013,272	724,675,797	939,689,070
2023	-	7,831,581,803	204,143,135	724,675,797	928,818,933
2024	-	7,106,906,006	193,272,999	724,675,797	917,948,796
2025	3,401,756,561	6,382,230,209	233,429,210	724,675,797	958,105,007
2026	-	11,050,317,602	216,781,112	1,109,873,168	1,326,654,280
2027	-	9,940,444,434	200,133,015	1,109,873,168	1,310,006,183
2028	-	8,830,571,266	183,484,917	1,109,873,168	1,293,358,085
2029	-	7,720,698,098	166,836,820	1,109,873,168	1,276,709,988
2030	-	9,785,797,721	150,188,722	1,336,656,939	1,486,845,661
2031	-	8,449,140,782	126,737,112	1,336,656,939	1,463,394,050
2032	-	7,112,483,844	106,687,258	1,336,656,939	1,443,344,196
2033	-	6,173,127,795	92,596,917	939,356,049	1,031,952,966
2034	-	5,233,771,746	78,506,576	939,356,049	1,017,862,625
2035	-	4,294,415,698	64,416,235	939,356,049	1,003,772,284
2036	-	3,355,059,649	50,325,895	939,356,049	989,681,943
2037	-	2,743,078,508	41,146,178	611,981,142	653,127,319
2038	-	2,131,097,366	31,966,460	611,981,142	643,947,602
2039	-	1,519,116,225	22,786,743	611,981,142	634,767,885
2040	-	907,135,083	13,607,026	611,981,142	625,588,168
2041	-	680,351,312	10,205,270	226,783,771	236,989,040
2042	-	453,567,542	6,803,513	226,783,771	233,587,284
2043	-	226,783,771	3,401,757	226,783,771	230,185,527
2044	20,049,854,080	0	0	226,783,771	226,783,771
			3,612,375,491	20,049,854,080	23,662,229,571

5. Financing Analysis

5.1 LBP (using the two step loan thru LBP and tariff from environmental + sewer charge)

Annex 13.A. 1 Phase 1

Phase 1	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013		229,532,457	283,076,884			512,609,341	(512,609,341)
2014		1,217,337,541	283,076,884			1,500,414,426	(1,500,414,426)
2015		4,508,231,353	283,076,884			4,791,308,237	(4,791,308,237)
2016		1,042,816,590	283,076,884			1,325,893,474	(1,325,893,474)
2017	1,367,352,780		283,076,884		70,000,000	353,076,884	1,014,275,896
2018	1,367,352,780		283,076,884		70,000,000	353,076,884	1,014,275,896
2019	1,367,352,780		283,076,884		70,000,000	353,076,884	1,014,275,896
2020	1,367,352,780		283,076,884		70,000,000	353,076,884	1,014,275,896
2021	1,367,352,780		283,076,884		70,000,000	353,076,884	1,014,275,896
2022	1,367,352,780		283,076,884		70,000,000	353,076,884	1,014,275,896
2023	1,367,352,780		275,999,962	397,300,890	70,000,000	743,300,852	624,051,928
2024	1,367,352,780		268,923,040	397,300,890	70,000,000	736,223,930	631,128,850
2025	1,367,352,780		261,846,118	397,300,890	70,000,000	729,147,008	638,205,772
2026	1,367,352,780		254,769,196	397,300,890	70,000,000	722,070,086	645,282,694
2027	1,367,352,780		247,692,274	397,300,890	70,000,000	714,993,164	652,359,616
2028	1,367,352,780		240,615,352	397,300,890	70,000,000	707,916,242	659,436,538
2029	1,367,352,780		233,538,429	397,300,890	70,000,000	700,839,319	666,513,460
2030	1,367,352,780		226,461,507	397,300,890	70,000,000	693,762,397	673,590,382
2031	1,367,352,780		219,384,585	397,300,890	70,000,000	686,685,475	680,667,304
2032	1,367,352,780		212,307,663	397,300,890	70,000,000	679,608,553	687,744,227
2033	1,367,352,780		205,230,741	397,300,890	70,000,000	672,531,631	694,821,149
2034	1,367,352,780		198,153,819	397,300,890	70,000,000	665,454,709	701,898,071
2035	1,367,352,780		191,076,897	397,300,890	70,000,000	658,377,787	708,974,993
2036	1,367,352,780		183,999,975	397,300,890	70,000,000	651,300,865	716,051,915
2037	1,367,352,780		176,923,053	397,300,890	70,000,000	644,223,943	723,128,837
2038	1,367,352,780		169,846,130	397,300,890	70,000,000	637,147,021	730,205,759
2039	1,367,352,780		162,769,208	397,300,890	70,000,000	630,070,098	737,282,681
2040	1,367,352,780		155,692,286	397,300,890	70,000,000	622,993,176	744,359,603
2041	1,367,352,780		148,615,364	397,300,890	70,000,000	615,916,254	751,436,525
2042	1,367,352,780		141,538,442	397,300,890	70,000,000	608,839,332	758,513,448
2043	1,367,352,780		134,461,520	397,300,890	70,000,000	601,762,410	765,590,370
2044	1,367,352,780		127,384,598	397,300,890	70,000,000	594,685,488	772,667,292
2045	1,367,352,780		120,307,676	397,300,890	70,000,000	587,608,566	779,744,214
2046	1,367,352,780		113,230,754	397,300,890	70,000,000	580,531,644	786,821,136
2047	1,367,352,780		106,153,832	397,300,890	70,000,000	573,454,722	793,898,058
2048	1,367,352,780		99,076,909	397,300,890	70,000,000	566,377,799	800,974,980
2049	1,367,352,780		91,999,987	397,300,890	70,000,000	559,300,877	808,051,902
2050	1,367,352,780		84,923,065	397,300,890	70,000,000	552,223,955	815,128,824
2051	1,367,352,780		77,846,143	397,300,890	70,000,000	545,147,033	822,205,746
2052	1,367,352,780		70,769,221	397,300,890	70,000,000	538,070,111	829,282,669
2053	1,367,352,780		63,692,299	397,300,890	70,000,000	530,993,189	836,359,591
2054	1,367,352,780		56,615,377	397,300,890	70,000,000	523,916,267	843,436,513
2055	1,367,352,780		49,538,455	397,300,890	70,000,000	516,839,345	850,513,435
2056	1,367,352,780		42,461,533	397,300,890	70,000,000	509,762,423	857,590,357
2057	1,367,352,780		35,384,611	397,300,890	70,000,000	502,685,501	864,667,279
2058	1,367,352,780		28,307,688	397,300,890	70,000,000	495,608,578	871,744,201
2059	1,367,352,780		21,230,766	397,300,890	70,000,000	488,531,656	878,821,123
2060	1,367,352,780		14,153,844	397,300,890	70,000,000	481,454,734	885,898,045
2061	1,367,352,780		7,076,922	397,300,890	70,000,000	474,377,812	892,974,968
2062	1,367,352,780		0	397,300,890	70,000,000	467,300,890	900,051,890
Financial IRR							9%
NPV @ 9.3 ADR							(211,647,151)

Annex 13.A.2 Phase 2

Phase 2	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2017		574,376,057	233,254,621			807,630,678	(807,630,678)
2018		965,567,132	233,254,621			1,198,821,754	(1,198,821,754)
2019		3,960,207,346	233,254,621			4,193,461,967	(4,193,461,967)
2020		945,358,062	233,254,621			1,178,612,683	(1,178,612,683)
2021	1,238,376,225		233,254,621		60,000,000	293,254,621	945,121,604
2022	1,238,376,225		233,254,621		60,000,000	293,254,621	945,121,604
2023	1,238,376,225		233,254,621		60,000,000	293,254,621	945,121,604
2024	1,238,376,225		233,254,621		60,000,000	293,254,621	945,121,604
2025	1,238,376,225		233,254,621		60,000,000	293,254,621	945,121,604
2026	1,238,376,225		227,423,256		60,000,000	287,423,256	950,952,969
2027	1,238,376,225		221,591,890	327,374,907	60,000,000	608,966,797	629,409,428
2028	1,238,376,225		215,760,525	327,374,907	60,000,000	603,135,432	635,240,793
2029	1,238,376,225		209,929,159	327,374,907	60,000,000	597,304,066	641,072,159
2030	1,238,376,225		204,097,794	327,374,907	60,000,000	591,472,701	646,903,524
2031	1,238,376,225		198,266,428	327,374,907	60,000,000	585,641,335	652,734,890
2032	1,238,376,225		192,435,063	327,374,907	60,000,000	579,809,970	658,566,255
2033	1,238,376,225		186,603,697	327,374,907	60,000,000	573,978,604	664,397,621
2034	1,238,376,225		180,772,332	327,374,907	60,000,000	568,147,239	670,228,986
2035	1,238,376,225		174,940,966	327,374,907	60,000,000	562,315,873	676,060,352
2036	1,238,376,225		169,109,600	327,374,907	60,000,000	556,484,508	681,891,717
2037	1,238,376,225		163,278,235	327,374,907	60,000,000	550,653,142	687,723,083
2038	1,238,376,225		157,446,869	327,374,907	60,000,000	544,821,777	693,554,449
2039	1,238,376,225		151,615,504	327,374,907	60,000,000	538,990,411	699,385,814
2040	1,238,376,225		145,784,138	327,374,907	60,000,000	533,159,045	705,217,180
2041	1,238,376,225		139,952,773	327,374,907	60,000,000	527,327,680	711,048,545
2042	1,238,376,225		134,121,407	327,374,907	60,000,000	521,496,314	716,879,911
2043	1,238,376,225		128,290,042	327,374,907	60,000,000	515,664,949	722,711,276
2044	1,238,376,225		122,458,676	327,374,907	60,000,000	509,833,583	728,542,642
2045	1,238,376,225		116,627,311	327,374,907	60,000,000	504,002,218	734,374,007
2046	1,238,376,225		110,795,945	327,374,907	60,000,000	498,170,852	740,205,373
2047	1,238,376,225		104,964,580	327,374,907	60,000,000	492,339,487	746,036,738
2048	1,238,376,225		99,133,214	327,374,907	60,000,000	486,508,121	751,868,104
2049	1,238,376,225		93,301,849	327,374,907	60,000,000	480,676,756	757,699,469
2050	1,238,376,225		87,470,483	327,374,907	60,000,000	474,845,390	763,530,835
2051	1,238,376,225		81,639,117	327,374,907	60,000,000	469,014,025	769,362,200
2052	1,238,376,225		75,807,752	327,374,907	60,000,000	463,182,659	775,193,566
2053	1,238,376,225		69,976,386	327,374,907	60,000,000	457,351,294	781,024,932
2054	1,238,376,225		64,145,021	327,374,907	60,000,000	451,519,928	786,856,297
2055	1,238,376,225		58,313,655	327,374,907	60,000,000	445,688,562	792,687,663
2056	1,238,376,225		52,482,290	327,374,907	60,000,000	439,857,197	798,519,028
2057	1,238,376,225		46,650,924	327,374,907	60,000,000	434,025,831	804,350,394
2058	1,238,376,225		40,819,559	327,374,907	60,000,000	428,194,466	810,181,759
2059	1,238,376,225		34,988,193	327,374,907	60,000,000	422,363,100	816,013,125
2060	1,238,376,225		29,156,828	327,374,907	60,000,000	416,531,735	821,844,490
2061	1,238,376,225		23,325,462	327,374,907	60,000,000	410,700,369	827,675,856
2062	1,238,376,225		17,494,097	327,374,907	60,000,000	404,869,004	833,507,221
2063	1,238,376,225		11,662,731	327,374,907	60,000,000	399,037,638	839,338,587
2064	1,238,376,225		5,831,366	327,374,907	60,000,000	393,206,273	845,169,952
2065	1,238,376,225		0	327,374,907	60,000,000	387,374,907	851,001,318
Financial IRR							9%
NPV @ 9,3 ADR							107,824,727

Annex 13.A. 1 Phase 3

Phase 3	Cash Inflow	Cash Outflow				Net Inflow	
	Revenues	Devt Cost	Interest	Principal	OM		Total
2021		1,724,506,137	274,453,127			1,998,959,263	(1,998,959,263)
2022		883,696,518	274,453,127			1,158,149,645	(1,158,149,645)
2023		4,121,083,638	274,453,127			4,395,536,764	(4,395,536,764)
2024		965,045,270	274,453,127			1,239,498,396	(1,239,498,396)
2025	1,277,272,090		274,453,127		54,000,000	328,453,127	948,818,964
2026	1,277,272,090		274,453,127		54,000,000	328,453,127	948,818,964
2027	1,277,272,090		274,453,127		54,000,000	328,453,127	948,818,964
2028	1,277,272,090		274,453,127		54,000,000	328,453,127	948,818,964
2029	1,277,272,090		274,453,127		54,000,000	328,453,127	948,818,964
2030	1,277,272,090		274,453,127		54,000,000	328,453,127	948,818,964
2031	1,277,272,090		267,591,799	481,496,713	54,000,000	803,088,512	474,183,578
2032	1,277,272,090		260,730,470	481,496,713	54,000,000	796,227,184	481,044,907
2033	1,277,272,090		253,869,142	481,496,713	54,000,000	789,365,856	487,906,235
2034	1,277,272,090		247,007,814	481,496,713	54,000,000	782,504,527	494,767,563
2035	1,277,272,090		240,146,486	481,496,713	54,000,000	775,643,199	501,628,891
2036	1,277,272,090		233,285,158	481,496,713	54,000,000	768,781,871	508,490,219
2037	1,277,272,090		226,423,830	481,496,713	54,000,000	761,920,543	515,351,547
2038	1,277,272,090		219,562,501	481,496,713	54,000,000	755,059,215	522,212,876
2039	1,277,272,090		212,701,173	481,496,713	54,000,000	748,197,887	529,074,204
2040	1,277,272,090		205,839,845	481,496,713	54,000,000	741,336,558	535,935,532
2041	1,277,272,090		198,978,517	481,496,713	54,000,000	734,475,230	542,796,860
2042	1,277,272,090		192,117,189	481,496,713	54,000,000	727,613,902	549,658,188
2043	1,277,272,090		185,255,861	481,496,713	54,000,000	720,752,574	556,519,516
2044	1,277,272,090		178,394,532	481,496,713	54,000,000	713,891,246	563,380,845
2045	1,277,272,090		171,533,204	481,496,713	54,000,000	707,029,918	570,242,173
2046	1,277,272,090		164,671,876	481,496,713	54,000,000	700,168,589	577,103,501
2047	1,277,272,090		157,810,548	481,496,713	54,000,000	693,307,261	583,964,829
2048	1,277,272,090		150,949,220	481,496,713	54,000,000	686,445,933	590,826,157
2049	1,277,272,090		144,087,892	481,496,713	54,000,000	679,584,605	597,687,485
2050	1,277,272,090		137,226,563	481,496,713	54,000,000	672,723,277	604,548,814
2051	1,277,272,090		130,365,235	481,496,713	54,000,000	665,861,949	611,410,142
2052	1,277,272,090		123,503,907	481,496,713	54,000,000	659,000,620	618,271,470
2053	1,277,272,090		116,642,579	481,496,713	54,000,000	652,139,292	625,132,798
2054	1,277,272,090		109,781,251	481,496,713	54,000,000	645,277,964	631,994,126
2055	1,277,272,090		102,919,923	481,496,713	54,000,000	638,416,636	638,855,454
2056	1,277,272,090		96,058,594	481,496,713	54,000,000	631,555,308	645,716,783
2057	1,277,272,090		89,197,266	481,496,713	54,000,000	624,693,980	652,578,111
2058	1,277,272,090		82,335,938	481,496,713	54,000,000	617,832,651	659,439,439
2059	1,277,272,090		75,474,610	481,496,713	54,000,000	610,971,323	666,300,767
2060	1,277,272,090		68,613,282	481,496,713	54,000,000	604,109,995	673,162,095
2061	1,277,272,090		61,751,954	481,496,713	54,000,000	597,248,667	680,023,423
2062	1,277,272,090		54,890,625	481,496,713	54,000,000	590,387,339	686,884,752
2063	1,277,272,090		48,029,297	481,496,713	54,000,000	583,526,011	693,746,080
2064	1,277,272,090		41,167,969	481,496,713	54,000,000	576,664,682	700,607,408
2065	1,277,272,090		34,306,641	481,496,713	54,000,000	569,803,354	707,468,736
2066	1,277,272,090		27,445,313	481,496,713	54,000,000	562,942,026	714,330,064
2067	1,277,272,090		20,583,985	481,496,713	54,000,000	556,080,698	721,191,392
2068	1,277,272,090		13,722,656	481,496,713	54,000,000	549,219,370	728,052,721
2069	1,277,272,090		6,861,328	481,496,713	54,000,000	542,358,042	734,914,049
2070	1,277,272,090		0	481,496,713	54,000,000	535,496,713	741,775,377
Financial IRR							7%
NPV @ 9.3 ADR							(1,923,171,251)

Annex 13.A.4 Phase 4

Phase 4	Cash Inflow		Cash Outflow			Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2025		181,022,934	161,583,437			342,606,370.69	(342,606,370.69)
2026		537,265,678	161,583,437			698,849,114.21	(698,849,114.21)
2027		2,328,584,166	161,583,437			2,490,167,603.14	(2,490,167,603.14)
2028		590,627,202	161,583,437			752,210,638.76	(752,210,638.76)
2029	452,534,683		161,583,437		30,000,000	191,583,436.67	260,951,246.70
2030	452,534,683		161,583,437		30,000,000	191,583,436.67	260,951,246.70
2031	452,534,683		161,583,437		30,000,000	191,583,436.67	260,951,246.70
2032	452,534,683		161,583,437		30,000,000	191,583,436.67	260,951,246.70
2033	452,534,683		161,583,437		30,000,000	191,583,436.67	260,951,246.70
2034	452,534,683		161,583,437		30,000,000	191,583,436.67	260,951,246.70
2035	452,534,683		157,543,851	85,043,914	30,000,000	272,587,764.79	179,946,918.59
2036	452,534,683		153,504,265	85,043,914	30,000,000	268,548,178.87	183,986,504.50
2037	452,534,683		149,464,679	85,043,914	30,000,000	264,508,592.95	188,026,090.42
2038	452,534,683		145,425,093	85,043,914	30,000,000	260,469,007.04	192,065,676.34
2039	452,534,683		141,385,507	85,043,914	30,000,000	256,429,421.12	196,105,262.25
2040	452,534,683		137,345,921	85,043,914	30,000,000	252,389,835.20	200,144,848.17
2041	452,534,683		133,306,335	85,043,914	30,000,000	248,350,249.29	204,184,434.09
2042	452,534,683		129,266,749	85,043,914	30,000,000	244,310,663.37	208,224,020.00
2043	452,534,683		125,227,163	85,043,914	30,000,000	240,271,077.45	212,263,605.92
2044	452,534,683		121,187,578	85,043,914	30,000,000	236,231,491.54	216,303,191.84
2045	452,534,683		117,147,992	85,043,914	30,000,000	232,191,905.62	220,342,777.75
2046	452,534,683		113,108,406	85,043,914	30,000,000	228,152,319.70	224,382,363.67
2047	452,534,683		109,068,820	85,043,914	30,000,000	224,112,733.79	228,421,949.59
2048	452,534,683		105,029,234	85,043,914	30,000,000	220,073,147.87	232,461,535.50
2049	452,534,683		100,989,648	85,043,914	30,000,000	216,033,561.95	236,501,121.42
2050	452,534,683		96,950,062	85,043,914	30,000,000	211,993,976.04	240,540,707.34
2051	452,534,683		92,910,476	85,043,914	30,000,000	207,954,390.12	244,580,293.25
2052	452,534,683		88,870,890	85,043,914	30,000,000	203,914,804.20	248,619,879.17
2053	452,534,683		84,831,304	85,043,914	30,000,000	199,875,218.29	252,659,465.09
2054	452,534,683		80,791,718	85,043,914	30,000,000	195,835,632.37	256,699,051.00
2055	452,534,683		76,752,132	85,043,914	30,000,000	191,796,046.45	260,738,636.92
2056	452,534,683		72,712,547	85,043,914	30,000,000	187,756,460.54	264,778,222.84
2057	452,534,683		68,672,961	85,043,914	30,000,000	183,716,874.62	268,817,808.75
2058	452,534,683		64,633,375	85,043,914	30,000,000	179,677,288.70	272,857,394.67
2059	452,534,683		60,593,789	85,043,914	30,000,000	175,637,702.79	276,896,980.59
2060	452,534,683		56,554,203	85,043,914	30,000,000	171,598,116.87	280,936,566.50
2061	452,534,683		52,514,617	85,043,914	30,000,000	167,558,530.95	284,976,152.42
2062	452,534,683		48,475,031	85,043,914	30,000,000	163,518,945.04	289,015,738.34
2063	452,534,683		44,435,445	85,043,914	30,000,000	159,479,359.12	293,055,324.25
2064	452,534,683		40,395,859	85,043,914	30,000,000	155,439,773.20	297,094,910.17
2065	452,534,683		36,356,273	85,043,914	30,000,000	151,400,187.29	301,134,496.09
2066	452,534,683		32,316,687	85,043,914	30,000,000	147,360,601.37	305,174,082.00
2067	452,534,683		28,277,101	85,043,914	30,000,000	143,321,015.45	309,213,667.92
2068	452,534,683		24,237,516	85,043,914	30,000,000	139,281,429.54	313,253,253.84
2069	452,534,683		20,197,930	85,043,914	30,000,000	135,241,843.62	317,292,839.75
2070	452,534,683		16,158,344	85,043,914	30,000,000	131,202,257.70	321,332,425.67
2071	452,534,683		12,118,758	85,043,914	30,000,000	127,162,671.79	325,372,011.59
2072	452,534,683		8,079,172	85,043,914	30,000,000	123,123,085.87	329,411,597.50
2073	452,534,683		4,039,586	85,043,914	30,000,000	119,083,499.95	333,451,183.42
2074	452,534,683		0.00	85,043,914	30,000,000	115,043,914.04	337,490,769.34
Financial IRR						5%	
NPV @ 9.3 ADR							(1,728,085,316)

Annex 13.A. 5 Overall Project

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	229,532,457	283,076,884			512,609,341	(512,609,341)
2014	-	1,217,337,541	283,076,884			1,500,414,426	(1,500,414,426)
2015	-	4,508,231,353	283,076,884			4,791,308,237	(4,791,308,237)
2016	-	1,042,816,590	283,076,884			1,325,893,474	(1,325,893,474)
2017	1,367,352,780	574,376,057	516,331,505		70,000,000	1,160,707,562	206,645,217
2018	1,367,352,780	965,567,132	516,331,505		70,000,000	1,551,898,638	(184,545,858)
2019	1,367,352,780	3,960,207,346	516,331,505		70,000,000	4,546,538,851	(3,179,186,071)
2020	1,367,352,780	945,358,062	516,331,505		70,000,000	1,531,689,567	(164,336,788)
2021	2,515,648,315	1,724,506,137	790,784,632		130,000,000	2,645,290,769	(129,642,453)
2022	2,515,648,315	883,696,518	790,784,632		130,000,000	1,804,481,150	711,167,165
2023	2,515,648,315	4,121,083,638	783,707,710	148,987,834	130,000,000	5,183,779,181	(2,668,130,866)
2024	2,515,648,315	965,045,270	776,630,788	148,987,834	130,000,000	2,020,663,892	494,984,424
2025	3,883,001,095	181,022,934	931,137,303	148,987,834	184,000,000	1,445,148,070	2,437,853,025
2026	3,883,001,095	537,265,678	918,229,015	271,753,424	184,000,000	1,911,248,116	1,971,752,979
2027	3,883,001,095	2,328,584,166	905,320,727	271,753,424	184,000,000	3,689,658,318	193,342,777
2028	3,883,001,095	590,627,202	892,412,440	271,753,424	184,000,000	1,938,793,066	1,944,208,029
2029	3,883,001,095		879,504,152	271,753,424	214,000,000	1,365,257,576	2,517,743,519
2030	4,335,535,778		866,595,864	271,753,424	214,000,000	1,352,349,288	2,983,186,490
2031	4,335,535,778		846,826,249	416,202,438	214,000,000	1,477,028,686	2,858,507,092
2032	4,335,535,778		827,056,633	416,202,438	214,000,000	1,457,259,071	2,878,276,708
2033	4,335,535,778		807,287,017	416,202,438	214,000,000	1,437,489,455	2,898,046,324
2034	4,335,535,778		787,517,401	416,202,438	214,000,000	1,417,719,839	2,917,815,939
2035	4,335,535,778		763,708,199	501,246,352	214,000,000	1,478,954,551	2,856,581,227
2036	4,335,535,778		739,898,998	501,246,352	214,000,000	1,455,145,350	2,880,390,429
2037	4,335,535,778		716,089,796	501,246,352	214,000,000	1,431,336,148	2,904,199,630
2038	4,335,535,778		692,280,594	501,246,352	214,000,000	1,407,526,946	2,928,008,832
2039	4,335,535,778		668,471,393	501,246,352	214,000,000	1,383,717,745	2,951,818,034
2040	4,335,535,778		644,662,191	501,246,352	214,000,000	1,359,908,543	2,975,627,236
2041	4,335,535,778		620,852,989	501,246,352	214,000,000	1,336,099,341	2,999,436,437
2042	4,335,535,778		597,043,787	501,246,352	214,000,000	1,312,290,139	3,023,245,639
2043	4,335,535,778		573,234,586	501,246,352	214,000,000	1,288,480,938	3,047,054,841
2044	4,335,535,778		549,425,384	501,246,352	214,000,000	1,264,671,736	3,070,864,042
2045	4,335,535,778		525,616,182	501,246,352	214,000,000	1,240,862,534	3,094,673,244
2046	4,335,535,778		501,806,980	501,246,352	214,000,000	1,217,053,332	3,118,482,446
2047	4,335,535,778		477,997,779	501,246,352	214,000,000	1,193,244,131	3,142,291,648
2048	4,335,535,778		454,188,577	501,246,352	214,000,000	1,169,434,929	3,166,100,849
2049	4,335,535,778		430,379,375	501,246,352	214,000,000	1,145,625,727	3,189,910,051
2050	4,335,535,778		406,570,174	501,246,352	214,000,000	1,121,816,526	3,213,719,253
2051	4,335,535,778		382,760,972	501,246,352	214,000,000	1,098,007,324	3,237,528,455
2052	4,335,535,778		358,951,770	501,246,352	214,000,000	1,074,198,122	3,261,337,656
2053	4,335,535,778		335,142,568	501,246,352	214,000,000	1,050,388,920	3,285,146,858
2054	4,335,535,778		311,333,367	501,246,352	214,000,000	1,026,579,719	3,308,956,060
2055	4,335,535,778		287,524,165	501,246,352	214,000,000	1,002,770,517	3,332,765,261
2056	4,335,535,778		263,714,963	501,246,352	214,000,000	978,961,315	3,356,574,463
2057	4,335,535,778		239,905,762	501,246,352	214,000,000	955,152,114	3,380,383,665
2058	4,335,535,778		216,096,560	501,246,352	214,000,000	931,342,912	3,404,192,867
2059	4,335,535,778		192,287,358	501,246,352	214,000,000	907,533,710	3,428,002,068
2060	4,335,535,778		168,478,156	501,246,352	214,000,000	883,724,508	3,451,811,270
2061	4,335,535,778		144,668,955	501,246,352	214,000,000	859,915,307	3,475,620,472
2062	4,335,535,778		120,859,753	501,246,352	214,000,000	836,106,105	3,499,429,673
2063	4,335,535,778		104,127,473	352,258,518	214,000,000	670,385,992	3,665,149,787
2064	4,335,535,778		87,395,194	352,258,518	214,000,000	653,653,712	3,681,882,066
2065	4,335,535,778		70,662,914	352,258,518	214,000,000	636,921,432	3,698,614,346
2066	4,335,535,778		59,762,000	229,492,928	214,000,000	503,254,928	3,832,280,850
2067	4,335,535,778		48,861,086	229,492,928	214,000,000	492,354,014	3,843,181,764
2068	4,335,535,778		37,960,172	229,492,928	214,000,000	481,453,100	3,854,082,678
2069	4,335,535,778		27,059,258	229,492,928	214,000,000	470,552,186	3,864,983,593
2070	4,335,535,778		16,158,344	229,492,928	214,000,000	459,651,272	3,875,884,507
2071	4,335,535,778		12,118,758	85,043,914	214,000,000	311,162,672	4,024,373,107
2072	4,335,535,778		8,079,172	85,043,914	214,000,000	307,123,086	4,028,412,693
2073	4,335,535,778		4,039,586	85,043,914	214,000,000	303,083,500	4,032,452,278
2074	4,335,535,778		0	85,043,914	214,000,000	299,043,914	4,036,491,864
						Financial IRR	10%
						NPV @ 9.3 ADR	844,841,405.09

5.2 DBP (using the Two Step Loan thru DBP and Tariff from Environmental + Sewer Charges)

Annex 13.B. 1 Phase 1

Phase 1	Cash Inflow	Cash Outflow					Net Inflow	
	Revenues	Devt Cost	Interest	Principal	OM	Total		
2013		229,532,457	342,672,018				572,204,475	(572,204,475)
2014		1,217,337,541	342,672,018				1,560,009,559	(1,560,009,559)
2015		4,508,231,353	342,672,018				4,850,903,370	(4,850,903,370)
2016		1,042,816,590	342,672,018				1,385,488,608	(1,385,488,608)
2017	1,367,352,780		342,672,018		70,000,000		412,672,018	954,680,762
2018	1,367,352,780		342,672,018		70,000,000		412,672,018	954,680,762
2019	1,367,352,780		342,672,018		70,000,000		412,672,018	954,680,762
2020	1,367,352,780		342,672,018		70,000,000		412,672,018	954,680,762
2021	1,367,352,780		342,672,018		70,000,000		412,672,018	954,680,762
2022	1,367,352,780		342,672,018		70,000,000		412,672,018	954,680,762
2023	1,367,352,780		334,105,217	148,987,834	70,000,000		553,093,051	814,259,729
2024	1,367,352,780		325,538,417	148,987,834	70,000,000		544,526,251	822,826,529
2025	1,367,352,780		316,971,616	148,987,834	70,000,000		535,959,450	831,393,330
2026	1,367,352,780		308,404,816	148,987,834	70,000,000		527,392,650	839,960,130
2027	1,367,352,780		299,838,015	148,987,834	70,000,000		518,825,849	848,526,930
2028	1,367,352,780		291,271,215	148,987,834	70,000,000		510,259,049	857,093,731
2029	1,367,352,780		282,704,415	148,987,834	70,000,000		501,692,248	865,660,531
2030	1,367,352,780		274,137,614	148,987,834	70,000,000		493,125,448	874,227,332
2031	1,367,352,780		265,570,814	148,987,834	70,000,000		484,558,647	882,794,132
2032	1,367,352,780		257,004,013	148,987,834	70,000,000		475,991,847	891,360,933
2033	1,367,352,780		248,437,213	148,987,834	70,000,000		467,425,047	899,927,733
2034	1,367,352,780		239,870,412	148,987,834	70,000,000		458,858,246	908,494,534
2035	1,367,352,780		231,303,612	148,987,834	70,000,000		450,291,446	917,061,334
2036	1,367,352,780		222,736,811	148,987,834	70,000,000		441,724,645	925,628,134
2037	1,367,352,780		214,170,011	148,987,834	70,000,000		433,157,845	934,194,935
2038	1,367,352,780		205,603,211	148,987,834	70,000,000		424,591,044	942,761,735
2039	1,367,352,780		197,036,410	148,987,834	70,000,000		416,024,244	951,328,536
2040	1,367,352,780		188,469,610	148,987,834	70,000,000		407,457,443	959,895,336
2041	1,367,352,780		179,902,809	148,987,834	70,000,000		398,890,643	968,462,137
2042	1,367,352,780		171,336,009	148,987,834	70,000,000		390,323,843	977,028,937
2043	1,367,352,780		162,769,208	148,987,834	70,000,000		381,757,042	985,595,738
2044	1,367,352,780		154,202,408	148,987,834	70,000,000		373,190,242	994,162,538
2045	1,367,352,780		145,635,607	148,987,834	70,000,000		364,623,441	1,002,729,338
2046	1,367,352,780		137,068,807	148,987,834	70,000,000		356,056,641	1,011,296,139
2047	1,367,352,780		128,502,007	148,987,834	70,000,000		347,489,840	1,019,862,939
2048	1,367,352,780		119,935,206	148,987,834	70,000,000		338,923,040	1,028,429,740
2049	1,367,352,780		111,368,406	148,987,834	70,000,000		330,356,239	1,036,996,540
2050	1,367,352,780		102,801,605	148,987,834	70,000,000		321,789,439	1,045,563,341
2051	1,367,352,780		94,234,805	148,987,834	70,000,000		313,222,639	1,054,130,141
2052	1,367,352,780		85,668,004	148,987,834	70,000,000		304,655,838	1,062,696,941
2053	1,367,352,780		77,101,204	148,987,834	70,000,000		296,089,038	1,071,263,742
2054	1,367,352,780		68,534,404	148,987,834	70,000,000		287,522,237	1,079,830,542
2055	1,367,352,780		59,967,603	148,987,834	70,000,000		278,955,437	1,088,397,343
2056	1,367,352,780		51,400,803	148,987,834	70,000,000		270,388,636	1,096,964,143
2057	1,367,352,780		42,834,002	148,987,834	70,000,000		261,821,836	1,105,530,944
2058	1,367,352,780		34,267,202	148,987,834	70,000,000		253,255,036	1,114,097,744
2059	1,367,352,780		25,700,401	148,987,834	70,000,000		244,688,235	1,122,664,545
2060	1,367,352,780		17,133,601	148,987,834	70,000,000		236,121,435	1,131,231,345
2061	1,367,352,780		8,566,800	148,987,834	70,000,000		227,554,634	1,139,798,145
2062	1,367,352,780		0	148,987,834	70,000,000		218,987,834	1,148,364,946
Financial IRR							6%	
NPV @ 9.3 ADR							(1,461,794,400)	

Annex 13.B.2 Phase 2

Phase 2	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		574,376,057	282,360,857			856,736,914	(856,736,914)
2018		965,567,132	282,360,857			1,247,927,990	(1,247,927,990)
2019		3,960,207,346	282,360,857			4,242,568,203	(4,242,568,203)
2020		945,358,062	282,360,857			1,227,718,919	(1,227,718,919)
2021	1,238,376,225		282,360,857		60,000,000	342,360,857	896,015,368
2022	1,238,376,225		282,360,857		60,000,000	342,360,857	896,015,368
2023	1,238,376,225		282,360,857		60,000,000	342,360,857	896,015,368
2024	1,238,376,225		282,360,857		60,000,000	342,360,857	896,015,368
2025	1,238,376,225		282,360,857		60,000,000	342,360,857	896,015,368
2026	1,238,376,225		282,360,857		60,000,000	342,360,857	896,015,368
2027	1,238,376,225		275,301,836	122,765,590	60,000,000	458,067,426	780,308,799
2028	1,238,376,225		268,242,815	122,765,590	60,000,000	451,008,405	787,367,820
2029	1,238,376,225		261,183,793	122,765,590	60,000,000	443,949,383	794,426,842
2030	1,238,376,225		254,124,772	122,765,590	60,000,000	436,890,362	801,485,863
2031	1,238,376,225		247,065,750	122,765,590	60,000,000	429,831,340	808,544,885
2032	1,238,376,225		240,006,729	122,765,590	60,000,000	422,772,319	815,603,906
2033	1,238,376,225		232,947,707	122,765,590	60,000,000	415,713,298	822,662,928
2034	1,238,376,225		225,888,686	122,765,590	60,000,000	408,654,276	829,721,949
2035	1,238,376,225		218,829,664	122,765,590	60,000,000	401,595,255	836,780,970
2036	1,238,376,225		211,770,643	122,765,590	60,000,000	394,536,233	843,839,992
2037	1,238,376,225		204,711,622	122,765,590	60,000,000	387,477,212	850,899,013
2038	1,238,376,225		197,652,600	122,765,590	60,000,000	380,418,190	857,958,035
2039	1,238,376,225		190,593,579	122,765,590	60,000,000	373,359,169	865,017,056
2040	1,238,376,225		183,534,557	122,765,590	60,000,000	366,300,147	872,076,078
2041	1,238,376,225		176,475,536	122,765,590	60,000,000	359,241,126	879,135,099
2042	1,238,376,225		169,416,514	122,765,590	60,000,000	352,182,105	886,194,120
2043	1,238,376,225		162,357,493	122,765,590	60,000,000	345,123,083	893,253,142
2044	1,238,376,225		155,298,472	122,765,590	60,000,000	338,064,062	900,312,163
2045	1,238,376,225		148,239,450	122,765,590	60,000,000	331,005,040	907,371,185
2046	1,238,376,225		141,180,429	122,765,590	60,000,000	323,946,019	914,430,206
2047	1,238,376,225		134,121,407	122,765,590	60,000,000	316,886,997	921,489,228
2048	1,238,376,225		127,062,386	122,765,590	60,000,000	309,827,976	928,548,249
2049	1,238,376,225		120,003,364	122,765,590	60,000,000	302,768,955	935,607,271
2050	1,238,376,225		112,944,343	122,765,590	60,000,000	295,709,933	942,666,292
2051	1,238,376,225		105,885,322	122,765,590	60,000,000	288,650,912	949,725,313
2052	1,238,376,225		98,826,300	122,765,590	60,000,000	281,591,890	956,784,335
2053	1,238,376,225		91,767,279	122,765,590	60,000,000	274,532,869	963,843,356
2054	1,238,376,225		84,708,257	122,765,590	60,000,000	267,473,847	970,902,378
2055	1,238,376,225		77,649,236	122,765,590	60,000,000	260,414,826	977,961,399
2056	1,238,376,225		70,590,214	122,765,590	60,000,000	253,355,805	985,020,421
2057	1,238,376,225		63,531,193	122,765,590	60,000,000	246,296,783	992,079,442
2058	1,238,376,225		56,472,171	122,765,590	60,000,000	239,237,762	999,138,463
2059	1,238,376,225		49,413,150	122,765,590	60,000,000	232,178,740	1,006,197,485
2060	1,238,376,225		42,354,129	122,765,590	60,000,000	225,119,719	1,013,256,506
2061	1,238,376,225		35,295,107	122,765,590	60,000,000	218,060,697	1,020,315,528
2062	1,238,376,225		28,236,086	122,765,590	60,000,000	211,001,676	1,027,374,549
2063	1,238,376,225		21,177,064	122,765,590	60,000,000	203,942,654	1,034,433,571
2064	1,238,376,225		14,118,043	122,765,590	60,000,000	196,883,633	1,041,492,592
2065	1,238,376,225		7,059,021	122,765,590	60,000,000	189,824,612	1,048,551,613
2066	1,238,376,225		0	122,765,590	60,000,000	182,765,590	1,055,610,635
Financial IRR							10%
NPV @ 9,3 ADR							539,439,683

Annex 13.B.3 Phase 3

Phase 3	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2021		1,724,506,137	332,232,732			2,056,738,869	(2,056,738,869)
2022		883,696,518	332,232,732			1,215,929,250	(1,215,929,250)
2023		4,121,083,638	332,232,732			4,453,316,370	(4,453,316,370)
2024		965,045,270	332,232,732			1,297,278,002	(1,297,278,002)
2025	1,277,272,090		332,232,732		54,000,000	386,232,732	891,039,358
2026	1,277,272,090		332,232,732		54,000,000	386,232,732	891,039,358
2027	1,277,272,090		332,232,732		54,000,000	386,232,732	891,039,358
2028	1,277,272,090		332,232,732		54,000,000	386,232,732	891,039,358
2029	1,277,272,090		332,232,732		54,000,000	386,232,732	891,039,358
2030	1,277,272,090		332,232,732		54,000,000	386,232,732	891,039,358
2031	1,277,272,090		323,926,914	144,449,014	54,000,000	522,375,928	754,896,162
2032	1,277,272,090		315,621,096	144,449,014	54,000,000	514,070,110	763,201,981
2033	1,277,272,090		307,315,277	144,449,014	54,000,000	505,764,291	771,507,799
2034	1,277,272,090		299,009,459	144,449,014	54,000,000	497,458,473	779,813,617
2035	1,277,272,090		290,703,641	144,449,014	54,000,000	489,152,655	788,119,436
2036	1,277,272,090		282,397,822	144,449,014	54,000,000	480,846,836	796,425,254
2037	1,277,272,090		274,092,004	144,449,014	54,000,000	472,541,018	804,731,072
2038	1,277,272,090		265,786,186	144,449,014	54,000,000	464,235,200	813,036,890
2039	1,277,272,090		257,480,368	144,449,014	54,000,000	455,929,382	821,342,709
2040	1,277,272,090		249,174,549	144,449,014	54,000,000	447,623,563	829,648,527
2041	1,277,272,090		240,868,731	144,449,014	54,000,000	439,317,745	837,954,345
2042	1,277,272,090		232,562,913	144,449,014	54,000,000	431,011,927	846,260,164
2043	1,277,272,090		224,257,094	144,449,014	54,000,000	422,706,108	854,565,982
2044	1,277,272,090		215,951,276	144,449,014	54,000,000	414,400,290	862,871,800
2045	1,277,272,090		207,645,458	144,449,014	54,000,000	406,094,472	871,177,619
2046	1,277,272,090		199,339,639	144,449,014	54,000,000	397,788,653	879,483,437
2047	1,277,272,090		191,033,821	144,449,014	54,000,000	389,482,835	887,789,255
2048	1,277,272,090		182,728,003	144,449,014	54,000,000	381,177,017	896,095,073
2049	1,277,272,090		174,422,184	144,449,014	54,000,000	372,871,198	904,400,892
2050	1,277,272,090		166,116,366	144,449,014	54,000,000	364,565,380	912,706,710
2051	1,277,272,090		157,810,548	144,449,014	54,000,000	356,259,562	921,012,528
2052	1,277,272,090		149,504,730	144,449,014	54,000,000	347,953,744	929,318,347
2053	1,277,272,090		141,198,911	144,449,014	54,000,000	339,647,925	937,624,165
2054	1,277,272,090		132,893,093	144,449,014	54,000,000	331,342,107	945,929,983
2055	1,277,272,090		124,587,275	144,449,014	54,000,000	323,036,289	954,235,802
2056	1,277,272,090		116,281,456	144,449,014	54,000,000	314,730,470	962,541,620
2057	1,277,272,090		107,975,638	144,449,014	54,000,000	306,424,652	970,847,438
2058	1,277,272,090		99,669,820	144,449,014	54,000,000	298,118,834	979,153,257
2059	1,277,272,090		91,364,001	144,449,014	54,000,000	289,813,015	987,459,075
2060	1,277,272,090		83,058,183	144,449,014	54,000,000	281,507,197	995,764,893
2061	1,277,272,090		74,752,365	144,449,014	54,000,000	273,201,379	1,004,070,711
2062	1,277,272,090		66,446,546	144,449,014	54,000,000	264,895,560	1,012,376,530
2063	1,277,272,090		58,140,728	144,449,014	54,000,000	256,589,742	1,020,682,348
2064	1,277,272,090		49,834,910	144,449,014	54,000,000	248,283,924	1,028,988,166
2065	1,277,272,090		41,529,092	144,449,014	54,000,000	239,978,106	1,037,293,985
2066	1,277,272,090		33,223,273	144,449,014	54,000,000	231,672,287	1,045,599,803
2067	1,277,272,090		24,917,455	144,449,014	54,000,000	223,366,469	1,053,905,621
2068	1,277,272,090		16,611,637	144,449,014	54,000,000	215,060,651	1,062,211,440
2069	1,277,272,090		8,305,818	144,449,014	54,000,000	206,754,832	1,070,517,258
2070	1,277,272,090		0	144,449,014	54,000,000	198,449,014	1,078,823,076
Financial IRR						8%	
NPV @ 9.3 ADR							(941,115,857)

Annex 13.B. 4 Phase 4

Phase 4	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2025		181,022,934	195,601,002			376,623,936.31	(376,623,936.31)
2026		537,265,678	195,601,002			732,866,679.83	(732,866,679.83)
2027		2,328,584,166	195,601,002			2,524,185,168.75	(2,524,185,168.75)
2028		590,627,202	195,601,002			786,228,204.37	(786,228,204.37)
2029	452,534,683		195,601,002		30,000,000	225,601,002.28	226,933,681.09
2030	452,534,683		195,601,002		30,000,000	225,601,002.28	226,933,681.09
2031	452,534,683		195,601,002		30,000,000	225,601,002.28	226,933,681.09
2032	452,534,683		195,601,002		30,000,000	225,601,002.28	226,933,681.09
2033	452,534,683		195,601,002		30,000,000	225,601,002.28	226,933,681.09
2034	452,534,683		195,601,002		30,000,000	225,601,002.28	226,933,681.09
2035	452,534,683		190,710,977	85,043,914	30,000,000	305,754,891.26	146,779,792.11
2036	452,534,683		185,820,952	85,043,914	30,000,000	300,864,866.20	151,669,817.17
2037	452,534,683		180,930,927	85,043,914	30,000,000	295,974,841.14	156,559,842.23
2038	452,534,683		176,040,902	85,043,914	30,000,000	291,084,816.09	161,449,867.28
2039	452,534,683		171,150,877	85,043,914	30,000,000	286,194,791.03	166,339,892.34
2040	452,534,683		166,260,852	85,043,914	30,000,000	281,304,765.97	171,229,917.40
2041	452,534,683		161,370,827	85,043,914	30,000,000	276,414,740.92	176,119,942.45
2042	452,534,683		156,480,802	85,043,914	30,000,000	271,524,715.86	181,009,967.51
2043	452,534,683		151,590,777	85,043,914	30,000,000	266,634,690.80	185,899,992.57
2044	452,534,683		146,700,752	85,043,914	30,000,000	261,744,665.75	190,790,017.63
2045	452,534,683		141,810,727	85,043,914	30,000,000	256,854,640.69	195,680,042.68
2046	452,534,683		136,920,702	85,043,914	30,000,000	251,964,615.63	200,570,067.74
2047	452,534,683		132,030,677	85,043,914	30,000,000	247,074,590.57	205,460,092.80
2048	452,534,683		127,140,651	85,043,914	30,000,000	242,184,565.52	210,350,117.85
2049	452,534,683		122,250,626	85,043,914	30,000,000	237,294,540.46	215,240,142.91
2050	452,534,683		117,360,601	85,043,914	30,000,000	232,404,515.40	220,130,167.97
2051	452,534,683		112,470,576	85,043,914	30,000,000	227,514,490.35	225,020,193.02
2052	452,534,683		107,580,551	85,043,914	30,000,000	222,624,465.29	229,910,218.08
2053	452,534,683		102,690,526	85,043,914	30,000,000	217,734,440.23	234,800,243.14
2054	452,534,683		97,800,501	85,043,914	30,000,000	212,844,415.18	239,690,268.20
2055	452,534,683		92,910,476	85,043,914	30,000,000	207,954,390.12	244,580,293.25
2056	452,534,683		88,020,451	85,043,914	30,000,000	203,064,365.06	249,470,318.31
2057	452,534,683		83,130,426	85,043,914	30,000,000	198,174,340.00	254,360,343.37
2058	452,534,683		78,240,401	85,043,914	30,000,000	193,284,314.95	259,250,368.42
2059	452,534,683		73,350,376	85,043,914	30,000,000	188,394,289.89	264,140,393.48
2060	452,534,683		68,460,351	85,043,914	30,000,000	183,504,264.83	269,030,418.54
2061	452,534,683		63,570,326	85,043,914	30,000,000	178,614,239.78	273,920,443.60
2062	452,534,683		58,680,301	85,043,914	30,000,000	173,724,214.72	278,810,468.65
2063	452,534,683		53,790,276	85,043,914	30,000,000	168,834,189.66	283,700,493.71
2064	452,534,683		48,900,251	85,043,914	30,000,000	163,944,164.61	288,590,518.77
2065	452,534,683		44,010,226	85,043,914	30,000,000	159,054,139.55	293,480,543.82
2066	452,534,683		39,120,200	85,043,914	30,000,000	154,164,114.49	298,370,568.88
2067	452,534,683		34,230,175	85,043,914	30,000,000	149,274,089.43	303,260,593.94
2068	452,534,683		29,340,150	85,043,914	30,000,000	144,384,064.38	308,150,618.99
2069	452,534,683		24,450,125	85,043,914	30,000,000	139,494,039.32	313,040,644.05
2070	452,534,683		19,560,100	85,043,914	30,000,000	134,604,014.26	317,930,669.11
2071	452,534,683		14,670,075	85,043,914	30,000,000	129,713,989.21	322,820,694.17
2072	452,534,683		9,780,050	85,043,914	30,000,000	124,823,964.15	327,710,719.22
2073	452,534,683		4,890,025	85,043,914	30,000,000	119,933,939.09	332,600,744.28
2074	452,534,683		0	85,043,914	30,000,000	115,043,914.04	337,490,769.34
						Financial IRR	4.0%
						NPV @ 9.3 ADR	(2,080,985,773)

Annex 13.B. 5 Overall Project

Overall Project	Cash Inflow			Cash Outflow			Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	229,532,457	342,672,018			572,204,475	(572,204,475)
2014	-	1,217,337,541	342,672,018			1,560,009,559	(1,560,009,559)
2015	-	4,508,231,353	342,672,018			4,850,903,370	(4,850,903,370)
2016	-	1,042,816,590	342,672,018			1,385,488,608	(1,385,488,608)
2017	1,367,352,780	574,376,057	625,032,875		70,000,000	1,269,408,932	97,943,848
2018	1,367,352,780	965,567,132	625,032,875		70,000,000	1,660,600,007	(293,247,228)
2019	1,367,352,780	3,960,207,346	625,032,875		70,000,000	4,655,240,221	(3,287,887,441)
2020	1,367,352,780	945,358,062	625,032,875		70,000,000	1,640,390,937	(273,038,157)
2021	2,515,648,315	1,724,506,137	957,265,607		130,000,000	2,811,771,744	(296,123,429)
2022	2,515,648,315	883,696,518	957,265,607		130,000,000	1,970,962,125	544,686,190
2023	2,515,648,315	4,121,083,638	948,698,807	148,987,834	130,000,000	5,348,770,278	(2,833,121,963)
2024	2,515,648,315	965,045,270	940,132,006	148,987,834	130,000,000	2,184,165,110	331,483,205
2025	3,883,001,095	181,022,934	1,127,166,208	148,987,834	184,000,000	1,641,176,976	2,241,824,119
2026	3,883,001,095	537,265,678	1,118,599,408	148,987,834	184,000,000	1,988,852,919	1,894,148,176
2027	3,883,001,095	2,328,584,166	1,102,973,586	271,753,424	184,000,000	3,887,311,176	(4,310,081)
2028	3,883,001,095	590,627,202	1,087,347,764	271,753,424	184,000,000	2,133,728,390	1,749,272,705
2029	3,883,001,095		1,071,721,942	271,753,424	214,000,000	1,557,475,366	2,325,525,729
2030	4,335,535,778		1,056,096,120	271,753,424	214,000,000	1,541,849,544	2,793,686,234
2031	4,335,535,778		1,032,164,480	416,202,438	214,000,000	1,662,366,918	2,673,168,860
2032	4,335,535,778		1,008,232,840	416,202,438	214,000,000	1,638,435,278	2,697,100,500
2033	4,335,535,778		984,301,200	416,202,438	214,000,000	1,614,503,638	2,721,032,141
2034	4,335,535,778		960,369,560	416,202,438	214,000,000	1,590,571,998	2,744,963,781
2035	4,335,535,778		931,547,894	501,246,352	214,000,000	1,646,794,246	2,688,741,532
2036	4,335,535,778		902,726,229	501,246,352	214,000,000	1,617,972,581	2,717,563,197
2037	4,335,535,778		873,904,564	501,246,352	214,000,000	1,589,150,916	2,746,384,863
2038	4,335,535,778		845,082,899	501,246,352	214,000,000	1,560,329,251	2,775,206,528
2039	4,335,535,778		816,261,233	501,246,352	214,000,000	1,531,507,585	2,804,028,193
2040	4,335,535,778		787,439,568	501,246,352	214,000,000	1,502,685,920	2,832,849,858
2041	4,335,535,778		758,617,903	501,246,352	214,000,000	1,473,864,255	2,861,671,523
2042	4,335,535,778		729,796,238	501,246,352	214,000,000	1,445,042,590	2,890,493,189
2043	4,335,535,778		700,974,572	501,246,352	214,000,000	1,416,220,924	2,919,314,854
2044	4,335,535,778		672,152,907	501,246,352	214,000,000	1,387,399,259	2,948,136,519
2045	4,335,535,778		643,331,242	501,246,352	214,000,000	1,358,577,594	2,976,958,184
2046	4,335,535,778		614,509,577	501,246,352	214,000,000	1,329,755,929	3,005,779,850
2047	4,335,535,778		585,687,911	501,246,352	214,000,000	1,300,934,263	3,034,601,515
2048	4,335,535,778		556,866,246	501,246,352	214,000,000	1,272,112,598	3,063,423,180
2049	4,335,535,778		528,044,581	501,246,352	214,000,000	1,243,290,933	3,092,244,845
2050	4,335,535,778		499,222,916	501,246,352	214,000,000	1,214,469,268	3,121,066,511
2051	4,335,535,778		470,401,251	501,246,352	214,000,000	1,185,647,603	3,149,888,176
2052	4,335,535,778		441,579,585	501,246,352	214,000,000	1,156,825,937	3,178,709,841
2053	4,335,535,778		412,757,920	501,246,352	214,000,000	1,128,004,272	3,207,531,506
2054	4,335,535,778		383,936,255	501,246,352	214,000,000	1,099,182,607	3,236,353,172
2055	4,335,535,778		355,114,590	501,246,352	214,000,000	1,070,360,942	3,265,174,837
2056	4,335,535,778		326,292,924	501,246,352	214,000,000	1,041,539,276	3,293,996,502
2057	4,335,535,778		297,471,259	501,246,352	214,000,000	1,012,717,611	3,322,818,167
2058	4,335,535,778		268,649,594	501,246,352	214,000,000	983,895,946	3,351,639,833
2059	4,335,535,778		239,827,929	501,246,352	214,000,000	955,074,281	3,380,461,498
2060	4,335,535,778		211,006,263	501,246,352	214,000,000	926,252,615	3,409,283,163
2061	4,335,535,778		182,184,598	501,246,352	214,000,000	897,430,950	3,438,104,828
2062	4,335,535,778		153,362,933	501,246,352	214,000,000	868,609,285	3,466,926,494
2063	4,335,535,778		133,108,068	352,258,518	214,000,000	699,366,586	3,636,169,192
2064	4,335,535,778		112,853,203	352,258,518	214,000,000	679,111,722	3,656,424,057
2065	4,335,535,778		92,598,338	352,258,518	214,000,000	658,856,857	3,676,678,922
2066	4,335,535,778		72,343,474	352,258,518	214,000,000	638,601,992	3,696,933,786
2067	4,335,535,778		59,147,630	229,492,928	214,000,000	502,640,558	3,832,895,220
2068	4,335,535,778		45,951,787	229,492,928	214,000,000	489,444,715	3,846,091,063
2069	4,335,535,778		32,755,944	229,492,928	214,000,000	476,248,872	3,859,286,907
2070	4,335,535,778		19,560,100	229,492,928	214,000,000	463,053,028	3,872,482,750
2071	4,335,535,778		14,670,075	85,043,914	214,000,000	313,713,989	4,021,821,789
2072	4,335,535,778		9,780,050	85,043,914	214,000,000	308,823,964	4,026,711,814
2073	4,335,535,778		4,890,025	85,043,914	214,000,000	303,933,939	4,031,601,839
2074	4,335,535,778		0	85,043,914	214,000,000	299,043,914	4,036,491,864
						Financial IRR	9%
						NPV @ 9.3 ADR	(529,447,733.30)

5.3 JICA

5.3.1 Direct Financing Scheme Standard Preferential Term

Annex 13.C.1 Phase 1

Phase 1	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013		630,003,378	104,291,484			734,294,862	(734,294,862)
2014		958,225,741	104,291,484			1,062,517,225	(1,062,517,225)
2015		2,396,984,756	104,291,484			2,501,276,240	(2,501,276,240)
2016		2,787,049,283	104,291,484			2,891,340,766	(2,891,340,766)
2017	1,367,352,780		104,291,484		70,000,000	174,291,484	1,193,061,296
2018	1,367,352,780		104,291,484		70,000,000	174,291,484	1,193,061,296
2019	1,367,352,780		104,291,484		70,000,000	174,291,484	1,193,061,296
2020	1,367,352,780		104,291,484		70,000,000	174,291,484	1,193,061,296
2021	1,367,352,780		104,291,484		70,000,000	174,291,484	1,193,061,296
2022	1,367,352,780		104,291,484		70,000,000	174,291,484	1,193,061,296
2023	1,367,352,780		104,030,755	14,898,783	70,000,000	188,929,538	1,178,423,241
2024	1,367,352,780		103,770,026	14,898,783	70,000,000	188,668,810	1,178,683,970
2025	1,367,352,780		103,509,298	14,898,783	70,000,000	188,408,081	1,178,944,699
2026	1,367,352,780		103,248,569	14,898,783	70,000,000	188,147,352	1,179,205,427
2027	1,367,352,780		102,987,840	14,898,783	70,000,000	187,886,623	1,179,466,156
2028	1,367,352,780		102,727,111	14,898,783	70,000,000	187,625,895	1,179,726,885
2029	1,367,352,780		102,466,383	14,898,783	70,000,000	187,365,166	1,179,987,614
2030	1,367,352,780		102,205,654	14,898,783	70,000,000	187,104,437	1,180,248,342
2031	1,367,352,780		101,944,925	14,898,783	70,000,000	186,843,709	1,180,509,071
2032	1,367,352,780		101,684,197	14,898,783	70,000,000	186,582,980	1,180,769,800
2033	1,367,352,780		101,423,468	14,898,783	70,000,000	186,322,251	1,181,030,528
2034	1,367,352,780		101,162,739	14,898,783	70,000,000	186,061,522	1,181,291,257
2035	1,367,352,780		100,902,010	14,898,783	70,000,000	185,800,794	1,181,551,986
2036	1,367,352,780		100,641,282	14,898,783	70,000,000	185,540,065	1,181,812,715
2037	1,367,352,780		100,380,553	14,898,783	70,000,000	185,279,336	1,182,073,443
2038	1,367,352,780		100,119,824	14,898,783	70,000,000	185,018,608	1,182,334,172
2039	1,367,352,780		99,859,096	14,898,783	70,000,000	184,757,879	1,182,594,901
2040	1,367,352,780		99,598,367	14,898,783	70,000,000	184,497,150	1,182,855,629
2041	1,367,352,780		99,337,638	14,898,783	70,000,000	184,236,422	1,183,116,358
2042	1,367,352,780		99,076,909	14,898,783	70,000,000	183,975,693	1,183,377,087
2043	1,367,352,780		98,816,181	14,898,783	70,000,000	183,714,964	1,183,637,816
2044	1,367,352,780		98,555,452	14,898,783	70,000,000	183,454,235	1,183,898,544
2045	1,367,352,780		98,294,723	14,898,783	70,000,000	183,193,507	1,184,159,273
2046	1,367,352,780		98,033,995	14,898,783	70,000,000	182,932,778	1,184,420,002
2047	1,367,352,780		97,773,266	14,898,783	70,000,000	182,672,049	1,184,680,730
2048	1,367,352,780		97,512,537	14,898,783	70,000,000	182,411,321	1,184,941,459
2049	1,367,352,780		97,251,808	14,898,783	70,000,000	182,150,592	1,185,202,188
2050	1,367,352,780		96,991,080	14,898,783	70,000,000	181,889,863	1,185,462,917
2051	1,367,352,780		96,730,351	14,898,783	70,000,000	181,629,134	1,185,723,645
2052	1,367,352,780		96,469,622	14,898,783	70,000,000	181,368,406	1,185,984,374
2053	1,367,352,780		96,208,894	14,898,783	70,000,000	181,107,677	1,186,245,103
2054	1,367,352,780		95,948,165	14,898,783	70,000,000	180,846,948	1,186,505,831
2055	1,367,352,780		95,687,436	14,898,783	70,000,000	180,586,220	1,186,766,560
2056	1,367,352,780		95,426,708	14,898,783	70,000,000	180,325,491	1,187,027,289
2057	1,367,352,780		95,165,979	14,898,783	70,000,000	180,064,762	1,187,288,017
2058	1,367,352,780		94,905,250	14,898,783	70,000,000	179,804,033	1,187,548,746
2059	1,367,352,780		94,644,521	14,898,783	70,000,000	179,543,305	1,187,809,475
2060	1,367,352,780		94,383,793	14,898,783	70,000,000	179,282,576	1,188,070,204
Financial IRR						14%	
NPV @ 9.3 ADR						3,557,057,031	

Annex 13.C.2 Phase 2

Phase 2	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2017		1,090,869,119	85,935,913			1,176,805,033	(1,176,805,033)
2018		1,226,342,517	85,935,913			1,312,278,430	(1,312,278,430)
2019		1,864,967,110	85,935,913			1,950,903,023	(1,950,903,023)
2020		2,049,347,570	85,935,913			2,135,283,483	(2,135,283,483)
2021	1,238,376,225		85,935,913		60,000,000	145,935,913	1,092,440,312
2022	1,238,376,225		85,935,913		60,000,000	145,935,913	1,092,440,312
2023	1,238,376,225		85,935,913		60,000,000	145,935,913	1,092,440,312
2024	1,238,376,225		85,935,913		60,000,000	145,935,913	1,092,440,312
2025	1,238,376,225		85,935,913		60,000,000	145,935,913	1,092,440,312
2026	1,238,376,225		85,935,913		60,000,000	145,935,913	1,092,440,312
2027	1,238,376,225		83,787,515	122,765,590	60,000,000	266,553,105	971,823,120
2028	1,238,376,225		81,639,117	122,765,590	60,000,000	264,404,708	973,971,517
2029	1,238,376,225		79,490,720	122,765,590	60,000,000	262,256,310	976,119,915
2030	1,238,376,225		77,342,322	122,765,590	60,000,000	260,107,912	978,268,313
2031	1,238,376,225		75,193,924	122,765,590	60,000,000	257,959,514	980,416,711
2032	1,238,376,225		73,045,526	122,765,590	60,000,000	255,811,116	982,565,109
2033	1,238,376,225		70,897,128	122,765,590	60,000,000	253,662,719	984,713,507
2034	1,238,376,225		68,748,731	122,765,590	60,000,000	251,514,321	986,861,904
2035	1,238,376,225		66,600,333	122,765,590	60,000,000	249,365,923	989,010,302
2036	1,238,376,225		64,451,935	122,765,590	60,000,000	247,217,525	991,158,700
2037	1,238,376,225		62,303,537	122,765,590	60,000,000	245,069,127	993,307,098
2038	1,238,376,225		60,155,139	122,765,590	60,000,000	242,920,729	995,455,496
2039	1,238,376,225		58,006,741	122,765,590	60,000,000	240,772,332	997,603,894
2040	1,238,376,225		55,858,344	122,765,590	60,000,000	238,623,934	999,752,291
2041	1,238,376,225		53,709,946	122,765,590	60,000,000	236,475,536	1,001,900,689
2042	1,238,376,225		51,561,548	122,765,590	60,000,000	234,327,138	
2043	1,238,376,225		49,413,150	122,765,590	60,000,000	232,178,740	
2044	1,238,376,225		47,264,752	122,765,590	60,000,000	230,030,342	
2045	1,238,376,225		45,116,354	122,765,590	60,000,000	227,881,945	
2046	1,238,376,225		42,967,957	122,765,590	60,000,000	225,733,547	
2047	1,238,376,225		40,819,559	122,765,590	60,000,000	223,585,149	
2048	1,238,376,225		38,671,161	122,765,590	60,000,000	221,436,751	
2049	1,238,376,225		36,522,763	122,765,590	60,000,000	219,288,353	
2050	1,238,376,225		34,374,365	122,765,590	60,000,000	217,139,955	
2051	1,238,376,225		32,225,967	122,765,590	60,000,000	214,991,558	
2052	1,238,376,225		30,077,570	122,765,590	60,000,000	212,843,160	
2053	1,238,376,225		27,929,172	122,765,590	60,000,000	210,694,762	
2054	1,238,376,225		25,780,774	122,765,590	60,000,000	208,546,364	
2055	1,238,376,225		23,632,376	122,765,590	60,000,000	206,397,966	
2056	1,238,376,225		21,483,978	122,765,590	60,000,000	204,249,568	
2057	1,238,376,225		19,335,580	122,765,590	60,000,000	202,101,171	
2058	1,238,376,225		17,187,183	122,765,590	60,000,000	199,952,773	
2059	1,238,376,225		15,038,785	122,765,590	60,000,000	197,804,375	
2060	1,238,376,225		12,890,387	122,765,590	60,000,000	195,655,977	
2061	1,238,376,225		10,741,989	122,765,590	60,000,000	193,507,579	
2062	1,238,376,225		8,593,591	122,765,590	60,000,000	191,359,181	1,047,017,044
2063	1,238,376,225		6,445,193	122,765,590	60,000,000	189,210,784	1,049,165,441
2064	1,238,376,225		4,296,796	122,765,590	60,000,000	187,062,386	1,051,313,839
2065	1,238,376,225		2,148,398	122,765,590	60,000,000	184,913,988	1,053,462,237
2066	1,238,376,225		0	122,765,590	60,000,000	182,765,590	1,055,610,635
						Financial IRR	13%
						NPV @ 9,3 ADR	1,884,943,314

Annex 13.C.3 Phase 3

Phase 3	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2021		1,411,860,161	101,114,310			1,512,974,471	(1,512,974,471)
2022		1,524,824,718	101,114,310			1,625,939,028	(1,625,939,028)
2023		2,114,163,456	101,114,310			2,215,277,765	(2,215,277,765)
2024		2,284,256,928	101,114,310			2,385,371,237	(2,385,371,237)
2025	1,277,272,090		101,114,310		54,000,000	155,114,310	1,122,157,780
2026	1,277,272,090		101,114,310		54,000,000	155,114,310	1,122,157,780
2027	1,277,272,090		101,114,310	144,449,014	54,000,000	299,563,324	977,708,766
2028	1,277,272,090		101,114,310	144,449,014	54,000,000	299,563,324	977,708,766
2029	1,277,272,090		101,114,310	144,449,014	54,000,000	299,563,324	977,708,766
2030	1,277,272,090		101,114,310	144,449,014	54,000,000	299,563,324	977,708,766
2031	1,277,272,090		98,586,452	144,449,014	54,000,000	297,035,466	980,236,624
2032	1,277,272,090		96,058,594	144,449,014	54,000,000	294,507,608	982,764,482
2033	1,277,272,090		93,530,737	144,449,014	54,000,000	291,979,751	985,292,340
2034	1,277,272,090		91,002,879	144,449,014	54,000,000	289,451,893	987,820,197
2035	1,277,272,090		88,475,021	144,449,014	54,000,000	286,924,035	990,348,055
2036	1,277,272,090		85,947,163	144,449,014	54,000,000	284,396,177	992,875,913
2037	1,277,272,090		83,419,306	144,449,014	54,000,000	281,868,320	995,403,771
2038	1,277,272,090		80,891,448	144,449,014	54,000,000	279,340,462	997,931,628
2039	1,277,272,090		78,363,590	144,449,014	54,000,000	276,812,604	1,000,459,486
2040	1,277,272,090		75,835,732	144,449,014	54,000,000	274,284,746	1,002,987,344
2041	1,277,272,090		73,307,875	144,449,014	54,000,000	271,756,889	1,005,515,202
2042	1,277,272,090		70,780,017	144,449,014	54,000,000	269,229,031	1,008,043,059
2043	1,277,272,090		68,252,159	144,449,014	54,000,000	266,701,173	1,010,570,917
2044	1,277,272,090		65,724,301	144,449,014	54,000,000	264,173,315	1,013,098,775
2045	1,277,272,090		63,196,444	144,449,014	54,000,000	261,645,458	1,015,626,633
2046	1,277,272,090		60,668,586	144,449,014	54,000,000	259,117,600	1,018,154,490
2047	1,277,272,090		58,140,728	144,449,014	54,000,000	256,589,742	1,020,682,348
2048	1,277,272,090		55,612,870	144,449,014	54,000,000	254,061,884	1,023,210,206
2049	1,277,272,090		53,085,013	144,449,014	54,000,000	251,534,027	1,025,738,064
2050	1,277,272,090		50,557,155	144,449,014	54,000,000	249,006,169	1,028,265,921
2051	1,277,272,090		48,029,297	144,449,014	54,000,000	246,478,311	1,030,793,779
2052	1,277,272,090		45,501,439	144,449,014	54,000,000	243,950,453	1,033,321,637
2053	1,277,272,090		42,973,582	144,449,014	54,000,000	241,422,596	1,035,849,495
2054	1,277,272,090		40,445,724	144,449,014	54,000,000	238,894,738	1,038,377,352
2055	1,277,272,090		37,917,866	144,449,014	54,000,000	236,366,880	1,040,905,210
2056	1,277,272,090		35,390,008	144,449,014	54,000,000	233,839,022	1,043,433,068
2057	1,277,272,090		32,862,151	144,449,014	54,000,000	231,311,165	1,045,960,926
2058	1,277,272,090		30,334,293	144,449,014	54,000,000	228,783,307	1,048,488,783
2059	1,277,272,090		27,806,435	144,449,014	54,000,000	226,255,449	1,051,016,641
2060	1,277,272,090		25,278,577	144,449,014	54,000,000	223,727,591	1,053,544,499
2061	1,277,272,090		22,750,720	144,449,014	54,000,000	221,199,734	1,056,072,357
2062	1,277,272,090		20,222,862	144,449,014	54,000,000	218,671,876	1,058,600,214
2063	1,277,272,090		17,695,004	144,449,014	54,000,000	216,144,018	1,061,128,072
2064	1,277,272,090		15,167,146	144,449,014	54,000,000	213,616,161	1,063,655,930
2065	1,277,272,090		12,639,289	144,449,014	54,000,000	211,088,303	1,066,183,788
2066	1,277,272,090		10,111,431	144,449,014	54,000,000	208,560,445	1,068,711,645
2067	1,277,272,090		7,583,573	192,598,685	54,000,000	254,182,259	1,023,089,832
2068	1,277,272,090		5,055,715	192,598,685	54,000,000	251,654,401	1,025,617,689
2069	1,277,272,090		2,527,858	192,598,685	54,000,000	249,126,543	1,028,145,547
2070	1,277,272,090		0	192,598,685	54,000,000	246,598,685	1,030,673,405
						Financial IRR	11%
						NPV @ 9.3 ADR	1,551,338,576

Annex 13.C.4 Phase 4

Phase 4	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2025		985,556,072	59,530,740			1,045,086,812.20	(1,045,086,812.20)
2026		1,028,778,245	59,530,740			1,088,308,984.56	(1,088,308,984.56)
2027		1,218,512,621	59,530,740			1,278,043,360.79	(1,278,043,360.79)
2028		1,280,153,062	59,530,740			1,339,683,801.75	(1,339,683,801.75)
2029	452,534,683		59,530,740		30,000,000	89,530,739.82	363,003,943.55
2030	452,534,683		59,530,740		30,000,000	89,530,739.82	363,003,943.55
2031	452,534,683		59,530,740		30,000,000	89,530,739.82	363,003,943.55
2032	452,534,683		59,530,740		30,000,000	89,530,739.82	363,003,943.55
2033	452,534,683		59,530,740		30,000,000	89,530,739.82	363,003,943.55
2034	452,534,683		59,530,740		30,000,000	89,530,739.82	363,003,943.55
2035	452,534,683		58,042,471	85,043,914	30,000,000	173,086,385.36	279,448,298.01
2036	452,534,683		56,554,203	85,043,914	30,000,000	171,598,116.87	280,936,566.50
2037	452,534,683		55,065,934	85,043,914	30,000,000	170,109,848.37	282,424,835.00
2038	452,534,683		53,577,666	85,043,914	30,000,000	168,621,579.88	283,913,103.49
2039	452,534,683		52,089,397	85,043,914	30,000,000	167,133,311.38	285,401,371.99
2040	452,534,683		50,601,129	85,043,914	30,000,000	165,645,042.89	286,889,640.49
2041	452,534,683		49,112,860	85,043,914	30,000,000	164,156,774.39	288,377,908.98
2042	452,534,683		47,624,592	85,043,914	30,000,000	162,668,505.89	289,866,177.48
2043	452,534,683		46,136,323	85,043,914	30,000,000	161,180,237.40	291,354,445.97
2044	452,534,683		44,648,055	85,043,914	30,000,000	159,691,968.90	292,842,714.47
2045	452,534,683		43,159,786	85,043,914	30,000,000	158,203,700.41	294,330,982.96
2046	452,534,683		41,671,518	85,043,914	30,000,000	156,715,431.91	295,819,251.46
2047	452,534,683		40,183,249	85,043,914	30,000,000	155,227,163.42	297,307,519.95
2048	452,534,683		38,694,981	85,043,914	30,000,000	153,738,894.92	298,795,788.45
2049	452,534,683		37,206,712	85,043,914	30,000,000	152,250,626.43	300,284,056.95
2050	452,534,683		35,718,444	85,043,914	30,000,000	150,762,357.93	301,772,325.44
2051	452,534,683		34,230,175	85,043,914	30,000,000	149,274,089.43	303,260,593.94
2052	452,534,683		32,741,907	85,043,914	30,000,000	147,785,820.94	304,748,862.43
2053	452,534,683		31,253,638	85,043,914	30,000,000	146,297,552.44	306,237,130.93
2054	452,534,683		29,765,370	85,043,914	30,000,000	144,809,283.95	307,725,399.42
2055	452,534,683		28,277,101	85,043,914	30,000,000	143,321,015.45	309,213,667.92
2056	452,534,683		26,788,833	85,043,914	30,000,000	141,832,746.96	310,701,936.42
2057	452,534,683		25,300,564	85,043,914	30,000,000	140,344,478.46	312,190,204.91
2058	452,534,683		23,812,296	85,043,914	30,000,000	138,856,209.96	313,678,473.41
2059	452,534,683		22,324,027	85,043,914	30,000,000	137,367,941.47	315,166,741.90
2060	452,534,683		20,835,759	85,043,914	30,000,000	135,879,672.97	316,655,010.40
2061	452,534,683		19,347,490	85,043,914	30,000,000	134,391,404.48	318,143,278.89
2062	452,534,683		17,859,222	85,043,914	30,000,000	132,903,135.98	319,631,547.39
2063	452,534,683		16,370,953	85,043,914	30,000,000	131,414,867.49	321,119,815.88
2064	452,534,683		14,882,685	85,043,914	30,000,000	129,926,598.99	322,608,084.38
2065	452,534,683		13,394,416	85,043,914	30,000,000	128,438,330.50	324,096,352.88
2066	452,534,683		11,906,148	85,043,914	30,000,000	126,950,062.00	325,584,621.37
2067	452,534,683		10,417,879	85,043,914	30,000,000	125,461,793.50	327,072,889.87
2068	452,534,683		8,929,611	85,043,914	30,000,000	123,973,525.01	328,561,158.36
2069	452,534,683		7,441,342	85,043,914	30,000,000	122,485,256.51	330,049,426.86
2070	452,534,683		5,953,074	85,043,914	30,000,000	120,996,988.02	331,537,695.35
2071	452,534,683		4,464,805	85,043,914	30,000,000	119,508,719.52	333,025,963.85
2072	452,534,683		2,976,537	85,043,914	30,000,000	118,020,451.03	334,514,232.35
2073	452,534,683		1,488,268	85,043,914	30,000,000	116,532,182.53	336,002,500.84
2074	452,534,683		0	85,043,914	30,000,000	115,043,914.04	337,490,769.34
Financial IRR						6%	
NPV @ 9.3 ADR							(1,522,473,540)

Annex 13.C.5 Overall Project Financial Analysis

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	630,003,378	104,291,484			734,294,862	(734,294,862)
2014	-	958,225,741	104,291,484			1,062,517,225	(1,062,517,225)
2015	-	2,396,984,756	104,291,484			2,501,276,240	(2,501,276,240)
2016	-	2,787,049,283	104,291,484			2,891,340,766	(2,891,340,766)
2017	1,367,352,780	1,090,869,119	190,227,397		70,000,000	1,351,096,516	16,256,263
2018	1,367,352,780	1,226,342,517	190,227,397		70,000,000	1,486,569,913	(119,217,134)
2019	1,367,352,780	1,864,967,110	190,227,397		70,000,000	2,125,194,507	(757,841,727)
2020	1,367,352,780	2,049,347,570	190,227,397		70,000,000	2,309,574,967	(942,222,187)
2021	2,515,648,315	1,411,860,161	291,341,707		130,000,000	1,833,201,868	682,446,447
2022	2,515,648,315	1,524,824,718	291,341,707		130,000,000	1,946,166,425	569,481,890
2023	2,515,648,315	2,114,163,456	291,080,978	14,898,783	130,000,000	2,550,143,217	(34,494,902)
2024	2,515,648,315	2,284,256,928	290,820,249	14,898,783	130,000,000	2,719,975,960	(204,327,645)
2025	3,883,001,095	985,556,072	350,090,260	14,898,783	184,000,000	1,534,545,116	2,348,455,979
2026	3,883,001,095	1,028,778,245	349,829,532	14,898,783	184,000,000	1,577,506,560	2,305,494,535
2027	3,883,001,095	1,218,512,621	347,420,405	137,664,374	184,000,000	1,887,597,400	1,995,403,695
2028	3,883,001,095	1,280,153,062	345,011,278	137,664,374	184,000,000	1,946,828,714	1,936,172,381
2029	3,883,001,095		342,602,152	137,664,374	214,000,000	694,266,526	3,188,734,570
2030	4,335,535,778		340,193,025	137,664,374	214,000,000	691,857,399	3,643,678,379
2031	4,335,535,778		335,256,041	282,113,388	214,000,000	831,369,429	3,504,166,350
2032	4,335,535,778		330,319,057	282,113,388	214,000,000	826,432,444	3,509,103,334
2033	4,335,535,778		325,382,073	282,113,388	214,000,000	821,495,460	3,514,040,318
2034	4,335,535,778		320,445,088	282,113,388	214,000,000	816,558,476	3,518,977,303
2035	4,335,535,778		314,019,836	367,157,302	214,000,000	895,177,137	3,440,358,641
2036	4,335,535,778		307,594,583	367,157,302	214,000,000	888,751,884	3,446,783,894
2037	4,335,535,778		301,169,330	367,157,302	214,000,000	882,326,632	3,453,209,147
2038	4,335,535,778		294,744,077	367,157,302	214,000,000	875,901,379	3,459,634,400
2039	4,335,535,778		288,318,824	367,157,302	214,000,000	869,476,126	3,466,059,652
2040	4,335,535,778		281,893,572	367,157,302	214,000,000	863,050,873	3,472,484,905
2041	4,335,535,778		275,468,319	367,157,302	214,000,000	856,625,620	3,478,910,158
2042	4,335,535,778		269,043,066	367,157,302	214,000,000	850,200,368	3,485,335,411
2043	4,335,535,778		262,617,813	367,157,302	214,000,000	843,775,115	3,491,760,663
2044	4,335,535,778		256,192,561	367,157,302	214,000,000	837,349,862	3,498,185,916
2045	4,335,535,778		249,767,308	367,157,302	214,000,000	830,924,609	3,504,611,169
2046	4,335,535,778		243,342,055	367,157,302	214,000,000	824,499,357	3,511,036,422
2047	4,335,535,778		236,916,802	367,157,302	214,000,000	818,074,104	3,517,461,675
2048	4,335,535,778		230,491,549	367,157,302	214,000,000	811,648,851	3,523,886,927
2049	4,335,535,778		224,066,297	367,157,302	214,000,000	805,223,598	3,530,312,180
2050	4,335,535,778		217,641,044	367,157,302	214,000,000	798,798,345	3,536,737,433
2051	4,335,535,778		211,215,791	367,157,302	214,000,000	792,373,093	3,543,162,686
2052	4,335,535,778		204,790,538	367,157,302	214,000,000	785,947,840	3,549,587,938
2053	4,335,535,778		198,365,285	367,157,302	214,000,000	779,522,587	3,556,013,191
2054	4,335,535,778		191,940,033	367,157,302	214,000,000	773,097,334	3,562,438,444
2055	4,335,535,778		185,514,780	367,157,302	214,000,000	766,672,082	3,568,863,697
2056	4,335,535,778		179,089,527	367,157,302	214,000,000	760,246,829	3,575,288,950
2057	4,335,535,778		172,664,274	367,157,302	214,000,000	753,821,576	3,581,714,202
2058	4,335,535,778		166,239,022	367,157,302	214,000,000	747,396,323	3,588,139,455
2059	4,335,535,778		159,813,769	367,157,302	214,000,000	740,971,070	3,594,564,708
2060	4,335,535,778		153,388,516	367,157,302	214,000,000	734,545,818	3,600,989,961
2061	4,335,535,778		146,963,263	367,157,302	214,000,000	728,120,565	3,607,415,214
2062	4,335,535,778		140,538,010	367,157,302	214,000,000	721,695,312	3,613,840,466
2063	4,335,535,778		40,511,151	352,258,518	214,000,000	606,769,669	3,728,766,109
2064	4,335,535,778		34,346,627	352,258,518	214,000,000	600,605,145	3,734,930,633
2065	4,335,535,778		28,182,103	352,258,518	214,000,000	594,440,621	3,741,095,157
2066	4,335,535,778		22,017,579	352,258,518	214,000,000	588,276,097	3,747,259,681
2067	4,335,535,778		18,001,453	229,492,928	214,000,000	461,494,381	3,874,041,398
2068	4,335,535,778		13,985,326	229,492,928	214,000,000	457,478,255	3,878,057,524
2069	4,335,535,778		9,969,200	229,492,928	214,000,000	453,462,128	3,882,073,650
2070	4,335,535,778		5,953,074	229,492,928	214,000,000	449,446,002	3,886,089,776
2071	4,335,535,778		4,464,805	85,043,914	214,000,000	303,508,720	4,032,027,059
2072	4,335,535,778		2,976,537	85,043,914	214,000,000	302,020,451	4,033,515,327
2073	4,335,535,778		1,488,268	85,043,914	214,000,000	300,532,183	4,035,003,596
2074	4,335,535,778		0	85,043,914	214,000,000	299,043,914	4,036,491,864
Financial IRR							13%
NPV @ 9.3 ADR							5,822,972,230

5.3.2 Direct Loan Scheme-Option 1 and Tariff based on Environmental and Sewer Charges

Annex 13.D .1 Phase 1							
Phase 1	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013		630,003,378	98,331,970			728,335,348	(728,335,348)
2014		958,225,741	98,331,970			1,056,557,712	(1,056,557,712)
2015		2,396,984,756	98,331,970			2,495,316,726	(2,495,316,726)
2016		2,787,049,283	98,331,970			2,885,381,253	(2,885,381,253)
2017	1,367,352,780		98,331,970		70,000,000	168,331,970	1,199,020,809
2018	1,367,352,780		98,331,970		70,000,000	168,331,970	1,199,020,809
2019	1,367,352,780		98,331,970		70,000,000	168,331,970	1,199,020,809
2020	1,367,352,780		98,331,970		70,000,000	168,331,970	1,199,020,809
2021	1,367,352,780		98,331,970		70,000,000	168,331,970	1,199,020,809
2022	1,367,352,780		98,331,970		70,000,000	168,331,970	1,199,020,809
2023	1,367,352,780		95,054,238	198,650,445	70,000,000	363,704,683	1,003,648,097
2024	1,367,352,780		91,776,506	198,650,445	70,000,000	360,426,951	1,006,925,829
2025	1,367,352,780		88,498,773	198,650,445	70,000,000	357,149,218	1,010,203,561
2026	1,367,352,780		85,221,041	198,650,445	70,000,000	353,871,486	1,013,481,294
2027	1,367,352,780		81,943,309	198,650,445	70,000,000	350,593,754	1,016,759,026
2028	1,367,352,780		78,665,576	198,650,445	70,000,000	347,316,021	1,020,036,758
2029	1,367,352,780		75,387,844	198,650,445	70,000,000	344,038,289	1,023,314,491
2030	1,367,352,780		72,110,112	198,650,445	70,000,000	340,760,557	1,026,592,223
2031	1,367,352,780		68,832,379	198,650,445	70,000,000	337,482,824	1,029,869,955
2032	1,367,352,780		65,554,647	198,650,445	70,000,000	334,205,092	1,033,147,688
2033	1,367,352,780		62,276,915	198,650,445	70,000,000	330,927,360	1,036,425,420
2034	1,367,352,780		58,999,182	198,650,445	70,000,000	327,649,627	1,039,703,152
2035	1,367,352,780		55,721,450	198,650,445	70,000,000	324,371,895	1,042,980,885
2036	1,367,352,780		52,443,717	198,650,445	70,000,000	321,094,162	1,046,258,617
2037	1,367,352,780		49,165,985	198,650,445	70,000,000	317,816,430	1,049,536,350
2038	1,367,352,780		45,888,253	198,650,445	70,000,000	314,538,698	1,052,814,082
2039	1,367,352,780		42,610,520	198,650,445	70,000,000	311,260,965	1,056,091,814
2040	1,367,352,780		39,332,788	198,650,445	70,000,000	307,983,233	1,059,369,547
2041	1,367,352,780		36,055,056	198,650,445	70,000,000	304,705,501	1,062,647,279
2042	1,367,352,780		32,777,323	198,650,445	70,000,000	301,427,768	1,065,925,011
2043	1,367,352,780		29,499,591	198,650,445	70,000,000	298,150,036	1,069,202,744
2044	1,367,352,780		26,221,859	198,650,445	70,000,000	294,872,304	1,072,480,476
2045	1,367,352,780		22,944,126	198,650,445	70,000,000	291,594,571	1,075,758,208
2046	1,367,352,780		19,666,394	198,650,445	70,000,000	288,316,839	1,079,035,941
2047	1,367,352,780		16,388,662	198,650,445	70,000,000	285,039,107	1,082,313,673
2048	1,367,352,780		13,110,929	198,650,445	70,000,000	281,761,374	1,085,591,405
2049	1,367,352,780		9,833,197	198,650,445	70,000,000	278,483,642	1,088,869,138
2050	1,367,352,780		6,555,465	198,650,445	70,000,000	275,205,910	1,092,146,870
2051	1,367,352,780		3,277,732	198,650,445	70,000,000	271,928,177	1,095,424,602
					Financial IRR		14%
						NPV @ 9.3 ADR	2,691,417,251

Annex 13.D.2 Phase 2							
Phase 2	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		1,090,869,119	81,025,290			1,171,894,409	(1,171,894,409)
2018		1,226,342,517	81,025,290			1,307,367,806	(1,307,367,806)
2019		1,864,967,110	81,025,290			1,945,992,399	(1,945,992,399)
2020		2,049,347,570	81,025,290			2,130,372,859	(2,130,372,859)
2021	1,238,376,225		81,025,290		60,000,000	141,025,290	1,097,350,936
2022	1,238,376,225		81,025,290		60,000,000	141,025,290	1,097,350,936
2023	1,238,376,225		81,025,290		60,000,000	141,025,290	1,097,350,936
2024	1,238,376,225		81,025,290		60,000,000	141,025,290	1,097,350,936
2025	1,238,376,225		81,025,290		60,000,000	141,025,290	1,097,350,936
2026	1,238,376,225		81,025,290		60,000,000	141,025,290	1,097,350,936
2027	1,238,376,225		78,324,447	163,687,454	60,000,000	302,011,900	936,364,325
2028	1,238,376,225		75,623,604	163,687,454	60,000,000	299,311,057	939,065,168
2029	1,238,376,225		72,922,761	163,687,454	60,000,000	296,610,214	941,766,011
2030	1,238,376,225		70,221,918	163,687,454	60,000,000	293,909,371	944,466,854
2031	1,238,376,225		67,521,075	163,687,454	60,000,000	291,208,528	947,167,697
2032	1,238,376,225		64,820,232	163,687,454	60,000,000	288,507,685	949,868,540
2033	1,238,376,225		62,119,389	163,687,454	60,000,000	285,806,842	952,569,383
2034	1,238,376,225		59,418,546	163,687,454	60,000,000	283,105,999	955,270,226
2035	1,238,376,225		56,717,703	163,687,454	60,000,000	280,405,156	957,971,069
2036	1,238,376,225		54,016,860	163,687,454	60,000,000	277,704,313	960,671,912
2037	1,238,376,225		51,316,017	163,687,454	60,000,000	275,003,470	963,372,755
2038	1,238,376,225		48,615,174	163,687,454	60,000,000	272,302,627	966,073,598
2039	1,238,376,225		45,914,331	163,687,454	60,000,000	269,601,784	968,774,441
2040	1,238,376,225		43,213,488	163,687,454	60,000,000	266,900,941	971,475,284
2041	1,238,376,225		40,512,645	163,687,454	60,000,000	264,200,098	974,176,127
2042	1,238,376,225		37,811,802	163,687,454	60,000,000	261,499,255	
2043	1,238,376,225		35,110,959	163,687,454	60,000,000	258,798,412	
2044	1,238,376,225		32,410,116	163,687,454	60,000,000	256,097,569	
2045	1,238,376,225		29,709,273	163,687,454	60,000,000	253,396,726	
2046	1,238,376,225		27,008,430	163,687,454	60,000,000	250,695,883	
2047	1,238,376,225		24,307,587	163,687,454	60,000,000	247,995,040	
2048	1,238,376,225		21,606,744	163,687,454	60,000,000	245,294,197	
2049	1,238,376,225		18,905,901	163,687,454	60,000,000	242,593,354	
2050	1,238,376,225		16,205,058	163,687,454	60,000,000	239,892,511	
2051	1,238,376,225		13,504,215	163,687,454	60,000,000	237,191,668	
2052	1,238,376,225		10,803,372	163,687,454	60,000,000	234,490,826	1,003,885,400
2053	1,238,376,225		8,102,529	163,687,454	60,000,000	231,789,983	1,006,586,243
2054	1,238,376,225		5,401,686	163,687,454	60,000,000	229,089,140	1,009,287,086
2055	1,238,376,225		2,700,843	163,687,454	60,000,000	226,388,297	1,011,987,929
2056	1,238,376,225		0	163,687,454	60,000,000	223,687,454	1,014,688,772
						Financial IRR	13%
						NPV @ 9,3 ADR	1,951,571,981

Annex 13.D .3 Phase 3							
Phase 3	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2021		1,411,860,161	95,336,349			1,507,196,511	(1,507,196,511)
2022		1,524,824,718	95,336,349			1,620,161,068	(1,620,161,068)
2023		2,114,163,456	95,336,349			2,209,499,805	(2,209,499,805)
2024		2,284,256,928	95,336,349			2,379,593,277	(2,379,593,277)
2025	1,277,272,090		95,336,349		54,000,000	149,336,349	1,127,935,741
2026	1,277,272,090		95,336,349		54,000,000	149,336,349	1,127,935,741
2027	1,277,272,090		95,336,349	192,598,685	54,000,000	341,935,035	935,337,056
2028	1,277,272,090		95,336,349	192,598,685	54,000,000	341,935,035	935,337,056
2029	1,277,272,090		95,336,349	192,598,685	54,000,000	341,935,035	935,337,056
2030	1,277,272,090		95,336,349	192,598,685	54,000,000	341,935,035	935,337,056
2031	1,277,272,090		92,158,471	192,598,685	54,000,000	338,757,156	938,514,934
2032	1,277,272,090		88,980,593	192,598,685	54,000,000	335,579,278	941,692,812
2033	1,277,272,090		85,802,714	192,598,685	54,000,000	332,401,400	944,870,691
2034	1,277,272,090		82,624,836	192,598,685	54,000,000	329,223,521	948,048,569
2035	1,277,272,090		79,446,958	192,598,685	54,000,000	326,045,643	951,226,447
2036	1,277,272,090		76,269,079	192,598,685	54,000,000	322,867,765	954,404,325
2037	1,277,272,090		73,091,201	192,598,685	54,000,000	319,689,886	957,582,204
2038	1,277,272,090		69,913,323	192,598,685	54,000,000	316,512,008	960,760,082
2039	1,277,272,090		66,735,444	192,598,685	54,000,000	313,334,130	963,937,960
2040	1,277,272,090		63,557,566	192,598,685	54,000,000	310,156,252	967,115,839
2041	1,277,272,090		60,379,688	192,598,685	54,000,000	306,978,373	970,293,717
2042	1,277,272,090		57,201,810	192,598,685	54,000,000	303,800,495	973,471,595
2043	1,277,272,090		54,023,931	192,598,685	54,000,000	300,622,617	976,649,474
2044	1,277,272,090		50,846,053	192,598,685	54,000,000	297,444,738	979,827,352
2045	1,277,272,090		47,668,175	192,598,685	54,000,000	294,266,860	983,005,230
2046	1,277,272,090		44,490,296	192,598,685	54,000,000	291,088,982	986,183,109
2047	1,277,272,090		41,312,418	192,598,685	54,000,000	287,911,103	989,360,987
2048	1,277,272,090		38,134,540	192,598,685	54,000,000	284,733,225	992,538,865
2049	1,277,272,090		34,956,661	192,598,685	54,000,000	281,555,347	995,716,744
2050	1,277,272,090		31,778,783	192,598,685	54,000,000	278,377,468	998,894,622
2051	1,277,272,090		28,600,905	192,598,685	54,000,000	275,199,590	1,002,072,500
2052	1,277,272,090		25,423,026	192,598,685	54,000,000	272,021,712	1,005,250,378
2053	1,277,272,090		22,245,148	192,598,685	54,000,000	268,843,834	1,008,428,257
2054	1,277,272,090		19,067,270	192,598,685	54,000,000	265,665,955	1,011,606,135
2055	1,277,272,090		15,889,392	192,598,685	54,000,000	262,488,077	1,014,784,013
2056	1,277,272,090		12,711,513	192,598,685	54,000,000	259,310,199	1,017,961,892
2057	1,277,272,090		9,533,635	192,598,685	54,000,000	256,132,320	1,021,139,770
2058	1,277,272,090		6,355,757	192,598,685	54,000,000	252,954,442	1,024,317,648
2059	1,277,272,090		3,177,878	192,598,685	54,000,000	249,776,564	1,027,495,527
2060	1,277,272,090		(0)	192,598,685	54,000,000	246,598,685	1,030,673,405
						Financial IRR	11%
						NPV @ 9.3 ADR	1,121,765,221

Annex 13.D.4 Phase 4

Phase 4	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2025		985,556,072	56,128,983			1,041,685,055.64	(1,041,685,055.64)
2026		1,028,778,245	56,128,983			1,084,907,228.00	(1,084,907,228.00)
2027		1,218,512,621	56,128,983			1,274,641,604.23	(1,274,641,604.23)
2028		1,280,153,062	56,128,983			1,336,282,045.19	(1,336,282,045.19)
2029	452,534,683		56,128,983		30,000,000	86,128,983.26	366,405,700.11
2030	452,534,683		56,128,983		30,000,000	86,128,983.26	366,405,700.11
2031	452,534,683		56,128,983		30,000,000	86,128,983.26	366,405,700.11
2032	452,534,683		56,128,983		30,000,000	86,128,983.26	366,405,700.11
2033	452,534,683		56,128,983		30,000,000	86,128,983.26	366,405,700.11
2034	452,534,683		56,128,983		30,000,000	86,128,983.26	366,405,700.11
2035	452,534,683		54,258,017	113,391,885	30,000,000	197,649,902.53	254,884,780.84
2036	452,534,683		52,387,051	113,391,885	30,000,000	195,778,936.43	256,755,746.95
2037	452,534,683		50,516,085	113,391,885	30,000,000	193,907,970.32	258,626,713.05
2038	452,534,683		48,645,119	113,391,885	30,000,000	192,037,004.21	260,497,679.16
2039	452,534,683		46,774,153	113,391,885	30,000,000	190,166,038.10	262,368,645.27
2040	452,534,683		44,903,187	113,391,885	30,000,000	188,295,071.99	264,239,611.38
2041	452,534,683		43,032,221	113,391,885	30,000,000	186,424,105.88	266,110,577.49
2042	452,534,683		41,161,254	113,391,885	30,000,000	184,553,139.77	267,981,543.60
2043	452,534,683		39,290,288	113,391,885	30,000,000	182,682,173.66	269,852,509.71
2044	452,534,683		37,419,322	113,391,885	30,000,000	180,811,207.56	271,723,475.82
2045	452,534,683		35,548,356	113,391,885	30,000,000	178,940,241.45	273,594,441.92
2046	452,534,683		33,677,390	113,391,885	30,000,000	177,069,275.34	275,465,408.03
2047	452,534,683		31,806,424	113,391,885	30,000,000	175,198,309.23	277,336,374.14
2048	452,534,683		29,935,458	113,391,885	30,000,000	173,327,343.12	279,207,340.25
2049	452,534,683		28,064,492	113,391,885	30,000,000	171,456,377.01	281,078,306.36
2050	452,534,683		26,193,526	113,391,885	30,000,000	169,585,410.90	282,949,272.47
2051	452,534,683		24,322,559	113,391,885	30,000,000	167,714,444.79	284,820,238.58
2052	452,534,683		22,451,593	113,391,885	30,000,000	165,843,478.69	286,691,204.69
2053	452,534,683		20,580,627	113,391,885	30,000,000	163,972,512.58	288,562,170.79
2054	452,534,683		18,709,661	113,391,885	30,000,000	162,101,546.47	290,433,136.90
2055	452,534,683		16,838,695	113,391,885	30,000,000	160,230,580.36	292,304,103.01
2056	452,534,683		14,967,729	113,391,885	30,000,000	158,359,614.25	294,175,069.12
2057	452,534,683		13,096,763	113,391,885	30,000,000	156,488,648.14	296,046,035.23
2058	452,534,683		11,225,797	113,391,885	30,000,000	154,617,682.03	297,917,001.34
2059	452,534,683		9,354,831	113,391,885	30,000,000	152,746,715.92	299,787,967.45
2060	452,534,683		7,483,864	113,391,885	30,000,000	150,875,749.82	301,658,933.56
2061	452,534,683		5,612,898	113,391,885	30,000,000	149,004,783.71	303,529,899.66
2062	452,534,683		3,741,932	113,391,885	30,000,000	147,133,817.60	305,400,865.77
2063	452,534,683		1,870,966	113,391,885	30,000,000	145,262,851.49	307,271,831.88
2064	452,534,683		0	113,391,885	30,000,000	143,391,885.38	309,142,797.99
						Financial IRR	5%
						NPV @ 9.3 ADR	(1,659,786,568)

Annex 13.D.5 Overall Project Financial Analysis

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	630,003,378	98,331,970			728,335,348	(728,335,348)
2014	-	958,225,741	98,331,970			1,056,557,712	(1,056,557,712)
2015	-	2,396,984,756	98,331,970			2,495,316,726	(2,495,316,726)
2016	-	2,787,049,283	98,331,970			2,885,381,253	(2,885,381,253)
2017	1,367,352,780	1,090,869,119	179,357,260		70,000,000	1,340,226,379	27,126,400
2018	1,367,352,780	1,226,342,517	179,357,260		70,000,000	1,475,699,776	(108,346,997)
2019	1,367,352,780	1,864,967,110	179,357,260		70,000,000	2,114,324,370	(746,971,590)
2020	1,367,352,780	2,049,347,570	179,357,260		70,000,000	2,298,704,830	(931,352,050)
2021	2,515,648,315	1,411,860,161	274,693,609		130,000,000	1,816,553,770	699,094,545
2022	2,515,648,315	1,524,824,718	274,693,609		130,000,000	1,929,518,328	586,129,988
2023	2,515,648,315	2,114,163,456	271,415,877	198,650,445	130,000,000	2,714,229,777	(198,581,462)
2024	2,515,648,315	2,284,256,928	268,138,144	198,650,445	130,000,000	2,881,045,517	(365,397,202)
2025	3,883,001,095	985,556,072	320,989,395	198,650,445	184,000,000	1,689,195,913	2,193,805,182
2026	3,883,001,095	1,028,778,245	317,711,663	198,650,445	184,000,000	1,729,140,353	2,153,860,742
2027	3,883,001,095	1,218,512,621	311,733,088	362,337,899	184,000,000	2,076,583,607	1,806,417,488
2028	3,883,001,095	1,280,153,062	305,754,512	362,337,899	184,000,000	2,132,245,473	1,750,755,622
2029	3,883,001,095		299,775,937	362,337,899	214,000,000	876,113,836	3,006,887,259
2030	4,335,535,778		293,797,362	362,337,899	214,000,000	870,135,260	3,465,400,518
2031	4,335,535,778		284,640,908	554,936,584	214,000,000	1,053,577,492	3,281,958,286
2032	4,335,535,778		275,484,454	554,936,584	214,000,000	1,044,421,038	3,291,114,740
2033	4,335,535,778		266,328,001	554,936,584	214,000,000	1,035,264,585	3,300,271,194
2034	4,335,535,778		257,171,547	554,936,584	214,000,000	1,026,108,131	3,309,427,647
2035	4,335,535,778		246,144,127	668,328,469	214,000,000	1,128,472,597	3,207,063,182
2036	4,335,535,778		235,116,708	668,328,469	214,000,000	1,117,445,177	3,218,090,601
2037	4,335,535,778		224,089,288	668,328,469	214,000,000	1,106,417,757	3,229,118,021
2038	4,335,535,778		213,061,868	668,328,469	214,000,000	1,095,390,337	3,240,145,441
2039	4,335,535,778		202,034,448	668,328,469	214,000,000	1,084,362,918	3,251,172,861
2040	4,335,535,778		191,007,029	668,328,469	214,000,000	1,073,335,498	3,262,200,280
2041	4,335,535,778		179,979,609	668,328,469	214,000,000	1,062,308,078	3,273,227,700
2042	4,335,535,778		168,952,189	668,328,469	214,000,000	1,051,280,658	3,284,255,120
2043	4,335,535,778		157,924,769	668,328,469	214,000,000	1,040,253,239	3,295,282,540
2044	4,335,535,778		146,897,350	668,328,469	214,000,000	1,029,225,819	3,306,309,959
2045	4,335,535,778		135,869,930	668,328,469	214,000,000	1,018,198,399	3,317,337,379
2046	4,335,535,778		124,842,510	668,328,469	214,000,000	1,007,170,980	3,328,364,799
2047	4,335,535,778		113,815,090	668,328,469	214,000,000	996,143,560	3,339,392,219
2048	4,335,535,778		102,787,671	668,328,469	214,000,000	985,116,140	3,350,419,638
2049	4,335,535,778		91,760,251	668,328,469	214,000,000	974,088,720	3,361,447,058
2050	4,335,535,778		80,732,831	668,328,469	214,000,000	963,061,301	3,372,474,478
2051	4,335,535,778		69,705,411	668,328,469	214,000,000	952,033,881	3,383,501,898
2052	4,335,535,778		58,677,992	668,328,469	214,000,000	941,006,461	3,394,529,317
2053	4,335,535,778		50,928,304	469,678,024	214,000,000	734,606,329	3,600,929,450
2054	4,335,535,778		43,178,617	469,678,024	214,000,000	726,856,641	3,608,679,137
2055	4,335,535,778		35,428,930	469,678,024	214,000,000	719,106,954	3,616,428,825
2056	4,335,535,778		27,679,242	469,678,024	214,000,000	711,357,266	3,624,178,512
2057	4,335,535,778		22,630,398	305,990,571	214,000,000	542,620,968	3,792,914,810
2058	4,335,535,778		17,581,553	305,990,571	214,000,000	537,572,124	3,797,963,654
2059	4,335,535,778		12,532,709	305,990,571	214,000,000	532,523,280	3,803,012,499
2060	4,335,535,778		7,483,864	305,990,571	214,000,000	527,474,435	3,808,061,343
2061	4,335,535,778		5,612,898	113,391,885	214,000,000	333,004,784	4,002,530,995
2062	4,335,535,778		3,741,932	113,391,885	214,000,000	331,133,818	4,004,401,961
2063	4,335,535,778		1,870,966	113,391,885	214,000,000	329,262,851	4,006,272,927
2064	4,335,535,778		0	113,391,885	214,000,000	327,391,885	4,008,143,893
						Financial IRR	12%
						NPV @ 9.3 ADR	4,817,969,117.56

5.3.3 Direct Loan Scheme-Option 2 and Tariff based on Environmental and Sewer Charges

Annex 13.E.1 Phase 1

Phase 1	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2013		229,532,457	95,352,214			324,884,671	(324,884,671)
2014		1,217,337,541	95,352,214			1,312,689,755	(1,312,689,755)
2015		4,508,231,353	95,352,214			4,603,583,566	(4,603,583,566)
2016		1,042,816,590	95,352,214			1,138,168,804	(1,138,168,804)
2017	1,367,352,780		95,352,214		70,000,000	165,352,214	1,202,000,566
2018	1,367,352,780		95,352,214		70,000,000	165,352,214	1,202,000,566
2019	1,367,352,780		95,352,214	297,975,668	70,000,000	463,327,881	904,024,899
2020	1,367,352,780		95,352,214	297,975,668	70,000,000	463,327,881	904,024,899
2021	1,367,352,780		95,352,214	297,975,668	70,000,000	463,327,881	904,024,899
2022	1,367,352,780		95,352,214	297,975,668	70,000,000	463,327,881	904,024,899
2023	1,367,352,780		22,348,175	297,975,668	70,000,000	390,323,843	977,028,937
2024	1,367,352,780		20,858,297	297,975,668	70,000,000	388,833,964	978,518,815
2025	1,367,352,780		19,368,418	297,975,668	70,000,000	387,344,086	980,008,694
2026	1,367,352,780		17,878,540	297,975,668	70,000,000	385,854,208	981,498,572
2027	1,367,352,780		16,388,662	297,975,668	70,000,000	384,364,329	982,988,450
2028	1,367,352,780		14,898,783	297,975,668	70,000,000	382,874,451	984,478,329
2029	1,367,352,780		13,408,905	297,975,668	70,000,000	381,384,573	985,968,207
2030	1,367,352,780		11,919,027	297,975,668	70,000,000	379,894,694	987,458,085
2031	1,367,352,780		10,429,148	297,975,668	70,000,000	378,404,816	988,947,964
2032	1,367,352,780		8,939,270	297,975,668	70,000,000	376,914,938	990,437,842
2033	1,367,352,780		7,449,392	297,975,668	70,000,000	375,425,059	991,927,720
2034	1,367,352,780		5,959,513	297,975,668	70,000,000	373,935,181	993,417,599
2035	1,367,352,780		4,469,635	297,975,668	70,000,000	372,445,303	994,907,477
2036	1,367,352,780		2,979,757	297,975,668	70,000,000	370,955,424	996,397,355
2037	1,367,352,780		1,489,878	297,975,668	70,000,000	369,465,546	997,887,234
2038	1,367,352,780		0	297,975,668	70,000,000	367,975,668	999,377,112
Financial IRR							11%
NPV @ 9.3 ADR							839,442,770

Annex 13.E.2 Phase 2

Phase 2	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		574,376,057	78,569,978			652,946,034	(652,946,034)
2018		965,567,132	78,569,978			1,044,137,110	(1,044,137,110)
2019		3,960,207,346	78,569,978			4,038,777,323	(4,038,777,323)
2020		945,358,062	78,569,978			1,023,928,040	(1,023,928,040)
2021	1,238,376,225		78,569,978		60,000,000	138,569,978	1,099,806,247
2022	1,238,376,225		78,569,978		60,000,000	138,569,978	1,099,806,247
2023	1,238,376,225		74,641,479	245,531,180	60,000,000	380,172,659	858,203,566
2024	1,238,376,225		70,712,980	245,531,180	60,000,000	376,244,160	862,132,065
2025	1,238,376,225		66,784,481	245,531,180	60,000,000	372,315,661	866,060,564
2026	1,238,376,225		62,855,982	245,531,180	60,000,000	368,387,163	869,989,063
2027	1,238,376,225		58,927,483	245,531,180	60,000,000	364,458,664	873,917,561
2028	1,238,376,225		54,998,984	245,531,180	60,000,000	360,530,165	877,846,060
2029	1,238,376,225		51,070,486	245,531,180	60,000,000	356,601,666	881,774,559
2030	1,238,376,225		47,141,987	245,531,180	60,000,000	352,673,167	885,703,058
2031	1,238,376,225		43,213,488	245,531,180	60,000,000	348,744,668	889,631,557
2032	1,238,376,225		39,284,989	245,531,180	60,000,000	344,816,169	893,560,056
2033	1,238,376,225		35,356,490	245,531,180	60,000,000	340,887,670	897,488,555
2034	1,238,376,225		31,427,991	245,531,180	60,000,000	336,959,171	901,417,054
2035	1,238,376,225		27,499,492	245,531,180	60,000,000	333,030,673	905,345,553
2036	1,238,376,225		23,570,993	245,531,180	60,000,000	329,102,174	909,274,051
2037	1,238,376,225		19,642,494	245,531,180	60,000,000	325,173,675	913,202,550
2038	1,238,376,225		15,713,996	245,531,180	60,000,000	321,245,176	917,131,049
2039	1,238,376,225		11,785,497	245,531,180	60,000,000	317,316,677	921,059,548
2040	1,238,376,225		7,856,998	245,531,180	60,000,000	313,388,178	924,988,047
2041	1,238,376,225		3,928,499	245,531,180	60,000,000	309,459,679	928,916,546
2042	1,238,376,225		-	245,531,180	60,000,000	305,531,180	932,845,045
Financial IRR							11%
NPV @ 9.3 ADR							769,675,849

Annex 13.E.3 Phase 3

Phase 3	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2021		1,724,506,137	92,447,369			1,816,953,506	(1,816,953,506)
2022		883,696,518	92,447,369			976,143,887	(976,143,887)
2023		4,121,083,638	92,447,369			4,213,531,007	(4,213,531,007)
2024		965,045,270	92,447,369			1,057,492,639	(1,057,492,639)
2025	1,277,272,090		92,447,369		54,000,000	146,447,369	1,130,824,721
2026	1,277,272,090		92,447,369		54,000,000	146,447,369	1,130,824,721
2027	1,277,272,090		87,825,001	288,898,028	54,000,000	430,723,029	846,549,062
2028	1,277,272,090		83,202,632	288,898,028	54,000,000	426,100,660	851,171,430
2029	1,277,272,090		78,580,264	288,898,028	54,000,000	421,478,292	855,793,799
2030	1,277,272,090		73,957,895	288,898,028	54,000,000	416,855,923	860,416,167
2031	1,277,272,090		69,335,527	288,898,028	54,000,000	412,233,555	865,038,535
2032	1,277,272,090		64,713,158	288,898,028	54,000,000	407,611,186	869,660,904
2033	1,277,272,090		60,090,790	288,898,028	54,000,000	402,988,818	874,283,272
2034	1,277,272,090		55,468,421	288,898,028	54,000,000	398,366,449	878,905,641
2035	1,277,272,090		50,846,053	288,898,028	54,000,000	393,744,081	883,528,009
2036	1,277,272,090		46,223,684	288,898,028	54,000,000	389,121,713	888,150,378
2037	1,277,272,090		41,601,316	288,898,028	54,000,000	384,499,344	892,772,746
2038	1,277,272,090		36,978,948	288,898,028	54,000,000	379,876,976	897,395,115
2039	1,277,272,090		32,356,579	288,898,028	54,000,000	375,254,607	902,017,483
2040	1,277,272,090		27,734,211	288,898,028	54,000,000	370,632,239	906,639,852
2041	1,277,272,090		23,111,842	288,898,028	54,000,000	366,009,870	911,262,220
2042	1,277,272,090		18,489,474	288,898,028	54,000,000	361,387,502	915,884,588
2043	1,277,272,090		13,867,105	288,898,028	54,000,000	356,765,133	920,506,957
2044	1,277,272,090		9,244,737	288,898,028	54,000,000	352,142,765	925,129,325
2045	1,277,272,090		4,622,368	288,898,028	54,000,000	347,520,397	929,751,694
2046	1,277,272,090		-	288,898,028	54,000,000	342,898,028	934,374,062
Financial IRR							8%
NPV @ 9.3 ADR							(502,670,726)

Annex 13.E.4 Phase 4

Phase 4	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2025		181,022,934	54,428,105			235,451,039.01	(235,451,039.01)
2026		537,265,678	54,428,105			591,693,782.53	(591,693,782.53)
2027		2,328,584,166	54,428,105			2,383,012,271.45	(2,383,012,271.45)
2028		590,627,202	54,428,105			645,055,307.07	(645,055,307.07)
2029	452,534,683		54,428,105		30,000,000	84,428,104.98	368,106,578.39
2030	452,534,683		54,428,105		30,000,000	84,428,104.98	368,106,578.39
2031	452,534,683		54,428,105	170,087,828	30,000,000	254,515,933.05	198,018,750.32
2032	452,534,683		48,985,294	170,087,828	30,000,000	249,073,122.55	203,461,560.82
2033	452,534,683		46,263,889	170,087,828	30,000,000	246,351,717.31	206,182,966.07
2034	452,534,683		43,542,484	170,087,828	30,000,000	243,630,312.06	208,904,371.32
2035	452,534,683		40,821,079	170,087,828	30,000,000	240,908,906.81	211,625,776.56
2036	452,534,683		38,099,673	170,087,828	30,000,000	238,187,501.56	214,347,181.81
2037	452,534,683		35,378,268	170,087,828	30,000,000	235,466,096.31	217,068,587.06
2038	452,534,683		32,656,863	170,087,828	30,000,000	232,744,691.06	219,789,992.31
2039	452,534,683		29,935,458	170,087,828	30,000,000	230,023,285.81	222,511,397.56
2040	452,534,683		27,214,052	170,087,828	30,000,000	227,301,880.56	225,232,802.81
2041	452,534,683		24,492,647	170,087,828	30,000,000	224,580,475.31	227,954,208.06
2042	452,534,683		21,771,242	170,087,828	30,000,000	221,859,070.06	230,675,613.31
2043	452,534,683		19,049,837	170,087,828	30,000,000	219,137,664.81	233,397,018.56
2044	452,534,683		16,328,431	170,087,828	30,000,000	216,416,259.56	236,118,423.81
2045	452,534,683		13,607,026	170,087,828	30,000,000	213,694,854.32	238,839,829.06
2046	452,534,683		10,885,621	170,087,828	30,000,000	210,973,449.07	241,561,234.30
2047	452,534,683		8,164,216	170,087,828	30,000,000	208,252,043.82	244,282,639.55
2048	452,534,683		5,442,810	170,087,828	30,000,000	205,530,638.57	247,004,044.80
2049	452,534,683		2,721,405	170,087,828	30,000,000	202,809,233.32	249,725,450.05
2050	452,534,683		(0)	170,087,828	30,000,000	200,087,828.07	252,446,855.30
						Financial IRR	3%
						NPV @ 9.3 ADR	(1,518,927,682)

Annex 13.E.5 Overall Project Financial Analysis

Overall Project	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2013	-	229,532,457	95,352,214			324,884,671	(324,884,671)
2014	-	1,217,337,541	95,352,214			1,312,689,755	(1,312,689,755)
2015	-	4,508,231,353	95,352,214			4,603,583,566	(4,603,583,566)
2016	-	1,042,816,590	95,352,214			1,138,168,804	(1,138,168,804)
2017	1,367,352,780	574,376,057	173,922,191		70,000,000	818,298,248	549,054,532
2018	1,367,352,780	965,567,132	173,922,191	297,975,668	70,000,000	1,507,464,991	(140,112,212)
2019	1,367,352,780	3,960,207,346	173,922,191	297,975,668	70,000,000	4,502,105,204	(3,134,752,425)
2020	1,367,352,780	945,358,062	173,922,191	297,975,668	70,000,000	1,487,255,921	(119,903,141)
2021	2,515,648,315	1,724,506,137	266,369,560	297,975,668	130,000,000	2,418,851,364	96,796,951
2022	2,515,648,315	883,696,518	266,369,560	543,506,848	130,000,000	1,823,572,926	692,075,389
2023	2,515,648,315	4,121,083,638	189,437,023	543,506,848	130,000,000	4,984,027,508	(2,468,379,193)
2024	2,515,648,315	965,045,270	184,018,646	543,506,848	130,000,000	1,822,570,763	693,077,552
2025	3,883,001,095	181,022,934	233,028,373	543,506,848	184,000,000	1,141,558,155	2,741,442,940
2026	3,883,001,095	537,265,678	227,609,996	832,404,876	184,000,000	1,781,280,550	2,101,720,545
2027	3,883,001,095	2,328,584,166	217,569,251	832,404,876	184,000,000	3,562,558,293	320,442,802
2028	3,883,001,095	590,627,202	207,528,505	832,404,876	184,000,000	1,814,560,583	2,068,440,512
2029	3,883,001,095		197,487,759	832,404,876	214,000,000	1,243,892,635	2,639,108,460
2030	4,335,535,778		187,447,013	1,002,492,704	214,000,000	1,403,939,718	2,931,596,061
2031	4,335,535,778		177,406,268	1,002,492,704	214,000,000	1,393,898,972	2,941,636,807
2032	4,335,535,778		161,922,712	1,002,492,704	214,000,000	1,378,415,416	2,957,120,363
2033	4,335,535,778		149,160,561	1,002,492,704	214,000,000	1,365,653,265	2,969,882,514
2034	4,335,535,778		136,398,410	1,002,492,704	214,000,000	1,352,891,114	2,982,644,665
2035	4,335,535,778		123,636,259	1,002,492,704	214,000,000	1,340,128,963	2,995,406,815
2036	4,335,535,778		110,874,108	1,002,492,704	214,000,000	1,327,366,812	3,008,168,966
2037	4,335,535,778		98,111,957	1,002,492,704	214,000,000	1,314,604,661	3,020,931,117
2038	4,335,535,778		85,349,806	704,517,037	214,000,000	1,003,866,843	3,331,668,936
2039	4,335,535,778		74,077,534	704,517,037	214,000,000	992,594,570	3,342,941,208
2040	4,335,535,778		62,805,261	704,517,037	214,000,000	981,322,297	3,354,213,481
2041	4,335,535,778		51,532,988	704,517,037	214,000,000	970,050,025	3,365,485,754
2042	4,335,535,778		40,260,716	458,985,856	214,000,000	713,246,572	3,622,289,206
2043	4,335,535,778		32,916,942	458,985,856	214,000,000	705,902,798	3,629,632,980
2044	4,335,535,778		25,573,168	458,985,856	214,000,000	698,559,025	3,636,976,754
2045	4,335,535,778		18,229,395	458,985,856	214,000,000	691,215,251	3,644,320,528
2046	4,335,535,778		10,885,621	170,087,828	214,000,000	394,973,449	3,940,562,329
2047	4,335,535,778		8,164,216	170,087,828	214,000,000	392,252,044	3,943,283,735
2048	4,335,535,778		5,442,810	170,087,828	214,000,000	389,530,639	3,946,005,140
2049	4,335,535,778		2,721,405	668,328,469	214,000,000	885,049,875	3,450,485,904
2050	4,335,535,778		(0)	668,328,469	214,000,000	882,328,469	3,453,207,309
						Financial IRR	10%
						NPV @ 9.3 ADR	1,631,799,477.93

5.3.4 Direct Loan Scheme-Option 3 and Tariff based on Environmental and Sewer Charges

Annex 13.F.1 Phase 1

Phase 1	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013		229,532,457	89,392,700			318,925,157	(318,925,157)
2014		1,217,337,541	89,392,700			1,306,730,242	(1,306,730,242)
2015		4,508,231,353	89,392,700			4,597,624,053	(4,597,624,053)
2016		1,042,816,590	89,392,700			1,132,209,290	(1,132,209,290)
2017	1,367,352,780		89,392,700		70,000,000	159,392,700	1,207,960,079
2018	1,367,352,780		83,433,187	397,300,890	70,000,000	550,734,077	816,618,703
2019	1,367,352,780		77,473,674	397,300,890	70,000,000	544,774,564	822,578,216
2020	1,367,352,780		71,514,160	397,300,890	70,000,000	538,815,050	828,537,729
2021	1,367,352,780		65,554,647	397,300,890	70,000,000	532,855,537	834,497,243
2022	1,367,352,780		59,595,134	397,300,890	70,000,000	526,896,024	840,456,756
2023	1,367,352,780		53,635,620	397,300,890	70,000,000	520,936,510	846,416,269
2024	1,367,352,780		47,676,107	397,300,890	70,000,000	514,976,997	852,375,783
2025	1,367,352,780		41,716,593	397,300,890	70,000,000	509,017,483	858,335,296
2026	1,367,352,780		35,757,080	397,300,890	70,000,000	503,057,970	864,294,810
2027	1,367,352,780		29,797,567	397,300,890	70,000,000	497,098,457	870,254,323
2028	1,367,352,780		23,838,053	397,300,890	70,000,000	491,138,943	876,213,836
2029	1,367,352,780		17,878,540	397,300,890	70,000,000	485,179,430	882,173,350
2030	1,367,352,780		11,919,027	397,300,890	70,000,000	479,219,917	888,132,863
2031	1,367,352,780		5,959,513	397,300,890	70,000,000	473,260,403	894,092,376
2032	1,367,352,780		0	397,300,890	70,000,000	467,300,890	900,051,890
Financial IRR							8%
NPV @ 9.3 ADR							(673,846,197)

Annex 13.F.2 Phase 2

Phase 2	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		574,376,057	73,659,354			648,035,411	(648,035,411)
2018		965,567,132	73,659,354			1,039,226,486	(1,039,226,486)
2019		3,960,207,346	73,659,354			4,033,866,700	(4,033,866,700)
2020		945,358,062	73,659,354			1,019,017,416	(1,019,017,416)
2021	1,238,376,225		73,659,354		60,000,000	133,659,354	1,104,716,871
2022	1,238,376,225		68,748,731	327,374,907	60,000,000	456,123,638	782,252,587
2023	1,238,376,225		63,838,107	327,374,907	60,000,000	451,213,014	787,163,211
2024	1,238,376,225		58,927,483	327,374,907	60,000,000	446,302,390	792,073,835
2025	1,238,376,225		54,016,860	327,374,907	60,000,000	441,391,767	796,984,458
2026	1,238,376,225		49,106,236	327,374,907	60,000,000	436,481,143	801,895,082
2027	1,238,376,225		44,195,612	327,374,907	60,000,000	431,570,520	806,805,705
2028	1,238,376,225		39,284,989	327,374,907	60,000,000	426,659,896	811,716,329
2029	1,238,376,225		34,374,365	327,374,907	60,000,000	421,749,272	816,626,953
2030	1,238,376,225		29,463,742	327,374,907	60,000,000	416,838,649	821,537,576
2031	1,238,376,225		24,553,118	327,374,907	60,000,000	411,928,025	826,448,200
2032	1,238,376,225		19,642,494	327,374,907	60,000,000	407,017,402	831,358,824
2033	1,238,376,225		14,731,871	327,374,907	60,000,000	402,106,778	836,269,447
2034	1,238,376,225		9,821,247	327,374,907	60,000,000	397,196,154	841,180,071
2035	1,238,376,225		4,910,624	327,374,907	60,000,000	392,285,531	846,090,694
2036	1,238,376,225		0	327,374,907	60,000,000	387,374,907	851,001,318
Financial IRR							8%
NPV @ 9.3 ADR							(494,031,535)

Annex 13.F.3 Phase 3

Phase 3	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2021		1,724,506,137	86,669,408			1,811,175,545	(1,811,175,545)
2022		883,696,518	86,669,408			970,365,926	(970,365,926)
2023		4,121,083,638	86,669,408			4,207,753,046	(4,207,753,046)
2024		965,045,270	86,669,408			1,051,714,678	(1,051,714,678)
2025	1,277,272,090		86,669,408		54,000,000	140,669,408	1,136,602,682
2026	1,277,272,090		80,891,448	385,197,371	54,000,000	520,088,819	757,183,272
2027	1,277,272,090		75,113,487	385,197,371	54,000,000	514,310,858	762,961,232
2028	1,277,272,090		69,335,527	385,197,371	54,000,000	508,532,897	768,739,193
2029	1,277,272,090		63,557,566	385,197,371	54,000,000	502,754,937	774,517,153
2030	1,277,272,090		57,779,606	385,197,371	54,000,000	496,976,976	780,295,114
2031	1,277,272,090		52,001,645	385,197,371	54,000,000	491,199,016	786,073,074
2032	1,277,272,090		46,223,684	385,197,371	54,000,000	485,421,055	791,851,035
2033	1,277,272,090		40,445,724	385,197,371	54,000,000	479,643,095	797,628,996
2034	1,277,272,090		34,667,763	385,197,371	54,000,000	473,865,134	803,406,956
2035	1,277,272,090		28,889,803	385,197,371	54,000,000	468,087,174	809,184,917
2036	1,277,272,090		23,111,842	385,197,371	54,000,000	462,309,213	814,962,877
2037	1,277,272,090		17,333,882	385,197,371	54,000,000	456,531,252	820,740,838
2038	1,277,272,090		11,555,921	385,197,371	54,000,000	450,753,292	826,518,798
2039	1,277,272,090		5,777,961	385,197,371	54,000,000	444,975,331	832,296,759
2040	1,277,272,090		0	385,197,371	54,000,000	439,197,371	838,074,720
Financial IRR							5%
NPV @ 9.3 ADR							(1,855,610,570)

Annex 13.F.4 Phase 4							
Phase 4	Cash Inflow	Cash Outflow					Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2025		181,022,934	51,026,348			232,049,282	(232,049,282)
2026		537,265,678	51,026,348			588,292,026	(588,292,026)
2027		2,328,584,166	51,026,348			2,379,610,515	(2,379,610,515)
2028		590,627,202	51,026,348			641,653,551	(641,653,551)
2029	452,534,683		51,026,348		30,000,000	81,026,348	371,508,335
2030	452,534,683		51,026,348	226,783,771	30,000,000	307,810,119	144,724,564
2031	452,534,683		44,222,835	226,783,771	30,000,000	301,006,606	151,528,077
2032	452,534,683		40,821,079	226,783,771	30,000,000	297,604,849	154,929,834
2033	452,534,683		37,419,322	226,783,771	30,000,000	294,203,093	158,331,590
2034	452,534,683		34,017,566	226,783,771	30,000,000	290,801,336	161,733,347
2035	452,534,683		30,615,809	226,783,771	30,000,000	287,399,580	165,135,104
2036	452,534,683		27,214,052	226,783,771	30,000,000	283,997,823	168,536,860
2037	452,534,683		23,812,296	226,783,771	30,000,000	280,596,067	171,938,617
2038	452,534,683		20,410,539	226,783,771	30,000,000	277,194,310	175,340,373
2039	452,534,683		17,008,783	226,783,771	30,000,000	273,792,554	178,742,130
2040	452,534,683		13,607,026	226,783,771	30,000,000	270,390,797	182,143,886
2041	452,534,683		10,205,270	226,783,771	30,000,000	266,989,040	185,545,643
2042	452,534,683		6,803,513	226,783,771	30,000,000	263,587,284	188,947,399
2043	452,534,683		3,401,757	226,783,771	30,000,000	260,185,527	192,349,156
2044	452,534,683		0	226,783,771	30,000,000	256,783,771	195,750,913
						Financial IRR	-2.7%
						NPV @ 9.3 ADR	(2,071,754,116)

Annex 13.F.5 Overall Project Financial Analysis

Overall Project	Cash Inflow	Cash Outflow				Net Inflow	
	Revenues	Devt Cost	Interest	Principal	OM		Total
2013	-	229,532,457	89,392,700			318,925,157	(318,925,157)
2014	-	1,217,337,541	89,392,700			1,306,730,242	(1,306,730,242)
2015	-	4,508,231,353	89,392,700			4,597,624,053	(4,597,624,053)
2016	-	1,042,816,590	89,392,700			1,132,209,290	(1,132,209,290)
2017	1,367,352,780	574,376,057	163,052,054		70,000,000	807,428,111	559,924,669
2018	1,367,352,780	965,567,132	157,092,541	397,300,890	70,000,000	1,589,960,563	(222,607,784)
2019	1,367,352,780	3,960,207,346	151,133,028	397,300,890	70,000,000	4,578,641,263	(3,211,288,484)
2020	1,367,352,780	945,358,062	145,173,514	397,300,890	70,000,000	1,557,832,466	(190,479,687)
2021	2,515,648,315	1,724,506,137	225,883,409	397,300,890	130,000,000	2,477,690,436	37,957,879
2022	2,515,648,315	883,696,518	215,013,272	724,675,797	130,000,000	1,953,385,588	562,262,728
2023	2,515,648,315	4,121,083,638	204,143,135	724,675,797	130,000,000	5,179,902,570	(2,664,254,255)
2024	2,515,648,315	965,045,270	193,272,999	724,675,797	130,000,000	2,012,994,066	502,654,250
2025	3,883,001,095	181,022,934	233,429,210	724,675,797	184,000,000	1,323,127,941	2,559,873,154
2026	3,883,001,095	537,265,678	216,781,112	1,109,873,168	184,000,000	2,047,919,958	1,835,081,137
2027	3,883,001,095	2,328,584,166	200,133,015	1,109,873,168	184,000,000	3,822,590,349	60,410,746
2028	3,883,001,095	590,627,202	183,484,917	1,109,873,168	184,000,000	2,067,985,287	1,815,015,808
2029	3,883,001,095		166,836,820	1,109,873,168	214,000,000	1,490,709,988	2,392,291,107
2030	4,335,535,778		150,188,722	1,336,656,939	214,000,000	1,700,845,661	2,634,690,117
2031	4,335,535,778		126,737,112	1,336,656,939	214,000,000	1,677,394,050	2,658,141,728
2032	4,335,535,778		106,687,258	1,336,656,939	214,000,000	1,657,344,196	2,678,191,582
2033	4,335,535,778		92,596,917	939,356,049	214,000,000	1,245,952,966	3,089,582,813
2034	4,335,535,778		78,506,576	939,356,049	214,000,000	1,231,862,625	3,103,673,154
2035	4,335,535,778		64,416,235	939,356,049	214,000,000	1,217,772,284	3,117,763,494
2036	4,335,535,778		50,325,895	939,356,049	214,000,000	1,203,681,943	3,131,853,835
2037	4,335,535,778		41,146,178	611,981,142	214,000,000	867,127,319	3,468,408,459
2038	4,335,535,778		31,966,460	611,981,142	214,000,000	857,947,602	3,477,588,176
2039	4,335,535,778		22,786,743	611,981,142	214,000,000	848,767,885	3,486,767,894
2040	4,335,535,778		13,607,026	611,981,142	214,000,000	839,588,168	3,495,947,611
2041	4,335,535,778		10,205,270	226,783,771	214,000,000	450,989,040	3,884,546,738
2042	4,335,535,778		6,803,513	226,783,771	214,000,000	447,587,284	3,887,948,495
2043	4,335,535,778		3,401,757	226,783,771	214,000,000	444,185,527	3,891,350,251
2044	4,335,535,778		0	226,783,771	214,000,000	440,783,771	3,894,752,008
Financial IRR							9%
NPV @ 9.3 ADR							(28,039,446.24)

5.4 Financial Computations without Interest and Principal Payments with Water Tariff from Environmental Charges Only

Phase 1 (N1)

Phase 1	Cash Inflow		Cash Outflow		Net Inflow
	Revenues	Devt Cost	OM	Total	
2013		229,532,457		229,532,457	(229,532,457)
2014		1,217,337,541		1,217,337,541	(1,217,337,541)
2015		4,508,231,353		4,508,231,353	(4,508,231,353)
2016		1,042,816,590		1,042,816,590	(1,042,816,590)
2017	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2018	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2019	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2020	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2021	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2022	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2023	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2024	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2025	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2026	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2027	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2028	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2029	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2030	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2031	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2032	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2033	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2034	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2035	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2036	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2037	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2038	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2039	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2040	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2041	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2042	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2043	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2044	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2045	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2046	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2047	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2048	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2049	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2050	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2051	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2052	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2053	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2054	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2055	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2056	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2057	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2058	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2059	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2060	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2061	1,367,352,780		70,000,000	70,000,000	1,297,352,780
2062	1,367,352,780		70,000,000	70,000,000	1,297,352,780
Financial IRR					16%
NPV @ 9.3 ADR					4,589,190,410

Phase 2 (N2)

Phase 2	Cash Inflow	Cash Outflow			Net Inflow
	Revenues	Devt Cost	OM	Total	
2017		574,376,057		574,376,057	(574,376,057)
2018		965,567,132		965,567,132	(965,567,132)
2019		3,960,207,346		3,960,207,346	(3,960,207,346)
2020		945,358,062		945,358,062	(945,358,062)
2021	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2022	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2023	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2024	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2025	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2026	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2027	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2028	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2029	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2030	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2031	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2032	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2033	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2034	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2035	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2036	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2037	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2038	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2039	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2040	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2041	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2042	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2043	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2044	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2045	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2046	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2047	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2048	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2049	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2050	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2051	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2052	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2053	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2054	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2055	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2056	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2057	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2058	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2059	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2060	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2061	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2062	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2063	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2064	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2065	1,238,376,225		60,000,000	60,000,000	1,178,376,225
2066	1,238,376,225		60,000,000	60,000,000	1,178,376,225
Financial IRR					15%
NPV @ 9.3 ADR					4,044,699,366

Phase 3 (N3)

Phase 3	Cash Inflow	Cash Outflow			Net Inflow
	Revenues	Devt Cost	OM	Total	
2021		1,724,506,137		1,724,506,137	(1,724,506,137)
2022		883,696,518		883,696,518	(883,696,518)
2023		4,121,083,638		4,121,083,638	(4,121,083,638)
2024		965,045,270		965,045,270	(965,045,270)
2025	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2026	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2027	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2028	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2029	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2030	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2031	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2032	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2033	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2034	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2035	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2036	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2037	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2038	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2039	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2040	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2041	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2042	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2043	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2044	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2045	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2046	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2047	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2048	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2049	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2050	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2051	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2052	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2053	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2054	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2055	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2056	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2057	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2058	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2059	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2060	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2061	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2062	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2063	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2064	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2065	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2066	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2067	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2068	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2069	1,277,272,090		54,000,000	54,000,000	1,223,272,090
2070	1,277,272,090		54,000,000	54,000,000	1,223,272,090
Financial IRR					13%
NPV @ 9.3 ADR					3,183,258,933

Phase 4 (N4)

Phase 4	Cash Inflow	Cash Outflow			Net Inflow
	Revenues	Devt Cost	OM	Total	
2025		181,022,934		181,022,934	(181,022,934)
2026		537,265,678		537,265,678	(537,265,678)
2027		2,328,584,166		2,328,584,166	(2,328,584,166)
2028		590,627,202		590,627,202	(590,627,202)
2029	452,534,683		30,000,000	30,000,000	422,534,683
2030	452,534,683		30,000,000	30,000,000	422,534,683
2031	452,534,683		30,000,000	30,000,000	422,534,683
2032	452,534,683		30,000,000	30,000,000	422,534,683
2033	452,534,683		30,000,000	30,000,000	422,534,683
2034	452,534,683		30,000,000	30,000,000	422,534,683
2035	452,534,683		30,000,000	30,000,000	422,534,683
2036	452,534,683		30,000,000	30,000,000	422,534,683
2037	452,534,683		30,000,000	30,000,000	422,534,683
2038	452,534,683		30,000,000	30,000,000	422,534,683
2039	452,534,683		30,000,000	30,000,000	422,534,683
2040	452,534,683		30,000,000	30,000,000	422,534,683
2041	452,534,683		30,000,000	30,000,000	422,534,683
2042	452,534,683		30,000,000	30,000,000	422,534,683
2043	452,534,683		30,000,000	30,000,000	422,534,683
2044	452,534,683		30,000,000	30,000,000	422,534,683
2045	452,534,683		30,000,000	30,000,000	422,534,683
2046	452,534,683		30,000,000	30,000,000	422,534,683
2047	452,534,683		30,000,000	30,000,000	422,534,683
2048	452,534,683		30,000,000	30,000,000	422,534,683
2049	452,534,683		30,000,000	30,000,000	422,534,683
2050	452,534,683		30,000,000	30,000,000	422,534,683
2051	452,534,683		30,000,000	30,000,000	422,534,683
2052	452,534,683		30,000,000	30,000,000	422,534,683
2053	452,534,683		30,000,000	30,000,000	422,534,683
2054	452,534,683		30,000,000	30,000,000	422,534,683
2055	452,534,683		30,000,000	30,000,000	422,534,683
2056	452,534,683		30,000,000	30,000,000	422,534,683
2057	452,534,683		30,000,000	30,000,000	422,534,683
2058	452,534,683		30,000,000	30,000,000	422,534,683
2059	452,534,683		30,000,000	30,000,000	422,534,683
2060	452,534,683		30,000,000	30,000,000	422,534,683
2061	452,534,683		30,000,000	30,000,000	422,534,683
2062	452,534,683		30,000,000	30,000,000	422,534,683
2063	452,534,683		30,000,000	30,000,000	422,534,683
2064	452,534,683		30,000,000	30,000,000	422,534,683
2065	452,534,683		30,000,000	30,000,000	422,534,683
2066	452,534,683		30,000,000	30,000,000	422,534,683
2067	452,534,683		30,000,000	30,000,000	422,534,683
2068	452,534,683		30,000,000	30,000,000	422,534,683
2069	452,534,683		30,000,000	30,000,000	422,534,683
2070	452,534,683		30,000,000	30,000,000	422,534,683
2071	452,534,683		30,000,000	30,000,000	422,534,683
2072	452,534,683		30,000,000	30,000,000	422,534,683
2073	452,534,683		30,000,000	30,000,000	422,534,683
2074	452,534,683		30,000,000	30,000,000	422,534,683
Financial IRR					10%
NPV @ 9.3 ADR					347,227,236

Overall Project (N5)

Overall Project	Cash Inflow		Cash Outflow		Net Inflow
	Revenues	Devt Cost	OM	Total	
2013	0	229,532,457		229,532,457	(229,532,457)
2014	0	1,217,337,541		1,217,337,541	(1,217,337,541)
2015	0	4,508,231,353		4,508,231,353	(4,508,231,353)
2016	0	1,042,816,590		1,042,816,590	(1,042,816,590)
2017	1,367,352,780	574,376,057	70,000,000	644,376,057	722,976,723
2018	1,367,352,780	965,567,132	70,000,000	1,035,567,132	331,785,647
2019	1,367,352,780	3,960,207,346	70,000,000	4,030,207,346	(2,662,854,566)
2020	1,367,352,780	945,358,062	70,000,000	1,015,358,062	351,994,718
2021	2,515,648,315	1,724,506,137	130,000,000	1,854,506,137	661,142,179
2022	2,515,648,315	883,696,518	130,000,000	1,013,696,518	1,501,951,797
2023	2,515,648,315	4,121,083,638	130,000,000	4,251,083,638	(1,735,435,322)
2024	2,515,648,315	965,045,270	130,000,000	1,095,045,270	1,420,603,046
2025	3,883,001,095	181,022,934	184,000,000	365,022,934	3,517,978,161
2026	3,883,001,095	537,265,678	184,000,000	721,265,678	3,161,735,417
2027	3,883,001,095	2,328,584,166	184,000,000	2,512,584,166	1,370,416,929
2028	3,883,001,095	590,627,202	184,000,000	774,627,202	3,108,373,893
2029	3,883,001,095		214,000,000	214,000,000	3,669,001,095
2030	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2031	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2032	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2033	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2034	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2035	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2036	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2037	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2038	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2039	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2040	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2041	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2042	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2043	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2044	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2045	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2046	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2047	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2048	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2049	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2050	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2051	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2052	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2053	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2054	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2055	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2056	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2057	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2058	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2059	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2060	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2061	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2062	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2063	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2064	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2065	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2066	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2067	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2068	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2069	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2070	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2071	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2072	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2073	4,335,535,778		214,000,000	214,000,000	4,121,535,778
2074	4,335,535,778		214,000,000	214,000,000	4,121,535,778
Financial IRR					15%
NPV @ 9.3 DR					9,040,757,845

(Annex G to M)

6. Basic Cost

6.1 By Phase

PHASE 1 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	0	5,598,625,500	5,598,625,500
A.2 Consulting Services			
Base Cost for JICA Financing	205,884,650	155,003,200	360,887,850
Total Eligible Portion	205,884,650	5,753,628,700	5,959,513,350
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	-	573,692,500	573,692,500
B. 2 Land Acquisition			
Base Cost for Equity	-	89,603,580	89,603,580
B. 3 Admin Cost			
Base Cost for Equity	-	375,108,511	375,108,511
Total Non-Eligible Portion	-	1,038,404,591	1,038,404,591
Total A+B	205,884,650	6,792,033,291	6,997,917,941
% of ODA (Eligible Portion)	85%		
% of Ecuity (Non-Eligible Portion)	15%		

PHASE 2 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	-	4,549,143,000	4,549,143,000
A.2 Consulting Services			
Base Cost for JICA Financing	206,520,577	154,960,030	361,480,607
Total Eligible Portion	206,520,577	4,704,103,030	4,910,623,607
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	-	773,806,000	773,806,000
B. 2 Land Acquisition			
Base Cost for Equity	-	420,972,200	420,972,200
B. 3 Admin Cost			
Base Cost for Equity	-	340,106,790	340,106,790
Total Non-Eligible Portion	-	1,534,884,990	1,534,884,990
Total A+B	206,520,577	6,238,988,020	6,445,508,597
% of ODA (Eligible Portion)	76%		
% of Ecuity (Non-Eligible Portion)	24%		

PHASE 3 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	-	5,416,480,000	5,416,480,000
A.2 Consulting Services			
Base Cost for JICA Financing	206,520,561	154,960,000	361,480,561
Total Eligible Portion	206,520,561	5,571,440,000	5,777,960,561
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	-	-	-
B. 2 Land Acquisition			
Base Cost for Equity	-	1,526,318,200	1,526,318,200
B. 3 Admin Cost			
Base Cost for Equity	-	390,052,801	390,052,801
Total Non-Eligible Portion	-	1,916,371,001	1,916,371,001
Total A+B	206,520,561	7,487,811,001	7,694,331,562
% of ODA (Eligible Portion)	75%		1,916,371,001
% of Ecuity (Non-Eligible Portion)	25%		

PHASE 4 in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	–	3,040,276,000	3,040,276,000
A.2 Consulting Services			
Base Cost for JICA Financing	206,520,561	154,960,000	361,480,561
Total Eligible Portion	206,520,561	3,195,236,000	3,401,756,561
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	–	–	–
B. 2 Land Acquisition			
Base Cost for Equity	–	–	–
B. 3 Admin Cost			
Base Cost for Equity	–	235,743,419	235,743,419
Total Non-Eligible Portion	–	235,743,419	235,743,419
Total A+B	206,520,561	3,430,979,419	3,637,499,980
% of ODA (Eligible Portion)		94%	235,743,419
% of Ecuity (Non-Eligible Portion)		6%	

OVERALL PROJECT in Php

	TOTAL BASE COSTS		TOTAL
	Foreign Cost	Local Cost	
A. Eligible Portion			
A. 1 Procurement and Construction			
Base cost for JICA financing	–	18,604,524,500	18,604,524,500
A.2 Consulting Services			
Base Cost for JICA Financing	825,446,350	619,883,230	1,445,329,580
Total Eligible Portion	825,446,350	19,224,407,730	20,049,854,080
B. Non-Eligible Portion			
B. 1 Procurement and Construction			
Base Cost for Equity	–	1,347,498,500	1,347,498,500
B. 2 Land Acquisition			
Base Cost for Equity	–	2,036,893,980	2,036,893,980
B. 3 Admin Cost			
Base Cost for Equity	–	1,341,011,520	1,341,011,520
Total Non-Eligible Portion	–	4,725,404,000	4,725,404,000
Total A+B	825,446,350	23,949,811,730	24,775,258,080
% of ODA (Eligible Portion)		81%	
% of Ecuity (Non-Eligible Portion)		19%	

Note: Eligible Portion = Procurement/Costs + Consulting Services

Non-Eligible = Procurement/Construction+Land Acquisition+Admin Cost

6.2. Cost Breakdown

Financial Cost on CAPEX			
	TOTAL CAPEX In	Year	Annual CAPEX in
	Php		Php
Phase 1	6,997,917,941	2013	229,532,457
		2014	1,217,337,541
		2015	4,508,231,353
		2016	1,042,816,590
		2017	574,376,057
Phase 2	6,445,508,597	2018	965,567,132
		2019	3,960,207,346
		2020	945,358,062
		2021	1,724,506,137
		2022	883,696,518
Phase 3	7,694,331,562	2023	4,121,083,638
		2024	965,045,270
		2025	181,022,934
		2026	537,265,678
		2027	2,328,584,166
Phase 4	3,637,499,980	2028	590,627,202
TOTAL	24,775,258,080		24,775,258,080

Economic Costs Computation on CAPEX (in PhP)

Year	Material (Imported)	Material Local	Total Material	Skilled Labor	Unskilled Labor	Total Labor	Total Investment Cost
2013	49,579,011	96,403,632	145,982,643	36,725,193	33,052,674	69,777,867	215,760,510
2014	262,944,909	511,281,767	774,226,676	194,774,007	175,296,606	370,070,613	1,144,297,289
2015	973,777,972	1,893,457,168	2,867,235,140	721,317,016	649,185,315	1,370,502,331	4,237,737,471
2016	225,248,383	437,982,968	663,231,351	166,850,654	150,165,589	317,016,243	980,247,595
2017	124,065,228	241,237,944	365,303,172	91,900,169	82,710,152	174,610,321	539,913,493
2018	208,562,501	405,538,196	614,100,696	154,490,741	139,041,667	293,532,408	907,633,104
2019	855,404,787	1,663,287,085	2,518,691,872	633,633,175	570,269,858	1,203,903,033	3,722,594,905
2020	204,197,341	397,050,386	601,247,727	151,257,290	136,131,561	287,388,851	888,636,578
2021	372,493,326	724,292,577	1,096,785,903	275,920,982	248,328,884	524,249,866	1,621,035,768
2022	190,878,448	371,152,538	562,030,985	141,391,443	127,252,299	268,643,741	830,674,727
2023	890,154,066	1,730,855,128	2,621,009,193	659,373,382	593,436,044	1,252,809,426	3,873,818,619
2024	208,449,778	405,319,013	613,768,792	154,407,243	138,966,519	293,373,762	907,142,554
2025	39,100,954	76,029,632	115,130,586	28,963,669	26,067,302	55,030,972	170,161,558
2026	116,049,386	225,651,585	341,700,971	85,962,508	77,366,258	163,328,766	505,029,737
2027	502,974,180	978,005,350	1,480,979,530	372,573,467	335,316,120	707,889,587	2,188,869,116
2028	127,575,476	248,063,425	375,638,901	94,500,352	85,050,317	179,550,669	555,189,570
	5,351,455,745	10,405,608,394	15,757,064,139	3,964,041,293	3,567,637,164	7,531,678,456	23,288,742,595

Shadow Exchange Rate = 1.2

Material Component = 60%

Imported Material Component = 30%

Shadow Wage Rate = 0.6

Labor Component = 40%

Unskilled Labor = 60%

Economic Cost Computations on OM (in Php)

Year	Annual OM	Material (Imported)	Material Local	Total Material	Skilled Labor	Unskilled Labor	Total Labor	Total OM Cost
2013		-	-	-	-	-	-	-
2014		-	-	-	-	-	-	-
2015		-	-	-	-	-	-	-
2016	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2017	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2018	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2019	70,000,000	10,080,000	19,600,000	29,680,000	16,800,000	15,120,000	31,920,000	61,600,000
2020	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2021	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2022	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2023	130,000,000	18,720,000	36,400,000	55,120,000	31,200,000	28,080,000	59,280,000	114,400,000
2024	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2025	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2026	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2027	184,000,000	26,496,000	51,520,000	78,016,000	44,160,000	39,744,000	83,904,000	161,920,000
2028	214,000,000	30,816,000	59,920,000	90,736,000	51,360,000	46,224,000	97,584,000	188,320,000

Base Costs Table

BASE COST ESTIMATES USED IN THE COMPUTATION (in Philippine Peso)

Phase	Service Coverage	Service Commencement	ODA Loan in Php			Equity in Php				TOTAL INVESTMENT	Annual OPEX
			Procurement/ Construction	Consulting Services	Total ODA	Procurement/ Construction	Land Procurement	Admin Cost	Total Equity		
Phase 1	427,932	2,017	5,598,625,500	360,887,850	5,959,513,350	573,692,500	89,603,580	375,108,511	1,038,404,591	6,997,917,941	70,000,000.00
Phase 2	387,567	2,021	4,549,143,000	361,480,607	4,910,623,607	773,806,000	420,972,200	340,106,790	1,534,884,990	6,445,508,597	60,000,000.00
Phase 3	399,740	2,015	5,416,480,000	361,480,561	5,777,960,561	-	1,526,318,200	390,052,801	1,916,371,001	7,694,331,562	54,000,000.00
Phase 4	141,627	2,029	3,040,276,000	361,480,561	3,401,756,561	-	-	235,743,419	235,743,419	3,637,499,980	30,000,000.00
	1,356,866		18,604,524,500	1,445,329,580	20,049,854,080	1,347,498,500	2,036,893,980	1,341,011,520	4,725,404,000	24,775,258,080	214,000,000.00
Percentages			93%	7%			43%	28%		ODA 81%	Equity 19%

563,074,047.28 in US Dollar @ Php044=1USD

	Loan Agreement	Const. Sked	Service Commitment	Pay Period (30 yrs) under Direct Loan
Phase 1	2012	2014-2016	2017	2013-2043
Phase 2	2016	2018-2020	2021	2017-2046
Phase 3	2020	2022-2024	2025	2021-2051
Phase 4	2024	2026-2028	2029	2025-2054

7. Impact on Tariff

Additional Fee

Construction Phase	Year of Service Commitment	Service Population	Water Demand Projection		OM Cost per Year Cumulative MP (A)	Construction Cost Cumulative MP (B)	Additional Monthly Cost ((A+B)/40)/12/C	Environmental Charge of 20% P/L/mo.	Total Charge Additional for Sewerage P/L/mo
			L/pcp	ML/mo (C)					
Phase 1	2017	427,932	180	2,311	697	6249	0.031	0.006	0.037
		1,237,607		6,683			0.011	0.002	0.013
Phase 2	2021	815,489	186	4,538	1295	11926	0.029	0.006	0.035
		1,284,930		7,151			0.019	0.004	0.022
Phase 3	2025	1,215,239	186	6,763	1839	18640	0.028	0.006	0.034
		1,321,618		7,355			0.026	0.005	0.031
Phase 4	2029	1,356,866	186	7,551	2138	22604	0.030	0.006	0.036
		1,356,866		7,551			0.030	0.006	0.036

Cumulative Coverage

Phase 1	34.58%
Phase 2	63.47%
Phase 3	91.95%
Phase 4	100.00%

Impact on Water Tariff

Project Impact on Water Tariff (Phases 1-4)			
Basic Tariff	Water Consumption in cu m	Rate per cu m in P	Amount (P)
First 10	10	8.57	85.68
Second 10	10	10.45	104.50
Next 20	10	19.81	198.10
Monthly Bill	30		388.27
Tariff per cu m			12.94
Addl Charge due to Project			0.036
Total Basic Charge			388.30
FCDA			4.7
Environmental Charge (16%)			62.13
Sewer Charge (20%)			77.66
Maintenance Service Charge			1.5
Total Current Charge Before Tax			534.29
Add Vat of 12%			64.12
Total Amount Due			598.41

0.23809524 percentage increase from 2010 to June 2011

Computation for Project Impact on Water Tariff (Phase 1)

Basic Tariff	Water Consumption in cu m	Rate per cu m in P	Amount (P)
First 10	10	8.57	85.68
Second 10	10	10.45	104.50
Next 20	10	19.81	198.10
Monthly Bill	30		388.27
Tariff per cu m			12.94
Addl Charge due to Project			0.037
Total Basic Charge			388.30
FCDA			4.7
Environmental Charge (16%)			62.13
Sewer Charge (20%)			77.66
Maintenance Service Charge			1.5
Total Current Charge Before Tax			534.29
Add Vat of 12%			64.12
Total Amount Due			598.41

0.238095238 percentage increase from 2010 to June 2011

Computation for Project Impact on Water Tariff (Phase 1-2)

Basic Tariff	Water Consumption in cu m	Rate per cu m in P	Amount (P)
First 10	10	8.57	85.68
Second 10	10	10.45	104.50
Next 20	10	19.81	198.10
Monthly Bill	30		388.27
Tariff per cu m			12.94

Addl Charge due to Project	0.035
Total Basic Charge	388.30
FCDA	4.7
Environmental Charge (16%)	62.13
Sewer Charge (20%)	77.66
Maintenance Service Charge	1.5
Total Current Charge Before Tax	534.29
Add Vat of 12%	64.12
Total Amount Due	598.41

0.238095238 percentage increase from 2010 to June 2011

Computation for Project Impact on Water Tariff (Phase 1-3)

Basic Tariff	Water Consumption in cu m	Rate per cu m in P	Amount (P)
First 10	10	8.57	85.68
Second 10	10	10.45	104.50
Next 20	10	19.81	198.10
Monthly Bill	30		388.27
Tariff per cu m			12.94

Addl Charge due to Project	0.000
Total Basic Charge	388.27
FCDA	4.7
Environmental Charge (16%)	62.12
Sewer Charge (20%)	77.65
Maintenance Service Charge	1.5
Total Current Charge Before Tax	534.24
Add Vat of 12%	64.11
Total Amount Due	598.35

0.238095238 percentage increase from 2010 to June 2011

8. Summary of Analysis

	Without Interest and Payments					With Interest and Payments				
	Phase 1	Phase 2	Phase 3	Phase 4	Overall	Phase 1	Phase 2	Phase 3	Phase 4	Overall
FINANCIAL ANALYSIS										
JICA Direct Loan										
Option 1 FIRR	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
NPV at 9.3% ADR (in Php)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
Option 2 FIRR	31%	30%	26%	21%	30%	28%	27%	23%	17%	26%
NPV at 9.3% ADR (in Php)	15,342,275,822	13,780,005,222	13,216,246,033	3,913,047,250	36,147,264,609	12,924,129,759	11,714,465,868	10,785,881,607	2,480,581,502	30,193,541,959
Option 3 FIRR	31%	30%	25%	21%	30%	26%	26%	22%	15%	26%
NPV at 9.3% ADR (in Php)	12,874,719,922	11,542,415,202	10,901,905,108	3,102,000,861	33,453,434,286	10,008,045,451	9,180,282,843	8,122,562,054	1,463,490,429	27,003,492,236
Two Step Loan										
LBP FIRR	14%	14%	11%	7%	14%	25%	25%	19%	0.156340898	23%
NPV at 9.3% ADR (in Php)	18,425,748,292	16,576,113,769	16,108,269,559	4,926,529,983	39,510,699,290	13,624,910,730	12,619,410,971	5,653,279,686	26,620,905,666	26,620,905,666
DBP FIRR	14%	14%	11%	7%	14%	24%	24%	20%	0.147638578	23%
NPV at 9.3% ADR (in Php)	18,428,000,474	16,578,153,513	16,110,373,369	4,927,275,358	39,515,658,897	14,174,031,213	13,072,893,830	11,985,998,580	2,499,062,349	29,974,910,416
ECONOMIC ANALYSIS										
EIRR	32%	31%	26%	22%	31%					
NPV at 15% DR (in Php)	7,634,125,293	6,781,253,466	6,037,790,886	1,547,217,864	13,806,102,939					

9. Two Step Loan through Government Financial Institutes

9.1 LBP

Govt Gurantee Fee	1%	Foreign Exchange Fee	0%	Admin Fee	3%	Interest + Commitment	0.50%	Total	4.75%
Grace	10								
Repay	40								

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	283,076,884		283,076,884
2014		283,076,884		283,076,884
2015		283,076,884		283,076,884
2016		283,076,884		283,076,884
2017		283,076,884		283,076,884
2018		283,076,884		283,076,884
2019		283,076,884		283,076,884
2020		283,076,884		283,076,884
2021		283,076,884		283,076,884
2022		283,076,884		283,076,884
2023	5,810,525,517	275,999,962	148,987,834	424,987,796
2024	5,661,537,683	268,923,040	148,987,834	417,910,874
2025	5,512,549,849	261,846,118	148,987,834	410,833,952
2026	5,363,562,015	254,769,196	148,987,834	403,757,029
2027	5,214,574,182	247,692,274	148,987,834	396,680,107
2028	5,065,586,348	240,615,352	148,987,834	389,603,185
2029	4,916,598,514	233,538,429	148,987,834	382,526,263
2030	4,767,610,680	226,461,507	148,987,834	375,449,341
2031	4,618,622,846	219,384,585	148,987,834	368,372,419
2032	4,469,635,013	212,307,663	148,987,834	361,295,497
2033	4,320,647,179	205,230,741	148,987,834	354,218,575
2034	4,171,659,345	198,153,819	148,987,834	347,141,653
2035	4,022,671,511	191,076,897	148,987,834	340,064,731
2036	3,873,683,678	183,999,975	148,987,834	332,987,808
2037	3,724,695,844	176,923,053	148,987,834	325,910,886
2038	3,575,708,010	169,846,130	148,987,834	318,833,964
2039	3,426,720,176	162,769,208	148,987,834	311,757,042
2040	3,277,732,343	155,692,286	148,987,834	304,680,120
2041	3,128,744,509	148,615,364	148,987,834	297,603,198
2042	2,979,756,675	141,538,442	148,987,834	290,526,276
2043	2,830,768,841	134,461,520	148,987,834	283,449,354
2044	2,681,781,008	127,384,598	148,987,834	276,372,432
2045	2,532,793,174	120,307,676	148,987,834	269,295,510
2046	2,383,805,340	113,230,754	148,987,834	262,218,587
2047	2,234,817,506	106,153,832	148,987,834	255,141,665
2048	2,085,829,673	99,076,909	148,987,834	248,064,743
2049	1,936,841,839	91,999,987	148,987,834	240,987,821
2050	1,787,854,005	84,923,065	148,987,834	233,910,899
2051	1,638,866,171	77,846,143	148,987,834	226,833,977
2052	1,489,878,338	70,769,221	148,987,834	219,757,055
2053	1,340,890,504	63,692,299	148,987,834	212,680,133
2054	1,191,902,670	56,615,377	148,987,834	205,603,211
2055	1,042,914,836	49,538,455	148,987,834	198,526,288
2056	893,927,003	42,461,533	148,987,834	191,449,366
2057	744,939,169	35,384,611	148,987,834	184,372,444
2058	595,951,335	28,307,688	148,987,834	177,295,522
2059	446,963,501	21,230,766	148,987,834	170,218,600
2060	297,975,668	14,153,844	148,987,834	163,141,678
2061	148,987,834	7,076,922	148,987,834	156,064,756
2062	0	0	148,987,834	148,987,834
2063				
2064				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	233,254,621		233,254,621
2018		233,254,621		233,254,621
2019		233,254,621		233,254,621
2020		233,254,621		233,254,621
2021		233,254,621		233,254,621
2022		233,254,621		233,254,621
2023		233,254,621		233,254,621
2024		233,254,621		233,254,621
2025		233,254,621		233,254,621
2026	4,787,858,017	227,423,256	122,765,590	350,188,846
2027	4,665,092,427	221,591,890	122,765,590	344,357,480
2028	4,542,326,837	215,760,525	122,765,590	338,526,115
2029	4,419,561,246	209,929,159	122,765,590	332,694,749
2030	4,296,795,656	204,097,794	122,765,590	326,863,384
2031	4,174,030,066	198,266,428	122,765,590	321,032,018
2032	4,051,264,476	192,435,063	122,765,590	315,200,653
2033	3,928,498,886	186,603,697	122,765,590	309,369,287
2034	3,805,733,296	180,772,332	122,765,590	303,537,922
2035	3,682,967,705	174,940,966	122,765,590	297,706,556
2036	3,560,202,115	169,109,600	122,765,590	291,875,191
2037	3,437,436,525	163,278,235	122,765,590	286,043,825
2038	3,314,670,935	157,446,869	122,765,590	280,212,460
2039	3,191,905,345	151,615,504	122,765,590	274,381,094
2040	3,069,139,754	145,784,138	122,765,590	268,549,729
2041	2,946,374,164	139,952,773	122,765,590	262,718,363
2042	2,823,608,574	134,121,407	122,765,590	256,886,997
2043	2,700,842,984	128,290,042	122,765,590	251,055,632
2044	2,578,077,394	122,458,676	122,765,590	245,224,266
2045	2,455,311,804	116,627,311	122,765,590	239,392,901
2046	2,332,546,213	110,795,945	122,765,590	233,561,535
2047	2,209,780,623	104,964,580	122,765,590	227,730,170
2048	2,087,015,033	99,133,214	122,765,590	221,898,804
2049	1,964,249,443	93,301,849	122,765,590	216,067,439
2050	1,841,483,853	87,470,483	122,765,590	210,236,073
2051	1,718,718,263	81,639,117	122,765,590	204,404,708
2052	1,595,952,672	75,807,752	122,765,590	198,573,342
2053	1,473,187,082	69,976,386	122,765,590	192,741,977
2054	1,350,421,492	64,145,021	122,765,590	186,910,611
2055	1,227,655,902	58,313,655	122,765,590	181,079,246
2056	1,104,890,312	52,482,290	122,765,590	175,247,880
2057	982,124,721	46,650,924	122,765,590	169,416,514
2058	859,359,131	40,819,559	122,765,590	163,585,149
2059	736,593,541	34,988,193	122,765,590	157,753,783
2060	613,827,951	29,156,828	122,765,590	151,922,418
2061	491,062,361	23,325,462	122,765,590	146,091,052
2062	368,296,771	17,494,097	122,765,590	140,259,687
2063	245,531,180	11,662,731	122,765,590	134,428,321
2064	122,765,590	5,831,366	122,765,590	128,596,956
2065		0	122,765,590	122,765,590
2066				
2067				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	274,453,127		274,453,127
2022		274,453,127		274,453,127
2023		274,453,127		274,453,127
2024		274,453,127		274,453,127
2025		274,453,127		274,453,127
2026		274,453,127		274,453,127
2027		274,453,127		274,453,127
2028		274,453,127		274,453,127
2029		274,453,127		274,453,127
2030		274,453,127		274,453,127
2031	5,633,511,547	267,591,799	144,449,014	412,040,813
2032	5,489,062,533	260,730,470	144,449,014	405,179,484
2033	5,344,613,519	253,869,142	144,449,014	398,318,156
2034	5,200,164,505	247,007,814	144,449,014	391,456,828
2035	5,055,715,491	240,146,486	144,449,014	384,595,500
2036	4,911,266,477	233,285,158	144,449,014	377,734,172
2037	4,766,817,463	226,423,830	144,449,014	370,872,844
2038	4,622,368,449	219,562,501	144,449,014	364,011,515
2039	4,477,919,435	212,701,173	144,449,014	357,150,187
2040	4,333,470,421	205,839,845	144,449,014	350,288,859
2041	4,189,021,407	198,978,517	144,449,014	343,427,531
2042	4,044,572,393	192,117,189	144,449,014	336,566,203
2043	3,900,123,379	185,255,861	144,449,014	329,704,875
2044	3,755,674,365	178,394,532	144,449,014	322,843,546
2045	3,611,225,351	171,533,204	144,449,014	315,982,218
2046	3,466,776,337	164,671,876	144,449,014	309,120,890
2047	3,322,327,323	157,810,548	144,449,014	302,259,562
2048	3,177,878,309	150,949,220	144,449,014	295,398,234
2049	3,033,429,295	144,087,892	144,449,014	288,536,906
2050	2,888,980,281	137,226,563	144,449,014	281,675,577
2051	2,744,531,267	130,365,235	144,449,014	274,814,249
2052	2,600,082,253	123,503,907	144,449,014	267,952,921
2053	2,455,633,239	116,642,579	144,449,014	261,091,593
2054	2,311,184,225	109,781,251	144,449,014	254,230,265
2055	2,166,735,211	102,919,923	144,449,014	247,368,937
2056	2,022,286,196	96,058,594	144,449,014	240,507,608
2057	1,877,837,182	89,197,266	144,449,014	233,646,280
2058	1,733,388,168	82,335,938	144,449,014	226,784,952
2059	1,588,939,154	75,474,610	144,449,014	219,923,624
2060	1,444,490,140	68,613,282	144,449,014	213,062,296
2061	1,300,041,126	61,751,954	144,449,014	206,200,968
2062	1,155,592,112	54,890,625	144,449,014	199,339,639
2063	1,011,143,098	48,029,297	144,449,014	192,478,311
2064	866,694,084	41,167,969	144,449,014	185,616,983
2065	722,245,070	34,306,641	144,449,014	178,755,655
2066	577,796,056	27,445,313	144,449,014	171,894,327
2067	433,347,042	20,583,985	144,449,014	165,032,999
2068	288,898,028	13,722,656	144,449,014	158,171,670
2069	144,449,014	6,861,328	144,449,014	151,310,342
2070	0	0	144,449,014	144,449,014
2071				
2072				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	161,583,437		161,583,437
2026		161,583,437		161,583,437
2027		161,583,437		161,583,437
2028		161,583,437		161,583,437
2029		161,583,437		161,583,437
2030		161,583,437		161,583,437
2031		161,583,437		161,583,437
2032		161,583,437		161,583,437
2033		161,583,437		161,583,437
2034		161,583,437		161,583,437
2035	3,316,712,647	157,543,851	85,043,914	242,587,765
2036	3,231,668,733	153,504,265	85,043,914	238,548,179
2037	3,146,624,819	149,464,679	85,043,914	234,508,593
2038	3,061,580,905	145,425,093	85,043,914	230,469,007
2039	2,976,536,991	141,385,507	85,043,914	226,429,421
2040	2,891,493,077	137,345,921	85,043,914	222,389,835
2041	2,806,449,163	133,306,335	85,043,914	218,350,249
2042	2,721,405,249	129,266,749	85,043,914	214,310,663
2043	2,636,361,335	125,227,163	85,043,914	210,271,077
2044	2,551,317,421	121,187,578	85,043,914	206,231,492
2045	2,466,273,507	117,147,992	85,043,914	202,191,906
2046	2,381,229,593	113,108,406	85,043,914	198,152,320
2047	2,296,185,679	109,068,820	85,043,914	194,112,734
2048	2,211,141,765	105,029,234	85,043,914	190,073,148
2049	2,126,097,851	100,989,648	85,043,914	186,033,562
2050	2,041,053,937	96,950,062	85,043,914	181,993,976
2051	1,956,010,023	92,910,476	85,043,914	177,954,390
2052	1,870,966,109	88,870,890	85,043,914	173,914,804
2053	1,785,922,195	84,831,304	85,043,914	169,875,218
2054	1,700,878,281	80,791,718	85,043,914	165,835,632
2055	1,615,834,367	76,752,132	85,043,914	161,796,046
2056	1,530,790,453	72,712,547	85,043,914	157,756,461
2057	1,445,746,539	68,672,961	85,043,914	153,716,875
2058	1,360,702,625	64,633,375	85,043,914	149,677,289
2059	1,275,658,711	60,593,789	85,043,914	145,637,703
2060	1,190,614,796	56,554,203	85,043,914	141,598,117
2061	1,105,570,882	52,514,617	85,043,914	137,558,531
2062	1,020,526,968	48,475,031	85,043,914	133,518,945
2063	935,483,054	44,435,445	85,043,914	129,479,359
2064	850,439,140	40,395,859	85,043,914	125,439,773
2065	765,395,226	36,356,273	85,043,914	121,400,187
2066	680,351,312	32,316,687	85,043,914	117,360,601
2067	595,307,398	28,277,101	85,043,914	113,321,015
2068	510,263,484	24,237,516	85,043,914	109,281,430
2069	425,219,570	20,197,930	85,043,914	105,241,844
2070	340,175,656	16,158,344	85,043,914	101,202,258
2071	255,131,742	12,118,758	85,043,914	97,162,672
2072	170,087,828	8,079,172	85,043,914	93,123,086
2073	85,043,914	4,039,586	85,043,914	89,083,500
2074	0	0	85,043,914	85,043,914

Year	TOTAL				
	Principal	Interest	Repayment	Total	
2012					
2013	5,959,513,350	-	283,076,884	-	283,076,884
2014		-	283,076,884	-	283,076,884
2015		-	283,076,884	-	283,076,884
2016		-	283,076,884	-	283,076,884
2017	4,910,623,607	-	516,331,505	-	516,331,505
2018		-	516,331,505	-	516,331,505
2019		-	516,331,505	-	516,331,505
2020		-	516,331,505	-	516,331,505
2021	5,777,960,561	-	790,784,632	-	790,784,632
2022		-	790,784,632	-	790,784,632
2023		5,810,525,517	783,707,710	148,987,834	932,695,544
2024		5,661,537,683	776,630,788	148,987,834	925,618,622
2025	3,401,756,561	5,512,549,849	931,137,303	148,987,834	1,080,125,136
2026		10,151,420,032	918,229,015	271,753,424	1,189,982,439
2027		9,879,666,608	905,320,727	271,753,424	1,177,074,151
2028		9,607,913,184	892,412,440	271,753,424	1,164,165,864
2029		9,336,159,760	879,504,152	271,753,424	1,151,257,576
2030		9,064,406,337	866,595,864	271,753,424	1,138,349,288
2031		14,426,164,460	846,826,249	416,202,438	1,263,028,686
2032		14,009,962,022	827,056,633	416,202,438	1,243,259,071
2033		13,593,759,584	807,287,017	416,202,438	1,223,489,455
2034		13,177,557,146	787,517,401	416,202,438	1,203,719,839
2035		16,078,067,355	763,708,199	501,246,352	1,264,954,551
2036		15,576,821,003	739,898,998	501,246,352	1,241,145,350
2037		15,075,574,651	716,089,796	501,246,352	1,217,336,148
2038		14,574,328,299	692,280,594	501,246,352	1,193,526,946
2039		14,073,081,947	668,471,393	501,246,352	1,169,717,745
2040		13,571,835,595	644,662,191	501,246,352	1,145,908,543
2041		13,070,589,243	620,852,989	501,246,352	1,122,099,341
2042		12,569,342,891	597,043,787	501,246,352	1,098,290,139
2043		12,068,096,539	573,234,586	501,246,352	1,074,480,938
2044		11,566,850,187	549,425,384	501,246,352	1,050,671,736
2045		11,065,603,835	525,616,182	501,246,352	1,026,862,534
2046		10,564,357,483	501,806,980	501,246,352	1,003,053,332
2047		10,063,111,131	477,997,779	501,246,352	979,244,131
2048		9,561,864,779	454,188,577	501,246,352	955,434,929
2049		9,060,618,427	430,379,375	501,246,352	931,625,727
2050		8,559,372,075	406,570,174	501,246,352	907,816,526
2051		8,058,125,723	382,760,972	501,246,352	884,007,324
2052		7,556,879,371	358,951,770	501,246,352	860,198,122
2053		7,055,633,019	335,142,568	501,246,352	836,388,920
2054		6,554,386,667	311,333,367	501,246,352	812,579,719
2055		6,053,140,315	287,524,165	501,246,352	788,770,517
2056		5,551,893,963	263,714,963	501,246,352	764,961,315
2057		5,050,647,611	239,905,762	501,246,352	741,152,114
2058		4,549,401,259	216,096,560	501,246,352	717,342,912
2059		4,048,154,907	192,287,358	501,246,352	693,533,710
2060		3,546,908,555	168,478,156	501,246,352	669,724,508
2061		3,045,662,203	144,668,955	501,246,352	645,915,307
2062		2,544,415,851	120,859,753	501,246,352	622,106,105
2063		2,192,157,333	104,127,473	352,258,518	456,385,992
2064		1,839,898,815	87,395,194	352,258,518	439,653,712
2065		1,487,640,296	70,662,914	352,258,518	422,921,432
2066		1,258,147,368	59,762,000	229,492,928	289,254,928
2067		1,028,654,440	48,861,086	229,492,928	278,354,014
2068		799,161,512	37,960,172	229,492,928	267,453,100
2069		569,668,584	27,059,258	229,492,928	256,552,186
2070		340,175,656	16,158,344	229,492,928	245,651,272
2071		255,131,742	12,118,758	85,043,914	97,162,672
2072		170,087,828	8,079,172	85,043,914	93,123,086
2073		85,043,914	4,039,586	85,043,914	89,083,500
2074		0	0	85,043,914	85,043,914
	20,049,854,080		27,861,603,409	20,049,854,080	47,911,457,489
					27,861,603,409

% increase of interest charges 58%

9.2 DBP

Govt Guarantee Fee	1%	Front Exchange Fee	0%	Admin Fee	3%	Interest + Commitment	0.75%	Front End Fee	1.0%	Total	5.75%
Grace	10										
Repay	40										

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	342,672,018		342,672,018
2014		342,672,018		342,672,018
2015		342,672,018		342,672,018
2016		342,672,018		342,672,018
2017		342,672,018		342,672,018
2018		342,672,018		342,672,018
2019		342,672,018		342,672,018
2020		342,672,018		342,672,018
2021		342,672,018		342,672,018
2022		342,672,018		342,672,018
2023	5,810,525,517	334,105,217	148,987,834	483,093,051
2024	5,661,537,683	325,538,417	148,987,834	474,526,251
2025	5,512,549,849	316,971,616	148,987,834	465,959,450
2026	5,363,562,015	308,404,816	148,987,834	457,392,650
2027	5,214,574,182	299,838,015	148,987,834	448,825,849
2028	5,065,586,348	291,271,215	148,987,834	440,259,049
2029	4,916,598,514	282,704,415	148,987,834	431,692,248
2030	4,767,610,680	274,137,614	148,987,834	423,125,448
2031	4,618,622,846	265,570,814	148,987,834	414,558,647
2032	4,469,635,013	257,004,013	148,987,834	405,991,847
2033	4,320,647,179	248,437,213	148,987,834	397,425,047
2034	4,171,659,345	239,870,412	148,987,834	388,858,246
2035	4,022,671,511	231,303,612	148,987,834	380,291,446
2036	3,873,683,678	222,736,811	148,987,834	371,724,645
2037	3,724,695,844	214,170,011	148,987,834	363,157,845
2038	3,575,708,010	205,603,211	148,987,834	354,591,044
2039	3,426,720,176	197,036,410	148,987,834	346,024,244
2040	3,277,732,343	188,469,610	148,987,834	337,457,443
2041	3,128,744,509	179,902,809	148,987,834	328,890,643
2042	2,979,756,675	171,336,009	148,987,834	320,323,843
2043	2,830,768,841	162,769,208	148,987,834	311,757,042
2044	2,681,781,008	154,202,408	148,987,834	303,190,242
2045	2,532,793,174	145,635,607	148,987,834	294,623,441
2046	2,383,805,340	137,068,807	148,987,834	286,056,641
2047	2,234,817,506	128,502,007	148,987,834	277,489,840
2048	2,085,829,673	119,935,206	148,987,834	268,923,040
2049	1,936,841,839	111,368,406	148,987,834	260,356,239
2050	1,787,854,005	102,801,605	148,987,834	251,789,439
2051	1,638,866,171	94,234,805	148,987,834	243,222,639
2052	1,489,878,338	85,668,004	148,987,834	234,655,838
2053	1,340,890,504	77,101,204	148,987,834	226,089,038
2054	1,191,902,670	68,534,404	148,987,834	217,522,237
2055	1,042,914,836	59,967,603	148,987,834	208,955,437
2056	893,927,003	51,400,803	148,987,834	200,388,636
2057	744,939,169	42,834,002	148,987,834	191,821,836
2058	595,951,335	34,267,202	148,987,834	183,255,036
2059	446,963,501	25,700,401	148,987,834	174,688,235
2060	297,975,668	17,133,601	148,987,834	166,121,435
2061	148,987,834	8,566,800	148,987,834	157,554,634
2062	0	0	148,987,834	148,987,834
2063				
2064				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	282,360,857		282,360,857
2018		282,360,857		282,360,857
2019		282,360,857		282,360,857
2020		282,360,857		282,360,857
2021		282,360,857		282,360,857
2022		282,360,857		282,360,857
2023		282,360,857		282,360,857
2024		282,360,857		282,360,857
2025		282,360,857		282,360,857
2026		282,360,857		282,360,857
2027	4,787,858,017	275,301,836	122,765,590	398,067,426
2028	4,665,092,427	268,242,815	122,765,590	391,008,405
2029	4,542,326,837	261,183,793	122,765,590	383,949,383
2030	4,419,561,246	254,124,772	122,765,590	376,890,362
2031	4,296,795,656	247,065,750	122,765,590	369,831,340
2032	4,174,030,066	240,006,729	122,765,590	362,772,319
2033	4,051,264,476	232,947,707	122,765,590	355,713,298
2034	3,928,498,886	225,888,686	122,765,590	348,654,276
2035	3,805,733,296	218,829,664	122,765,590	341,595,255
2036	3,682,967,705	211,770,643	122,765,590	334,536,233
2037	3,560,202,115	204,711,622	122,765,590	327,477,212
2038	3,437,436,525	197,652,600	122,765,590	320,418,190
2039	3,314,670,935	190,593,579	122,765,590	313,359,169
2040	3,191,905,345	183,534,557	122,765,590	306,300,147
2041	3,069,139,754	176,475,536	122,765,590	299,241,126
2042	2,946,374,164	169,416,514	122,765,590	292,182,105
2043	2,823,608,574	162,357,493	122,765,590	285,123,083
2044	2,700,842,984	155,298,472	122,765,590	278,064,062
2045	2,578,077,394	148,239,450	122,765,590	271,005,040
2046	2,455,311,804	141,180,429	122,765,590	263,946,019
2047	2,332,546,213	134,121,407	122,765,590	256,886,997
2048	2,209,780,623	127,062,386	122,765,590	249,827,976
2049	2,087,015,033	120,003,364	122,765,590	242,768,955
2050	1,964,249,443	112,944,343	122,765,590	235,709,933
2051	1,841,483,853	105,885,322	122,765,590	228,650,912
2052	1,718,718,263	98,826,300	122,765,590	221,591,890
2053	1,595,952,672	91,767,279	122,765,590	214,532,869
2054	1,473,187,082	84,708,257	122,765,590	207,473,847
2055	1,350,421,492	77,649,236	122,765,590	200,414,826
2056	1,227,655,902	70,590,214	122,765,590	193,355,805
2057	1,104,890,312	63,531,193	122,765,590	186,296,783
2058	982,124,721	56,472,171	122,765,590	179,237,762
2059	859,359,131	49,413,150	122,765,590	172,178,740
2060	736,593,541	42,354,129	122,765,590	165,119,719
2061	613,827,951	35,295,107	122,765,590	158,060,697
2062	491,062,361	28,236,086	122,765,590	151,001,676
2063	368,296,771	21,177,064	122,765,590	143,942,654
2064	245,531,180	14,118,043	122,765,590	136,883,633
2065	122,765,590	7,059,021	122,765,590	129,824,612
2066		0	0	122,765,590
2067				
2068				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	332,232,732		332,232,732
2022		332,232,732		332,232,732
2023		332,232,732		332,232,732
2024		332,232,732		332,232,732
2025		332,232,732		332,232,732
2026		332,232,732		332,232,732
2027		332,232,732		332,232,732
2028		332,232,732		332,232,732
2029		332,232,732		332,232,732
2030		332,232,732		332,232,732
2031	5,633,511,547	323,926,914	144,449,014	468,375,928
2032	5,489,062,533	315,621,096	144,449,014	460,070,110
2033	5,344,613,519	307,315,277	144,449,014	451,764,291
2034	5,200,164,505	299,009,459	144,449,014	443,458,473
2035	5,055,715,491	290,703,641	144,449,014	435,152,655
2036	4,911,266,477	282,397,822	144,449,014	426,846,836
2037	4,766,817,463	274,092,004	144,449,014	418,541,018
2038	4,622,368,449	265,786,186	144,449,014	410,235,200
2039	4,477,919,435	257,480,368	144,449,014	401,929,382
2040	4,333,470,421	249,174,549	144,449,014	393,623,563
2041	4,189,021,407	240,868,731	144,449,014	385,317,745
2042	4,044,572,393	232,562,913	144,449,014	377,011,927
2043	3,900,123,379	224,257,094	144,449,014	368,706,108
2044	3,755,674,365	215,951,276	144,449,014	360,400,290
2045	3,611,225,351	207,645,458	144,449,014	352,094,472
2046	3,466,776,337	199,339,639	144,449,014	343,788,653
2047	3,322,327,323	191,033,821	144,449,014	335,482,835
2048	3,177,878,309	182,728,003	144,449,014	327,177,017
2049	3,033,429,295	174,422,184	144,449,014	318,871,198
2050	2,888,980,281	166,116,366	144,449,014	310,565,380
2051	2,744,531,267	157,810,548	144,449,014	302,259,562
2052	2,600,082,253	149,504,730	144,449,014	293,953,744
2053	2,455,633,239	141,198,911	144,449,014	285,647,925
2054	2,311,184,225	132,893,093	144,449,014	277,342,107
2055	2,166,735,211	124,587,275	144,449,014	269,036,289
2056	2,022,286,196	116,281,456	144,449,014	260,730,470
2057	1,877,837,182	107,975,638	144,449,014	252,424,652
2058	1,733,388,168	99,669,820	144,449,014	244,118,834
2059	1,588,939,154	91,364,001	144,449,014	235,813,015
2060	1,444,490,140	83,058,183	144,449,014	227,507,197
2061	1,300,041,126	74,752,365	144,449,014	219,201,379
2062	1,155,592,112	66,446,546	144,449,014	210,895,560
2063	1,011,143,098	58,140,728	144,449,014	202,589,742
2064	866,694,084	49,834,910	144,449,014	194,283,924
2065	722,245,070	41,529,092	144,449,014	185,978,106
2066	577,796,056	33,223,273	144,449,014	177,672,287
2067	433,347,042	24,917,455	144,449,014	169,366,469
2068	288,898,028	16,611,637	144,449,014	161,060,651
2069	144,449,014	8,305,818	144,449,014	152,754,832
2070	0	0	144,449,014	144,449,014
2071				
2072				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	195,601,002		195,601,002
2026		195,601,002		195,601,002
2027		195,601,002		195,601,002
2028		195,601,002		195,601,002
2029		195,601,002		195,601,002
2030		195,601,002		195,601,002
2031		195,601,002		195,601,002
2032		195,601,002		195,601,002
2033		195,601,002		195,601,002
2034		195,601,002		195,601,002
2035	3,316,712,647	190,710,977	85,043,914	275,754,891
2036	3,231,668,733	185,820,952	85,043,914	270,864,866
2037	3,146,624,819	180,930,927	85,043,914	265,974,841
2038	3,061,580,905	176,040,902	85,043,914	261,084,816
2039	2,976,536,991	171,150,877	85,043,914	256,194,791
2040	2,891,493,077	166,260,852	85,043,914	251,304,766
2041	2,806,449,163	161,370,827	85,043,914	246,414,741
2042	2,721,405,249	156,480,802	85,043,914	241,524,716
2043	2,636,361,335	151,590,777	85,043,914	236,634,691
2044	2,551,317,421	146,700,752	85,043,914	231,744,666
2045	2,466,273,507	141,810,727	85,043,914	226,854,641
2046	2,381,229,593	136,920,702	85,043,914	221,964,616
2047	2,296,185,679	132,030,677	85,043,914	217,074,591
2048	2,211,141,765	127,140,651	85,043,914	212,184,566
2049	2,126,097,851	122,250,626	85,043,914	207,294,540
2050	2,041,053,937	117,360,601	85,043,914	202,404,515
2051	1,956,010,023	112,470,576	85,043,914	197,514,490
2052	1,870,966,109	107,580,551	85,043,914	192,624,465
2053	1,785,922,195	102,690,526	85,043,914	187,734,440
2054	1,700,878,281	97,800,501	85,043,914	182,844,415
2055	1,615,834,367	92,910,476	85,043,914	177,954,390
2056	1,530,790,453	88,020,451	85,043,914	173,064,365
2057	1,445,746,539	83,130,426	85,043,914	168,174,340
2058	1,360,702,625	78,240,401	85,043,914	163,284,315
2059	1,275,658,711	73,350,376	85,043,914	158,394,290
2060	1,190,614,796	68,460,351	85,043,914	153,504,265
2061	1,105,570,882	63,570,326	85,043,914	148,614,240
2062	1,020,526,968	58,680,301	85,043,914	143,724,215
2063	935,483,054	53,790,276	85,043,914	138,834,190
2064	850,439,140	48,900,251	85,043,914	133,944,165
2065	765,395,226	44,010,226	85,043,914	129,054,140
2066	680,351,312	39,120,200	85,043,914	124,164,114
2067	595,307,398	34,230,175	85,043,914	119,274,089
2068	510,263,484	29,340,150	85,043,914	114,384,064
2069	425,219,570	24,450,125	85,043,914	109,494,039
2070	340,175,656	19,560,100	85,043,914	104,604,014
2071	255,131,742	14,670,075	85,043,914	99,713,989
2072	170,087,828	9,780,050	85,043,914	94,823,964
2073	85,043,914	4,890,025	85,043,914	89,933,939
2074	0	0	85,043,914	85,043,914

Year	TOTAL				
	Principal	Interest	Repayment	Total	
2012					
2013	5,959,513,350	-	342,672,018	-	342,672,018
2014	-	-	342,672,018	-	342,672,018
2015	-	-	342,672,018	-	342,672,018
2016	-	-	342,672,018	-	342,672,018
2017	4,910,623,607	-	625,032,875	-	625,032,875
2018	-	-	625,032,875	-	625,032,875
2019	-	-	625,032,875	-	625,032,875
2020	-	-	625,032,875	-	625,032,875
2021	5,777,960,561	-	957,265,607	-	957,265,607
2022	-	-	957,265,607	-	957,265,607
2023	-	5,810,525,517	948,698,807	148,987,834	1,097,686,641
2024	-	5,661,537,683	940,132,006	148,987,834	1,089,119,840
2025	3,401,756,561	5,512,549,849	1,127,166,208	148,987,834	1,276,154,042
2026	-	5,363,562,015	1,118,599,408	148,987,834	1,267,587,242
2027	-	10,002,432,199	1,102,973,586	271,753,424	1,374,727,010
2028	-	9,730,678,775	1,087,347,764	271,753,424	1,359,101,188
2029	-	9,458,925,351	1,071,721,942	271,753,424	1,343,475,366
2030	-	9,187,171,927	1,056,096,120	271,753,424	1,327,849,544
2031	-	14,548,930,050	1,032,164,480	416,202,438	1,448,366,918
2032	-	14,132,727,612	1,008,232,840	416,202,438	1,424,435,278
2033	-	13,716,525,174	984,301,200	416,202,438	1,400,503,638
2034	-	13,300,322,736	960,369,560	416,202,438	1,376,571,998
2035	-	16,200,832,946	931,547,894	501,246,352	1,432,794,246
2036	-	15,699,586,594	902,726,229	501,246,352	1,403,972,581
2037	-	15,198,340,241.6	873,904,564	501,246,352.0	1,375,150,915.9
2038		14,697,093,890	845,082,899	501,246,352	1,346,329,251
2039		14,195,847,538	816,261,233	501,246,352	1,317,507,585
2040		13,694,601,186	787,439,568	501,246,352	1,288,685,920
2041		13,193,354,834	758,617,903	501,246,352	1,259,864,255
2042		12,692,108,482	729,796,238	501,246,352	1,231,042,590
2043		12,190,862,130	700,974,572	501,246,352	1,202,220,924
2044		11,689,615,778	672,152,907	501,246,352	1,173,399,259
2045		11,188,369,426	643,331,242	501,246,352	1,144,577,594
2046		10,687,123,074	614,509,577	501,246,352	1,115,755,929
2047		10,185,876,722	585,687,911	501,246,352	1,086,934,263
2048		9,684,630,370	556,866,246	501,246,352	1,058,112,598
2049		9,183,384,018	528,044,581	501,246,352	1,029,290,933
2050		8,682,137,666	499,222,916	501,246,352	1,000,469,268
2051		8,180,891,314	470,401,251	501,246,352	971,647,603
2052		7,679,644,961	441,579,585	501,246,352	942,825,937
2053		7,178,398,609	412,757,920	501,246,352	914,004,272
2054		6,677,152,257	383,936,255	501,246,352	885,182,607
2055		6,175,905,905	355,114,590	501,246,352	856,360,942
2056		5,674,659,553	326,292,924	501,246,352	827,539,276
2057		5,173,413,201	297,471,259	501,246,352	798,717,611
2058		4,672,166,849	268,649,594	501,246,352	769,895,946
2059		4,170,920,497	239,827,929	501,246,352	741,074,281
2060		3,669,674,145	211,006,263	501,246,352	712,252,615
2061		3,168,427,793	182,184,598	501,246,352	683,430,950
2062		2,667,181,441	153,362,933	501,246,352	654,609,285
2063		2,314,922,923	133,108,068	352,258,518	485,366,586
2064		1,962,664,405	112,853,203	352,258,518	465,111,722
2065		1,610,405,887	92,598,338	352,258,518	444,856,857
2066		1,258,147,368	72,343,474	352,258,518	424,601,992
2067		1,028,654,440	59,147,630	229,492,928	288,640,558
2068		799,161,512	45,951,787	229,492,928	275,444,715
2069		569,668,584	32,755,944	229,492,928	262,248,872
2070		340,175,656	19,560,100	229,492,928	249,053,028
2071		255,131,742	14,670,075	85,043,914	99,713,989
2072		170,087,828	9,780,050	85,043,914	94,823,964
2073		85,043,914	4,890,025	85,043,914	89,933,939
2074		0	0	85,043,914	85,043,914
			34,009,564,984	20,049,854,080	54,059,419,064
					20,049,854,080

% increase in interest charges 37%

10. JICA Direct Loan

10.1 Option 1

Interest **0.65%** Commitment Charge **0.10%** Govt. Gurantee Fee **1%** TOTAL **1.75%**
 Grace **10**
 Repay **40**

Year	Phase 1			Total
	Principal	Interest	Repayment	
2012				
2013	5,959,513,350	104,291,484		104,291,484
2014		104,291,484		104,291,484
2015		104,291,484		104,291,484
2016		104,291,484		104,291,484
2017		104,291,484		104,291,484
2018		104,291,484		104,291,484
2019		104,291,484		104,291,484
2020		104,291,484		104,291,484
2021		104,291,484		104,291,484
2022		104,291,484		104,291,484
2023	5,810,525,517	101,684,197	148,987,834	250,672,030
2024	5,661,537,683	99,076,909	148,987,834	248,064,743
2025	5,512,549,849	96,469,622	148,987,834	245,457,456
2026	5,363,562,015	93,862,335	148,987,834	242,850,169
2027	5,214,574,182	91,255,048	148,987,834	240,242,882
2028	5,065,586,348	88,647,761	148,987,834	237,635,595
2029	4,916,598,514	86,040,474	148,987,834	235,028,308
2030	4,767,610,680	83,433,187	148,987,834	232,421,021
2031	4,618,622,846	80,825,900	148,987,834	229,813,734
2032	4,469,635,013	78,218,613	148,987,834	227,206,446
2033	4,320,647,179	75,611,326	148,987,834	224,599,159
2034	4,171,659,345	73,004,039	148,987,834	221,991,872
2035	4,022,671,511	70,396,751	148,987,834	219,384,585
2036	3,873,683,678	67,789,464	148,987,834	216,777,298
2037	3,724,695,844	65,182,177	148,987,834	214,170,011
2038	3,575,708,010	62,574,890	148,987,834	211,562,724
2039	3,426,720,176	59,967,603	148,987,834	208,955,437
2040	3,277,732,343	57,360,316	148,987,834	206,348,150
2041	3,128,744,509	54,753,029	148,987,834	203,740,863
2042	2,979,756,675	52,145,742	148,987,834	201,133,576
2043	2,830,768,841	49,538,455	148,987,834	198,526,288
2044	2,681,781,008	46,931,168	148,987,834	195,919,001
2045	2,532,793,174	44,323,881	148,987,834	193,311,714
2046	2,383,805,340	41,716,593	148,987,834	190,704,427
2047	2,234,817,506	39,109,306	148,987,834	188,097,140
2048	2,085,829,673	36,502,019	148,987,834	185,489,853
2049	1,936,841,839	33,894,732	148,987,834	182,882,566
2050	1,787,854,005	31,287,445	148,987,834	180,275,279
2052	1,638,866,171	28,680,158	148,987,834	177,667,992
2051	1,489,878,338	26,072,871	148,987,834	175,060,705
2053	1,340,890,504	23,465,584	148,987,834	172,453,418
2054	1,191,902,670	20,858,297	148,987,834	169,846,130
2055	1,042,914,836	18,251,010	148,987,834	167,238,843
2056	893,927,003	15,643,723	148,987,834	164,631,556
2057	744,939,169	13,036,435	148,987,834	162,024,269
2058	595,951,335	10,429,148	148,987,834	159,416,982
2059	446,963,501	7,821,861	148,987,834	156,809,695
2060	297,975,668	5,214,574	148,987,834	154,202,408
2061	148,987,834	2,607,287	148,987,834	151,595,121
2062	0	0	148,987,834	148,987,834
2063				
to				
2074				

Year	Phase 2			Total
	Principal	Interest	Repayment	
2016				
2017	4,910,623,607	85,935,913		85,935,913
2018		85,935,913		85,935,913
2019		85,935,913		85,935,913
2020		85,935,913		85,935,913
2021		85,935,913		85,935,913
2022		85,935,913		85,935,913
2023		85,935,913		85,935,913
2024		85,935,913		85,935,913
2025		85,935,913		85,935,913
2026		85,935,913		85,935,913
2027	4,787,858,017	83,787,515	122,765,590	206,553,105
2028	4,665,092,427	81,639,117	122,765,590	204,404,708
2029	4,542,326,837	79,490,720	122,765,590	202,256,310
2030	4,419,561,246	77,342,322	122,765,590	200,107,912
2031	4,296,795,656	75,193,924	122,765,590	197,959,514
2032	4,174,030,066	73,045,526	122,765,590	195,811,116
2033	4,051,264,476	70,897,128	122,765,590	193,662,719
2034	3,928,498,886	68,748,731	122,765,590	191,514,321
2035	3,805,733,296	66,600,333	122,765,590	189,365,923
2036	3,682,967,705	64,451,935	122,765,590	187,217,525
2037	3,560,202,115	62,303,537	122,765,590	185,069,127
2038	3,437,436,525	60,155,139	122,765,590	182,920,729
2039	3,314,670,935	58,006,741	122,765,590	180,772,332
2040	3,191,905,345	55,858,344	122,765,590	178,623,934
2041	3,069,139,754	53,709,946	122,765,590	176,475,536
2042	2,946,374,164	51,561,548	122,765,590	174,327,138
2043	2,823,608,574	49,413,150	122,765,590	172,178,740
2044	2,700,842,984	47,264,752	122,765,590	170,030,342
2045	2,578,077,394	45,116,354	122,765,590	167,881,945
2046	2,455,311,804	42,967,957	122,765,590	165,733,547
2047	2,332,546,213	40,819,559	122,765,590	163,585,149
2048	2,209,780,623	38,671,161	122,765,590	161,436,751
2049	2,087,015,033	36,522,763	122,765,590	159,288,353
2050	1,964,249,443	34,374,365	122,765,590	157,139,955
2052	1,841,483,853	32,225,967	122,765,590	154,991,558
2051	1,718,718,263	30,077,570	122,765,590	152,843,160
2053	1,595,952,672	27,929,172	122,765,590	150,694,762
2054	1,473,187,082	25,780,774	122,765,590	148,546,364
2055	1,350,421,492	23,632,376	122,765,590	146,397,966
2056	1,227,655,902	21,483,978	122,765,590	144,249,568
2057	1,104,890,312	19,335,580	122,765,590	142,101,171
2058	982,124,721	17,187,183	122,765,590	139,952,773
2059	859,359,131	15,038,785	122,765,590	137,804,375
2060	736,593,541	12,890,387	122,765,590	135,655,977
2061	613,827,951	10,741,989	122,765,590	133,507,579
2062	491,062,361	8,593,591	122,765,590	131,359,181
2063	368,296,771	6,445,193	122,765,590	129,210,784
2064	245,531,180	4,296,796	122,765,590	127,062,386
2065	122,765,590	2,148,398	122,765,590	124,913,988
2066	0	0	122,765,590	122,765,590
2067				
to				
2074				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	101,114,310		101,114,310
2022		101,114,310		101,114,310
2023		101,114,310		101,114,310
2024		101,114,310		101,114,310
2025		101,114,310		101,114,310
2026		101,114,310		101,114,310
2027		101,114,310		101,114,310
2028		101,114,310		101,114,310
2029		101,114,310		101,114,310
2030		101,114,310		101,114,310
2031	5,633,511,547	98,586,452	144,449,014	243,035,466
2032	5,489,062,533	96,058,594	144,449,014	240,507,608
2033	5,344,613,519	93,530,737	144,449,014	237,979,751
2034	5,200,164,505	91,002,879	144,449,014	235,451,893
2035	5,055,715,491	88,475,021	144,449,014	232,924,035
2036	4,911,266,477	85,947,163	144,449,014	230,396,177
2037	4,766,817,463	83,419,306	144,449,014	227,868,320
2038	4,622,368,449	80,891,448	144,449,014	225,340,462
2039	4,477,919,435	78,363,590	144,449,014	222,812,604
2040	4,333,470,421	75,835,732	144,449,014	220,284,746
2041	4,189,021,407	73,307,875	144,449,014	217,756,889
2042	4,044,572,393	70,780,017	144,449,014	215,229,031
2043	3,900,123,379	68,252,159	144,449,014	212,701,173
2044	3,755,674,365	65,724,301	144,449,014	210,173,315
2045	3,611,225,351	63,196,444	144,449,014	207,645,458
2046	3,466,776,337	60,668,586	144,449,014	205,117,600
2047	3,322,327,323	58,140,728	144,449,014	202,589,742
2048	3,177,878,309	55,612,870	144,449,014	200,061,884
2049	3,033,429,295	53,085,013	144,449,014	197,534,027
2050	2,888,980,281	50,557,155	144,449,014	195,006,169
2052	2,744,531,267	48,029,297	144,449,014	192,478,311
2051	2,600,082,253	45,501,439	144,449,014	189,950,453
2053	2,455,633,239	42,973,582	144,449,014	187,422,596
2054	2,311,184,225	40,445,724	144,449,014	184,894,738
2055	2,166,735,211	37,917,866	144,449,014	182,366,880
2056	2,022,286,196	35,390,008	144,449,014	179,839,022
2057	1,877,837,182	32,862,151	144,449,014	177,311,165
2058	1,733,388,168	30,334,293	144,449,014	174,783,307
2059	1,588,939,154	27,806,435	144,449,014	172,255,449
2060	1,444,490,140	25,278,577	144,449,014	169,727,591
2061	1,300,041,126	22,750,720	144,449,014	167,199,734
2062	1,155,592,112	20,222,862	144,449,014	164,671,876
2063	1,011,143,098	17,695,004	144,449,014	162,144,018
2064	866,694,084	15,167,146	144,449,014	159,616,161
2065	722,245,070	12,639,289	144,449,014	157,088,303
2066	577,796,056	10,111,431	144,449,014	154,560,445
2067	433,347,042	7,583,573	144,449,014	152,032,587
2068	288,898,028	5,055,715	144,449,014	149,504,730
2069	144,449,014	2,527,858	144,449,014	146,976,872
2070	0	0	144,449,014	144,449,014
2071				
to				
2074				
2074				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	59,530,740		59,530,740
2026		59,530,740		59,530,740
2027		59,530,740		59,530,740
2028		59,530,740		59,530,740
2029		59,530,740		59,530,740
2030		59,530,740		59,530,740
2031		59,530,740		59,530,740
2032		59,530,740		59,530,740
2033		59,530,740		59,530,740
2034		59,530,740		59,530,740
2035	3,316,712,647	58,042,471	85,043,914	143,086,385
2036	3,231,668,733	56,554,203	85,043,914	141,598,117
2037	3,146,624,819	55,065,934	85,043,914	140,109,848
2038	3,061,580,905	53,577,666	85,043,914	138,621,580
2039	2,976,536,991	52,089,397	85,043,914	137,133,311
2040	2,891,493,077	50,601,129	85,043,914	135,645,043
2041	2,806,449,163	49,112,860	85,043,914	134,156,774
2042	2,721,405,249	47,624,592	85,043,914	132,668,506
2043	2,636,361,335	46,136,323	85,043,914	131,180,237
2044	2,551,317,421	44,648,055	85,043,914	129,691,969
2045	2,466,273,507	43,159,786	85,043,914	128,203,700
2046	2,381,229,593	41,671,518	85,043,914	126,715,432
2047	2,296,185,679	40,183,249	85,043,914	125,227,163
2048	2,211,141,765	38,694,981	85,043,914	123,738,895
2049	2,126,097,851	37,206,712	85,043,914	122,250,626
2050	2,041,053,937	35,718,444	85,043,914	120,762,358
2052	1,956,010,023	34,230,175	85,043,914	119,274,089
2051	1,870,966,109	32,741,907	85,043,914	117,785,821
2053	1,785,922,195	31,253,638	85,043,914	116,297,552
2054	1,700,878,281	29,765,370	85,043,914	114,809,284
2055	1,615,834,367	28,277,101	85,043,914	113,321,015
2056	1,530,790,453	26,788,833	85,043,914	111,832,747
2057	1,445,746,539	25,300,564	85,043,914	110,344,478
2058	1,360,702,625	23,812,296	85,043,914	108,856,210
2059	1,275,658,711	22,324,027	85,043,914	107,367,941
2060	1,190,614,796	20,835,759	85,043,914	105,879,673
2061	1,105,570,882	19,347,490	85,043,914	104,391,404
2062	1,020,526,968	17,859,222	85,043,914	102,903,136
2063	935,483,054	16,370,953	85,043,914	101,414,867
2064	850,439,140	14,882,685	85,043,914	99,926,599
2065	765,395,226	13,394,416	85,043,914	98,438,330
2066	680,351,312	11,906,148	85,043,914	96,950,062
2067	595,307,398	10,417,879	85,043,914	95,461,794
2068	510,263,484	8,929,611	85,043,914	93,973,525
2069	425,219,570	7,441,342	85,043,914	92,485,257
2070	340,175,656	5,953,074	85,043,914	90,996,988
2071	255,131,742	4,464,805	85,043,914	89,508,720
2072	170,087,828	2,976,537	85,043,914	88,020,451
2073	85,043,914	1,488,268	85,043,914	86,532,183
2074	0	0	85,043,914	85,043,914

Year	TOTAL			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	-	104,291,484	-
2014		-	104,291,484	-
2015		-		-
2016	-	-	104,291,484	-
2017	4,910,623,607	-	190,227,397	-
2018		-	190,227,397	-
2019		-		-
2020	-	-	190,227,397	-
2021	5,777,960,561	-	291,341,707	-
2022	-	-	291,341,707	-
2023	-	5,810,525,517	288,734,419	148,987,834
2024	-	5,661,537,683	286,127,132	148,987,834
2025	3,401,756,561	5,512,549,849	343,050,585	148,987,834
2026	-	5,363,562,015	340,443,298	148,987,834
2027	-	10,002,432,199	335,687,613	271,753,424
2028	-	9,730,678,775	330,931,928	271,753,424
2029	-	9,458,925,351	326,176,243	271,753,424
2030	-	9,187,171,927	321,420,558	271,753,424
2031	-	14,548,930,050	314,137,016	416,202,438
2032	-	14,132,727,612	306,853,473	416,202,438
2033	-	13,716,525,174	299,569,930	416,202,438
2034	-	13,300,322,736	292,286,388	416,202,438
2035	-	16,200,832,946	283,514,577	501,246,352
2036	-	15,699,586,594	274,742,765	501,246,352
2037	-	15,198,340,242	265,970,954	501,246,352
2038	-	14,697,093,890	257,199,143	501,246,352
2039	-	14,195,847,538	248,427,332	501,246,352
2040	-	13,694,601,186	239,655,521	501,246,352
2041	-	13,193,354,834	230,883,710	501,246,352
2042	-	12,692,108,482	222,111,898	501,246,352
2043	-	12,190,862,130	213,340,087	501,246,352
2044	-	11,689,615,778	204,568,276	501,246,352
2045	-	11,188,369,426	195,796,465	501,246,352
2046	-	10,687,123,074	187,024,654	501,246,352
2047	-	10,185,876,722	178,252,843	501,246,352
2048	-	9,684,630,370	169,481,031	501,246,352
2049	-	9,183,384,018	160,709,220	501,246,352
2050	-	8,682,137,666	151,937,409	501,246,352
2052	-	8,180,891,314	143,165,598	501,246,352
2051	-	7,679,644,961	134,393,787	501,246,352
2053	-	7,178,398,609	125,621,976	501,246,352
2054	-	6,677,152,257	116,850,165	501,246,352
2055	-	6,175,905,905	108,078,353	501,246,352
2056	-	5,674,659,553	99,306,542	501,246,352
2057	-	5,173,413,201	90,534,731	501,246,352
2058	-	4,672,166,849	81,762,920	501,246,352
2059	-	4,170,920,497	72,991,109	501,246,352
2060	-	3,669,674,145	64,219,298	501,246,352
2061	-	3,168,427,793	55,447,486	501,246,352
2062	-	2,667,181,441	46,675,675	501,246,352
2063	-	2,314,922,923	40,511,151	352,258,518
2064	-	1,962,664,405	34,346,627	352,258,518
2065	-	1,610,405,887	28,182,103	352,258,518
2066	-	1,258,147,368	22,017,579	352,258,518
2067	-	1,028,654,440	18,001,453	229,492,928
2068	-	799,161,512	13,985,326	229,492,928
2069	-	569,668,584	9,969,200	229,492,928
2070	-	340,175,656	5,953,074	229,492,928
2071	-	255,131,742	4,464,805	85,043,914
2072	-	170,087,828	2,976,537	85,043,914
2073	-	85,043,914	1,488,268	85,043,914
2074	20,049,854,080	0	0	85,043,914
			10,056,218,289	20,049,854,080
				30,106,072,369
				10,056,218,289

10.2 Option 2

Interest **0.55%** Commitment Charge **0.10%** Govt. Gurantee Fee **1%** TOTAL **1.65%**
 Grace **10**
 Repay **30**

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	98,331,970		98,331,970
2014		98,331,970		98,331,970
2015		98,331,970		98,331,970
2016		98,331,970		98,331,970
2017		98,331,970		98,331,970
2018		98,331,970		98,331,970
2019		98,331,970		98,331,970
2020		98,331,970		98,331,970
2021		98,331,970		98,331,970
2022		98,331,970		98,331,970
2023	5,760,862,905	95,054,238	198,650,445	293,704,683
2024	5,562,212,460	91,776,506	198,650,445	290,426,951
2025	5,363,562,015	88,498,773	198,650,445	287,149,218
2026	5,164,911,570	85,221,041	198,650,445	283,871,486
2027	4,966,261,125	81,943,309	198,650,445	280,593,754
2028	4,767,610,680	78,665,576	198,650,445	277,316,021
2029	4,568,960,235	75,387,844	198,650,445	274,038,289
2030	4,370,309,790	72,110,112	198,650,445	270,760,557
2031	4,171,659,345	68,832,379	198,650,445	267,482,824
2032	3,973,008,900	65,554,647	198,650,445	264,205,092
2033	3,774,358,455	62,276,915	198,650,445	260,927,360
2034	3,575,708,010	58,999,182	198,650,445	257,649,627
2035	3,377,057,565	55,721,450	198,650,445	254,371,895
2036	3,178,407,120	52,443,717	198,650,445	251,094,162
2037	2,979,756,675	49,165,985	198,650,445	247,816,430
2038	2,781,106,230	45,888,253	198,650,445	244,538,698
2039	2,582,455,785	42,610,520	198,650,445	241,260,965
2040	2,383,805,340	39,332,788	198,650,445	237,983,233
2041	2,185,154,895	36,055,056	198,650,445	234,705,501
2042	1,986,504,450	32,777,323	198,650,445	231,427,768
2043	1,787,854,005	29,499,591	198,650,445	228,150,036
2044	1,589,203,560	26,221,859	198,650,445	224,872,304
2045	1,390,553,115	22,944,126	198,650,445	221,594,571
2046	1,191,902,670	19,666,394	198,650,445	218,316,839
2047	993,252,225	16,388,662	198,650,445	215,039,107
2048	794,601,780	13,110,929	198,650,445	211,761,374
2049	595,951,335	9,833,197	198,650,445	208,483,642
2050	397,300,890	6,555,465	198,650,445	205,205,910
2052	198,650,445	3,277,732	198,650,445	201,928,177
2051	0	0	198,650,445	198,650,445
2053				
to				
2064				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	81,025,290		81,025,290
2018		81,025,290		81,025,290
2019		81,025,290		81,025,290
2020		81,025,290		81,025,290
2021		81,025,290		81,025,290
2022		81,025,290		81,025,290
2023		81,025,290		81,025,290
2024		81,025,290		81,025,290
2025		81,025,290		81,025,290
2026		81,025,290		81,025,290
2027	4,746,936,154	78,324,447	163,687,454	242,011,900
2028	4,583,248,700	75,623,604	163,687,454	239,311,057
2029	4,419,561,246	72,922,761	163,687,454	236,610,214
2030	4,255,873,793	70,221,918	163,687,454	233,909,371
2031	4,092,186,339	67,521,075	163,687,454	231,208,528
2032	3,928,498,886	64,820,232	163,687,454	228,507,685
2033	3,764,811,432	62,119,389	163,687,454	225,806,842
2034	3,601,123,979	59,418,546	163,687,454	223,105,999
2035	3,437,436,525	56,717,703	163,687,454	220,405,156
2036	3,273,749,071	54,016,860	163,687,454	217,704,313
2037	3,110,061,618	51,316,017	163,687,454	215,003,470
2038	2,946,374,164	48,615,174	163,687,454	212,302,627
2039	2,782,686,711	45,914,331	163,687,454	209,601,784
2040	2,618,999,257	43,213,488	163,687,454	206,900,941
2041	2,455,311,804	40,512,645	163,687,454	204,200,098
2042	2,291,624,350	37,811,802	163,687,454	201,499,255
2043	2,127,936,896	35,110,959	163,687,454	198,798,412
2044	1,964,249,443	32,410,116	163,687,454	196,097,569
2045	1,800,561,989	29,709,273	163,687,454	193,396,726
2046	1,636,874,536	27,008,430	163,687,454	190,695,883
2047	1,473,187,082	24,307,587	163,687,454	187,995,040
2048	1,309,499,629	21,606,744	163,687,454	185,294,197
2049	1,145,812,175	18,905,901	163,687,454	182,593,354
2050	982,124,721	16,205,058	163,687,454	179,892,511
2052	818,437,268	13,504,215	163,687,454	177,191,668
2051	654,749,814	10,803,372	163,687,454	174,490,826
2053	491,062,361	8,102,529	163,687,454	171,789,983
2054	327,374,907	5,401,686	163,687,454	169,089,140
2055	163,687,454	2,700,843	163,687,454	166,388,297
2056	0		163,687,454	163,687,454
2057				
to				
2064				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	95,336,349		95,336,349
2022		95,336,349		95,336,349
2023		95,336,349		95,336,349
2024		95,336,349		95,336,349
2025		95,336,349		95,336,349
2026		95,336,349		95,336,349
2027		95,336,349		95,336,349
2028		95,336,349		95,336,349
2029		95,336,349		95,336,349
2030		95,336,349		95,336,349
2031	5,585,361,876	92,158,471	192,598,685	284,757,156
2032	5,392,763,191	88,980,593	192,598,685	281,579,278
2033	5,200,164,505	85,802,714	192,598,685	278,401,400
2034	5,007,565,820	82,624,836	192,598,685	275,223,521
2035	4,814,967,135	79,446,958	192,598,685	272,045,643
2036	4,622,368,449	76,269,079	192,598,685	268,867,765
2037	4,429,769,764	73,091,201	192,598,685	265,689,886
2038	4,237,171,078	69,913,323	192,598,685	262,512,008
2039	4,044,572,393	66,735,444	192,598,685	259,334,130
2040	3,851,973,708	63,557,566	192,598,685	256,156,252
2041	3,659,375,022	60,379,688	192,598,685	252,978,373
2042	3,466,776,337	57,201,810	192,598,685	249,800,495
2043	3,274,177,651	54,023,931	192,598,685	246,622,617
2044	3,081,578,966	50,846,053	192,598,685	243,444,738
2045	2,888,980,281	47,668,175	192,598,685	240,266,860
2046	2,696,381,595	44,490,296	192,598,685	237,088,982
2047	2,503,782,910	41,312,418	192,598,685	233,911,103
2048	2,311,184,225	38,134,540	192,598,685	230,733,225
2049	2,118,585,539	34,956,661	192,598,685	227,555,347
2050	1,925,986,854	31,778,783	192,598,685	224,377,468
2052	1,733,388,168	28,600,905	192,598,685	221,199,590
2051	1,540,789,483	25,423,026	192,598,685	218,021,712
2053	1,348,190,798	22,245,148	192,598,685	214,843,834
2054	1,155,592,112	19,067,270	192,598,685	211,665,955
2055	962,993,427	15,889,392	192,598,685	208,488,077
2056	770,394,742	12,711,513	192,598,685	205,310,199
2057	577,796,056	9,533,635	192,598,685	202,132,320
2058	385,197,371	6,355,757	192,598,685	198,954,442
2059	192,598,685	3,177,878	192,598,685	195,776,564
2060	0	0	192,598,685	192,598,685
2061				
to				
2064				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	56,128,983		56,128,983
2026		56,128,983		56,128,983
2027		56,128,983		56,128,983
2028		56,128,983		56,128,983
2029		56,128,983		56,128,983
2030		56,128,983		56,128,983
2031		56,128,983		56,128,983
2032		56,128,983		56,128,983
2033		56,128,983		56,128,983
2034		56,128,983		56,128,983
2035	3,288,364,676	54,258,017	113,391,885	167,649,903
2036	3,174,972,791	52,387,051	113,391,885	165,778,936
2037	3,061,580,905	50,516,085	113,391,885	163,907,970
2038	2,948,189,020	48,645,119	113,391,885	162,037,004
2039	2,834,797,135	46,774,153	113,391,885	160,166,038
2040	2,721,405,249	44,903,187	113,391,885	158,295,072
2041	2,608,013,364	43,032,221	113,391,885	156,424,106
2042	2,494,621,478	41,161,254	113,391,885	154,553,140
2043	2,381,229,593	39,290,288	113,391,885	152,682,174
2044	2,267,837,708	37,419,322	113,391,885	150,811,208
2045	2,154,445,822	35,548,356	113,391,885	148,940,241
2046	2,041,053,937	33,677,390	113,391,885	147,069,275
2047	1,927,662,051	31,806,424	113,391,885	145,198,309
2048	1,814,270,166	29,935,458	113,391,885	143,327,343
2049	1,700,878,281	28,064,492	113,391,885	141,456,377
2050	1,587,486,395	26,193,526	113,391,885	139,585,411
2052	1,474,094,510	24,322,559	113,391,885	137,714,445
2051	1,360,702,625	22,451,593	113,391,885	135,843,479
2053	1,247,310,739	20,580,627	113,391,885	133,972,513
2054	1,133,918,854	18,709,661	113,391,885	132,101,546
2055	1,020,526,968	16,838,695	113,391,885	130,230,580
2056	907,135,083	14,967,729	113,391,885	128,359,614
2057	793,743,198	13,096,763	113,391,885	126,488,648
2058	680,351,312	11,225,797	113,391,885	124,617,682
2059	566,959,427	9,354,831	113,391,885	122,746,716
2060	453,567,542	7,483,864	113,391,885	120,875,750
2061	340,175,656	5,612,898	113,391,885	119,004,784
2062	226,783,771	3,741,932	113,391,885	117,133,818
2063	113,391,885	1,870,966	113,391,885	115,262,851
2064	0	0	113,391,885	113,391,885

Year	TOTAL			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	-	98,331,970	-
2014		-	98,331,970	-
2015		-		-
2016	-	-	98,331,970	-
2017	4,910,623,607	-	179,357,260	-
2018		-	179,357,260	-
2019		-		-
2020	-	-	179,357,260	-
2021	5,777,960,561	-	274,693,609	-
2022		-	274,693,609	-
2023		5,760,862,905		-
2024	-	5,562,212,460	268,138,144	198,650,445
2025	3,401,756,561	5,363,562,015	320,989,395	198,650,445
2026	-	5,164,911,570	317,711,663	198,650,445
2027	-	9,713,197,279	311,733,088	362,337,899
2028	-	9,350,859,380	305,754,512	362,337,899
2029	-	8,988,521,482	299,775,937	362,337,899
2030	-	8,626,183,583	293,797,362	362,337,899
2031	-	13,849,207,561	284,640,908	554,936,584
2032	-	13,294,270,977	275,484,454	554,936,584
2033	-	12,739,334,393	266,328,001	554,936,584
2034	-	12,184,397,809	257,171,547	554,936,584
2035	-	14,917,825,901	246,144,127	668,328,469
2036	-	14,249,497,431	235,116,708	668,328,469
2037	-	13,581,168,962	224,089,288	668,328,469
2038	-	12,912,840,493	213,061,868	668,328,469
2039	-	12,244,512,023	202,034,448	668,328,469
2040	-	11,576,183,554	191,007,029	668,328,469
2041	-	10,907,855,085	179,979,609	668,328,469
2042	-	10,239,526,615	168,952,189	668,328,469
2043	-	9,571,198,146	157,924,769	668,328,469
2044	-	8,902,869,677	146,897,350	668,328,469
2045	-	8,234,541,207	135,869,930	668,328,469
2046	-	7,566,212,738	124,842,510	668,328,469
2047	-	6,897,884,269	113,815,090	668,328,469
2048	-	6,229,555,799	102,787,671	668,328,469
2049	-	5,561,227,330	91,760,251	668,328,469
2050	-	4,892,898,861	80,732,831	668,328,469
2052	-	4,224,570,391	69,705,411	668,328,469
2051	-	3,556,241,922	58,677,992	668,328,469
2053	-	3,086,563,898	50,928,304	469,678,024
2054	-	2,616,885,873	43,178,617	469,678,024
2055	-	2,147,207,849	35,428,930	469,678,024
2056	-	1,677,529,825	27,679,242	469,678,024
2057	-	1,371,539,254	22,630,398	305,990,571
2058	-	1,065,548,683	17,581,553	305,990,571
2059	-	759,558,112	12,532,709	305,990,571
2060	-	453,567,542	7,483,864	305,990,571
2061	-	340,175,656	5,612,898	113,391,885
2062	-	226,783,771	3,741,932	113,391,885
2063	-	113,391,885	1,870,966	113,391,885
2064	20,049,854,080	0	0	113,391,885
			7,556,048,405	19,851,203,635
				27,407,252,040
				7,357,397,960
				27%

10.3 Option 3

Interest **0.50%** Commitment Charge **0.10%** Govt. Gurantee Fee **1%** TOTAL **1.60%**
 Grace **6**
 Repay **20**

Year	Phase 1			Total
	Principal	Interest	Repayment	
2012				
2013	5,959,513,350	95,352,214		95,352,214
2014		95,352,214		95,352,214
2015		95,352,214		95,352,214
2016		95,352,214		95,352,214
2017		95,352,214		95,352,214
2018		95,352,214		95,352,214
2019	5,661,537,683	95,352,214	297,975,668	393,327,881
2020	5,363,562,015	95,352,214	297,975,668	393,327,881
2021	5,065,586,348	95,352,214	297,975,668	393,327,881
2022	4,767,610,680	95,352,214	297,975,668	393,327,881
2023	4,469,635,013	22,348,175	297,975,668	320,323,843
2024	4,171,659,345	20,858,297	297,975,668	318,833,964
2025	3,873,683,678	19,368,418	297,975,668	317,344,086
2026	3,575,708,010	17,878,540	297,975,668	315,854,208
2027	3,277,732,343	16,388,662	297,975,668	314,364,329
2028	2,979,756,675	14,898,783	297,975,668	312,874,451
2029	2,681,781,008	13,408,905	297,975,668	311,384,573
2030	2,383,805,340	11,919,027	297,975,668	309,894,694
2031	2,085,829,673	10,429,148	297,975,668	308,404,816
2032	1,787,854,005	8,939,270	297,975,668	306,914,938
2033	1,489,878,338	7,449,392	297,975,668	305,425,059
2034	1,191,902,670	5,959,513	297,975,668	303,935,181
2035	893,927,003	4,469,635	297,975,668	302,445,303
2036	595,951,335	2,979,757	297,975,668	300,955,424
2037	297,975,668	1,489,878	297,975,668	299,465,546
2038	0	0	297,975,668	297,975,668
2039				
to				
2050				

Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	78,569,978		78,569,978
2018		78,569,978		78,569,978
2019		78,569,978		78,569,978
2020		78,569,978		78,569,978
2021		78,569,978		78,569,978
2022		78,569,978		78,569,978
2023	4,665,092,427	74,641,479	245,531,180	320,172,659
2024	4,419,561,246	70,712,980	245,531,180	316,244,160
2025	4,174,030,066	66,784,481	245,531,180	312,315,661
2026	3,928,498,886	62,855,982	245,531,180	308,387,163
2027	3,682,967,705	58,927,483	245,531,180	304,458,664
2028	3,437,436,525	54,998,984	245,531,180	300,530,165
2029	3,191,905,345	51,070,486	245,531,180	296,601,666
2030	2,946,374,164	47,141,987	245,531,180	292,673,167
2031	2,700,842,984	43,213,488	245,531,180	288,744,668
2032	2,455,311,804	39,284,989	245,531,180	284,816,169
2033	2,209,780,623	35,356,490	245,531,180	280,887,670
2034	1,964,249,443	31,427,991	245,531,180	276,959,171
2035	1,718,718,263	27,499,492	245,531,180	273,030,673
2036	1,473,187,082	23,570,993	245,531,180	269,102,174
2037	1,227,655,902	19,642,494	245,531,180	265,173,675
2038	982,124,721	15,713,996	245,531,180	261,245,176
2039	736,593,541	11,785,497	245,531,180	257,316,677
2040	491,062,361	7,856,998	245,531,180	253,388,178
2041	245,531,180	3,928,499	245,531,180	249,459,679
2042	0	0	245,531,180	245,531,180
2043				
to				
2050				

Year	Phase 3			Total
	Principal	Interest	Repayment	
2020				
2021	5,777,960,561	92,447,369		92,447,369
2022		92,447,369		92,447,369
2023		92,447,369		92,447,369
2024		92,447,369		92,447,369
2025		92,447,369		92,447,369
2026		92,447,369		92,447,369
2027	5,489,062,533	87,825,001	288,898,028	376,723,029
2028	5,200,164,505	83,202,632	288,898,028	372,100,660
2029	4,911,266,477	78,580,264	288,898,028	367,478,292
2030	4,622,368,449	73,957,895	288,898,028	362,855,923
2031	4,333,470,421	69,335,527	288,898,028	358,233,555
2032	4,044,572,393	64,713,158	288,898,028	353,611,186
2033	3,755,674,365	60,090,790	288,898,028	348,988,818
2034	3,466,776,337	55,468,421	288,898,028	344,366,449
2035	3,177,878,309	50,846,053	288,898,028	339,744,081
2036	2,888,980,281	46,223,684	288,898,028	335,121,713
2037	2,600,082,253	41,601,316	288,898,028	330,499,344
2038	2,311,184,225	36,978,948	288,898,028	325,876,976
2039	2,022,286,196	32,356,579	288,898,028	321,254,607
2040	1,733,388,168	27,734,211	288,898,028	316,632,239
2041	1,444,490,140	23,111,842	288,898,028	312,009,870
2042	1,155,592,112	18,489,474	288,898,028	307,387,502
2043	866,694,084	13,867,105	288,898,028	302,765,133
2044	577,796,056	9,244,737	288,898,028	298,142,765
2045	288,898,028	4,622,368	288,898,028	293,520,397
2046	0	0	288,898,028	288,898,028
2047				
to				
2050				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	54,428,105		
2026		54,428,105		
2027		54,428,105		
2028		54,428,105		
2029		54,428,105		
2030		54,428,105		
2031	3,231,668,733	54,428,105	170,087,828	224,515,933
2032	3,061,580,905	48,985,294	170,087,828	219,073,123
2033	2,891,493,077	46,263,889	170,087,828	216,351,717
2034	2,721,405,249	43,542,484	170,087,828	213,630,312
2035	2,551,317,421	40,821,079	170,087,828	210,908,907
2036	2,381,229,593	38,099,673	170,087,828	208,187,502
2037	2,211,141,765	35,378,268	170,087,828	205,466,096
2038	2,041,053,937	32,656,863	170,087,828	202,744,691
2039	1,870,966,109	29,935,458	170,087,828	200,023,286
2040	1,700,878,281	27,214,052	170,087,828	197,301,881
2041	1,530,790,453	24,492,647	170,087,828	194,580,475
2042	1,360,702,625	21,771,242	170,087,828	191,859,070
2043	1,190,614,796	19,049,837	170,087,828	189,137,665
2044	1,020,526,968	16,328,431	170,087,828	186,416,260
2045	850,439,140	13,607,026	170,087,828	183,694,854
2046	680,351,312	10,885,621	170,087,828	180,973,449
2047	510,263,484	8,164,216	170,087,828	178,252,044
2048	340,175,656	5,442,810	170,087,828	175,530,639
2049	170,087,828	2,721,405	170,087,828	172,809,233
2050	0	0	170,087,828	170,087,828

Year	TOTAL				
	Principal	Interest	Repayment	Total	
2012					
2013	5,959,513,350	–	95,352,214	–	95,352,214
2014	–	–	95,352,214	–	95,352,214
2015	–	–	95,352,214	–	95,352,214
2016	–	–	95,352,214	–	95,352,214
2017	4,910,623,607	–	173,922,191	–	173,922,191
2018	–	–	173,922,191	–	173,922,191
2019	–	5,661,537,683	173,922,191	297,975,668	471,897,859
2020	–	5,363,562,015	173,922,191	297,975,668	471,897,859
2021	5,777,960,561	5,065,586,348	266,369,560	297,975,668	564,345,228
2022	–	4,767,610,680	266,369,560	297,975,668	564,345,228
2023	–	9,134,727,440	189,437,023	543,506,848	732,943,871
2024	–	8,591,220,592	184,018,646	543,506,848	727,525,494
2025	3,401,756,561	8,047,713,744	233,028,373	543,506,848	776,535,221
2026	–	7,504,206,896	227,609,996	543,506,848	771,116,844
2027	–	12,449,762,581	217,569,251	832,404,876	1,049,974,126
2028	–	11,617,357,705	207,528,505	832,404,876	1,039,933,381
2029	–	10,784,952,830	197,487,759	832,404,876	1,029,892,635
2030	–	9,952,547,954	187,447,013	832,404,876	1,019,851,889
2031	–	12,351,811,811	177,406,268	1,002,492,704	1,179,898,972
2032	–	11,349,319,107	161,922,712	1,002,492,704	1,164,415,416
2033	–	10,346,826,403	149,160,561	1,002,492,704	1,151,653,265
2034	–	9,344,333,699	136,398,410	1,002,492,704	1,138,891,114
2035	–	8,341,840,995	123,636,259	1,002,492,704	1,126,128,963
2036	–	7,339,348,291	110,874,108	1,002,492,704	1,113,366,812
2037	–	6,336,855,587	98,111,957	1,002,492,704	1,100,604,661
2038	–	5,334,362,883	85,349,806	1,002,492,704	1,087,842,510
2039	–	4,629,845,846	74,077,534	704,517,037	778,594,570
2040	–	3,925,328,810	62,805,261	704,517,037	767,322,297
2041	–	3,220,811,773	51,532,988	704,517,037	756,050,025
2042	–	2,516,294,737	40,260,716	704,517,037	744,777,752
2043	–	2,057,308,881	32,916,942	458,985,856	491,902,798
2044	–	1,598,323,025	25,573,168	458,985,856	484,559,025
2045	–	1,139,337,168	18,229,395	458,985,856	477,215,251
2046	–	680,351,312	10,885,621	458,985,856	469,871,477
2047	–	510,263,484	8,164,216	170,087,828	178,252,044
2048	–	340,175,656	5,442,810	170,087,828	175,530,639
2049	–	170,087,828	2,721,405	170,087,828	172,809,233
2050	20,049,854,080	0	0	170,087,828	170,087,828
			4,629,433,443	20,049,854,080	24,679,287,523
					4,629,433,443
					19%

10.4 Option 4

Interest **0.40%** Commitment Charge **0.10%** Govt. Gurantee Fee **1%** **TOTAL 1.50%**
 Grace **5**
 Repay **15**

Year	Phase 1			
	Principal	Interest	Repayment	Total
2012				
2013	5,959,513,350	89,392,700		89,392,700
2014		89,392,700		89,392,700
2015		89,392,700		89,392,700
2016		89,392,700		89,392,700
2017		89,392,700		89,392,700
2018	5,562,212,460	83,433,187	397,300,890	480,734,077
2019	5,164,911,570	77,473,674	397,300,890	474,774,564
2020	4,767,610,680	71,514,160	397,300,890	468,815,050
2021	4,370,309,790	65,554,647	397,300,890	462,855,537
2022	3,973,008,900	59,595,134	397,300,890	456,896,024
2023	3,575,708,010	53,635,620	397,300,890	450,936,510
2024	3,178,407,120	47,676,107	397,300,890	444,976,997
2025	2,781,106,230	41,716,593	397,300,890	439,017,483
2026	2,383,805,340	35,757,080	397,300,890	433,057,970
2027	1,986,504,450	29,797,567	397,300,890	427,098,457
2028	1,589,203,560	23,838,053	397,300,890	421,138,943
2029	1,191,902,670	17,878,540	397,300,890	415,179,430
2030	794,601,780	11,919,027	397,300,890	409,219,917
2031	397,300,890	5,959,513	397,300,890	403,260,403
2032	0	0	397,300,890	397,300,890
2033				
to				
2044				
Year	Phase 2			
	Principal	Interest	Repayment	Total
2016				
2017	4,910,623,607	73,659,354		73,659,354
2018		73,659,354		73,659,354
2019		73,659,354		73,659,354
2020		73,659,354		73,659,354
2021		73,659,354		73,659,354
2022	4,583,248,700	68,748,731	327,374,907	396,123,638
2023	4,255,873,793	63,838,107	327,374,907	391,213,014
2024	3,928,498,886	58,927,483	327,374,907	386,302,390
2025	3,601,123,979	54,016,860	327,374,907	381,391,767
2026	3,273,749,071	49,106,236	327,374,907	376,481,143
2027	2,946,374,164	44,195,612	327,374,907	371,570,520
2028	2,618,999,257	39,284,989	327,374,907	366,659,896
2029	2,291,624,350	34,374,365	327,374,907	361,749,272
2030	1,964,249,443	29,463,742	327,374,907	356,838,649
2031	1,636,874,536	24,553,118	327,374,907	351,928,025
2032	1,309,499,629	19,642,494	327,374,907	347,017,402
2033	982,124,721	14,731,871	327,374,907	342,106,778
2034	654,749,814	9,821,247	327,374,907	337,196,154
2035	327,374,907	4,910,624	327,374,907	332,285,531
2036	0	0	327,374,907	327,374,907
2037				
to				
2044				

Year	Phase 3			
	Principal	Interest	Repayment	Total
2020				
2021	5,777,960,561	86,669,408		86,669,408
2022		86,669,408		86,669,408
2023		86,669,408		86,669,408
2024		86,669,408		86,669,408
2025		86,669,408		86,669,408
2026	5,392,763,191	80,891,448	385,197,371	466,088,819
2027	5,007,565,820	75,113,487	385,197,371	460,310,858
2028	4,622,368,449	69,335,527	385,197,371	454,532,897
2029	4,237,171,078	63,557,566	385,197,371	448,754,937
2030	3,851,973,708	57,779,606	385,197,371	442,976,976
2031	3,466,776,337	52,001,645	385,197,371	437,199,016
2032	3,081,578,966	46,223,684	385,197,371	431,421,055
2033	2,696,381,595	40,445,724	385,197,371	425,643,095
2034	2,311,184,225	34,667,763	385,197,371	419,865,134
2035	1,925,986,854	28,889,803	385,197,371	414,087,174
2036	1,540,789,483	23,111,842	385,197,371	408,309,213
2037	1,155,592,112	17,333,882	385,197,371	402,531,252
2038	770,394,742	11,555,921	385,197,371	396,753,292
2039	385,197,371	5,777,961	385,197,371	390,975,331
2040	0	0	385,197,371	385,197,371
2041 to 2044				

Year	Phase 4			
	Principal	Interest	Repayment	Total
2024				
2025	3,401,756,561	51,026,348		51,026,348
2026		51,026,348		51,026,348
2027		51,026,348		51,026,348
2028		51,026,348		51,026,348
2029		51,026,348		51,026,348
2030	3,174,972,791	51,026,348	226,783,771	277,810,119
2031	2,948,189,020	44,222,835	226,783,771	271,006,606
2032	2,721,405,249	40,821,079	226,783,771	267,604,849
2033	2,494,621,478	37,419,322	226,783,771	264,203,093
2034	2,267,837,708	34,017,566	226,783,771	260,801,336
2035	2,041,053,937	30,615,809	226,783,771	257,399,580
2036	1,814,270,166	27,214,052	226,783,771	253,997,823
2037	1,587,486,395	23,812,296	226,783,771	250,596,067
2038	1,360,702,625	20,410,539	226,783,771	247,194,310
2039	1,133,918,854	17,008,783	226,783,771	243,792,554
2040	907,135,083	13,607,026	226,783,771	240,390,797
2041	680,351,312	10,205,270	226,783,771	236,989,040
2042	453,567,542	6,803,513	226,783,771	233,587,284
2043	226,783,771	3,401,757	226,783,771	230,185,527
2044	0	0	226,783,771	226,783,771

Year	TOTAL				
	Principal		Interest	Repayment	Total
2012					
2013	5,959,513,350	-	89,392,700	-	89,392,700
2014	-	-	89,392,700	-	89,392,700
2015	-	-	89,392,700	-	89,392,700
2016	-	-	89,392,700	-	89,392,700
2017	4,910,623,607	-	163,052,054	-	163,052,054
2018	-	5,562,212,460	157,092,541	397,300,890	554,393,431
2019	-	5,164,911,570	151,133,028	397,300,890	548,433,918
2020	-	4,767,610,680	145,173,514	397,300,890	542,474,404
2021	5,777,960,561	4,370,309,790	225,883,409	397,300,890	623,184,299
2022	-	8,556,257,600	215,013,272	724,675,797	939,689,070
2023	-	7,831,581,803	204,143,135	724,675,797	928,818,933
2024	-	7,106,906,006	193,272,999	724,675,797	917,948,796
2025	3,401,756,561	6,382,230,209	233,429,210	724,675,797	958,105,007
2026	-	11,050,317,602	216,781,112	1,109,873,168	1,326,654,280
2027	-	9,940,444,434	200,133,015	1,109,873,168	1,310,006,183
2028	-	8,830,571,266	183,484,917	1,109,873,168	1,293,358,085
2029	-	7,720,698,098	166,836,820	1,109,873,168	1,276,709,988
2030	-	9,785,797,721	150,188,722	1,336,656,939	1,486,845,661
2031	-	8,449,140,782	126,737,112	1,336,656,939	1,463,394,050
2032	-	7,112,483,844	106,687,258	1,336,656,939	1,443,344,196
2033	-	6,173,127,795	92,596,917	939,356,049	1,031,952,966
2034	-	5,233,771,746	78,506,576	939,356,049	1,017,862,625
2035	-	4,294,415,698	64,416,235	939,356,049	1,003,772,284
2036	-	3,355,059,649	50,325,895	939,356,049	989,681,943
2037	-	2,743,078,508	41,146,178	611,981,142	653,127,319
2038	-	2,131,097,366	31,966,460	611,981,142	643,947,602
2039	-	1,519,116,225	22,786,743	611,981,142	634,767,885
2040	-	907,135,083	13,607,026	611,981,142	625,588,168
2041	-	680,351,312	10,205,270	226,783,771	236,989,040
2042	-	453,567,542	6,803,513	226,783,771	233,587,284
2043	-	226,783,771	3,401,757	226,783,771	230,185,527
2044	20,049,854,080	0	0	226,783,771	226,783,771
			3,612,375,491	20,049,854,080	23,662,229,571

11. Financing Analysis

11.1 LBP (G)

(using the Two Step Loan thru Land Bank and Tariff from Environmental + Sewer Charges)

Phase 1 (G1)

Phase 1	Cash Inflow		Cash Outflow			Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2013		229,532,457	283,076,884			512,609,341	(512,609,341)
2014		1,217,337,541	283,076,884			1,500,414,426	(1,500,414,426)
2015		4,508,231,353	283,076,884			4,791,308,237	(4,791,308,237)
2016		1,042,816,590	283,076,884			1,325,893,474	(1,325,893,474)
2017	3,076,180,623		283,076,884		70,000,000	353,076,884	2,723,103,739
2018	3,076,180,623		283,076,884		70,000,000	353,076,884	2,723,103,739
2019	3,076,180,623		283,076,884		70,000,000	353,076,884	2,723,103,739
2020	3,076,180,623		283,076,884		70,000,000	353,076,884	2,723,103,739
2021	3,076,180,623		283,076,884		70,000,000	353,076,884	2,723,103,739
2022	3,076,180,623		283,076,884		70,000,000	353,076,884	2,723,103,739
2023	3,076,180,623		275,999,962	397,300,890	70,000,000	743,300,852	2,332,879,771
2024	3,076,180,623		268,923,040	397,300,890	70,000,000	736,223,930	2,339,956,693
2025	3,076,180,623		261,846,118	397,300,890	70,000,000	729,147,008	2,347,033,615
2026	3,076,180,623		254,769,196	397,300,890	70,000,000	722,070,086	2,354,110,537
2027	3,076,180,623		247,692,274	397,300,890	70,000,000	714,993,164	2,361,187,459
2028	3,076,180,623		240,615,352	397,300,890	70,000,000	707,916,242	2,368,264,382
2029	3,076,180,623		233,538,429	397,300,890	70,000,000	700,839,319	2,375,341,304
2030	3,076,180,623		226,461,507	397,300,890	70,000,000	693,762,397	2,382,418,226
2031	3,076,180,623		219,384,585	397,300,890	70,000,000	686,685,475	2,389,495,148
2032	3,076,180,623		212,307,663	397,300,890	70,000,000	679,608,553	2,396,572,070
2033	3,076,180,623		205,230,741	397,300,890	70,000,000	672,531,631	2,403,648,992
2034	3,076,180,623		198,153,819	397,300,890	70,000,000	665,454,709	2,410,725,914
2035	3,076,180,623		191,076,897	397,300,890	70,000,000	658,377,787	2,417,802,836
2036	3,076,180,623		183,999,975	397,300,890	70,000,000	651,300,865	2,424,879,758
2037	3,076,180,623		176,923,053	397,300,890	70,000,000	644,223,943	2,431,956,681
2038	3,076,180,623		169,846,130	397,300,890	70,000,000	637,147,021	2,439,033,603
2039	3,076,180,623		162,769,208	397,300,890	70,000,000	630,070,098	2,446,110,525
2040	3,076,180,623		155,692,286	397,300,890	70,000,000	622,993,176	2,453,187,447
2041	3,076,180,623		148,615,364	397,300,890	70,000,000	615,916,254	2,460,264,369
2042	3,076,180,623		141,538,442	397,300,890	70,000,000	608,839,332	2,467,341,291
2043	3,076,180,623		134,461,520	397,300,890	70,000,000	601,762,410	2,474,418,213
2044	3,076,180,623		127,384,598	397,300,890	70,000,000	594,685,488	2,481,495,135
2045	3,076,180,623		120,307,676	397,300,890	70,000,000	587,608,566	2,488,572,057
2046	3,076,180,623		113,230,754	397,300,890	70,000,000	580,531,644	2,495,648,979
2047	3,076,180,623		106,153,832	397,300,890	70,000,000	573,454,722	2,502,725,902
2048	3,076,180,623		99,076,909	397,300,890	70,000,000	566,377,799	2,509,802,824
2049	3,076,180,623		91,999,987	397,300,890	70,000,000	559,300,877	2,516,879,746
2050	3,076,180,623		84,923,065	397,300,890	70,000,000	552,223,955	2,523,956,668
2051	3,076,180,623		77,846,143	397,300,890	70,000,000	545,147,033	2,531,033,590
2052	3,076,180,623		70,769,221	397,300,890	70,000,000	538,070,111	2,538,110,512
2053	3,076,180,623		63,692,299	397,300,890	70,000,000	530,993,189	2,545,187,434
2054	3,076,180,623		56,615,377	397,300,890	70,000,000	523,916,267	2,552,264,356
2055	3,076,180,623		49,538,455	397,300,890	70,000,000	516,839,345	2,559,341,278
2056	3,076,180,623		42,461,533	397,300,890	70,000,000	509,762,423	2,566,418,200
2057	3,076,180,623		35,384,611	397,300,890	70,000,000	502,685,501	2,573,495,123
2058	3,076,180,623		28,307,688	397,300,890	70,000,000	495,608,578	2,580,572,045
2059	3,076,180,623		21,230,766	397,300,890	70,000,000	488,531,656	2,587,648,967
2060	3,076,180,623		14,153,844	397,300,890	70,000,000	481,454,734	2,594,725,889
2061	3,076,180,623		7,076,922	397,300,890	70,000,000	474,377,812	2,601,802,811
2062	3,076,180,623		0	397,300,890	70,000,000	467,300,890	2,608,879,733
Financial IRR						25%	
NPV @ 9.3 ADR						13,624,910,730	

Phase 2 (G2)

Phase 2	Cash Inflow	Cash Outflow				Net Inflow	
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		574,376,057	233,254,621			807,630,678	(807,630,678)
2018		965,567,132	233,254,621			1,198,821,754	(1,198,821,754)
2019		3,960,207,346	233,254,621			4,193,461,967	(4,193,461,967)
2020		945,358,062	233,254,621			1,178,612,683	(1,178,612,683)
2021	2,786,017,628		233,254,621		60,000,000	293,254,621	2,492,763,007
2022	2,786,017,628		233,254,621		60,000,000	293,254,621	2,492,763,007
2023	2,786,017,628		233,254,621		60,000,000	293,254,621	2,492,763,007
2024	2,786,017,628		233,254,621		60,000,000	293,254,621	2,492,763,007
2025	2,786,017,628		233,254,621		60,000,000	293,254,621	2,492,763,007
2026	2,786,017,628		227,423,256		60,000,000	287,423,256	2,498,594,372
2027	2,786,017,628		221,591,890	327,374,907	60,000,000	608,966,797	2,177,050,831
2028	2,786,017,628		215,760,525	327,374,907	60,000,000	603,135,432	2,182,882,196
2029	2,786,017,628		209,929,159	327,374,907	60,000,000	597,304,066	2,188,713,562
2030	2,786,017,628		204,097,794	327,374,907	60,000,000	591,472,701	2,194,544,927
2031	2,786,017,628		198,266,428	327,374,907	60,000,000	585,641,335	2,200,376,293
2032	2,786,017,628		192,435,063	327,374,907	60,000,000	579,809,970	2,206,207,658
2033	2,786,017,628		186,603,697	327,374,907	60,000,000	573,978,604	2,212,039,024
2034	2,786,017,628		180,772,332	327,374,907	60,000,000	568,147,239	2,217,870,389
2035	2,786,017,628		174,940,966	327,374,907	60,000,000	562,315,873	2,223,701,755
2036	2,786,017,628		169,109,600	327,374,907	60,000,000	556,484,508	2,229,533,120
2037	2,786,017,628		163,278,235	327,374,907	60,000,000	550,653,142	2,235,364,486
2038	2,786,017,628		157,446,869	327,374,907	60,000,000	544,821,777	2,241,195,851
2039	2,786,017,628		151,615,504	327,374,907	60,000,000	538,990,411	2,247,027,217
2040	2,786,017,628		145,784,138	327,374,907	60,000,000	533,159,045	2,252,858,582
2041	2,786,017,628		139,952,773	327,374,907	60,000,000	527,327,680	2,258,689,948
2042	2,786,017,628		134,121,407	327,374,907	60,000,000	521,496,314	2,264,521,314
2043	2,786,017,628		128,290,042	327,374,907	60,000,000	515,664,949	2,270,352,679
2044	2,786,017,628		122,458,676	327,374,907	60,000,000	509,833,583	2,276,184,045
2045	2,786,017,628		116,627,311	327,374,907	60,000,000	504,002,218	2,282,015,410
2046	2,786,017,628		110,795,945	327,374,907	60,000,000	498,170,852	2,287,846,776
2047	2,786,017,628		104,964,580	327,374,907	60,000,000	492,339,487	2,293,678,141
2048	2,786,017,628		99,133,214	327,374,907	60,000,000	486,508,121	2,299,509,507
2049	2,786,017,628		93,301,849	327,374,907	60,000,000	480,676,756	2,305,340,872
2050	2,786,017,628		87,470,483	327,374,907	60,000,000	474,845,390	2,311,172,238
2051	2,786,017,628		81,639,117	327,374,907	60,000,000	469,014,025	2,317,003,603
2052	2,786,017,628		75,807,752	327,374,907	60,000,000	463,182,659	2,322,834,969
2053	2,786,017,628		69,976,386	327,374,907	60,000,000	457,351,294	2,328,666,334
2054	2,786,017,628		64,145,021	327,374,907	60,000,000	451,519,928	2,334,497,700
2055	2,786,017,628		58,313,655	327,374,907	60,000,000	445,688,562	2,340,329,065
2056	2,786,017,628		52,482,290	327,374,907	60,000,000	439,857,197	2,346,160,431
2057	2,786,017,628		46,650,924	327,374,907	60,000,000	434,025,831	2,351,991,797
2058	2,786,017,628		40,819,559	327,374,907	60,000,000	428,194,466	2,357,823,162
2059	2,786,017,628		34,988,193	327,374,907	60,000,000	422,363,100	2,363,654,528
2060	2,786,017,628		29,156,828	327,374,907	60,000,000	416,531,735	2,369,485,893
2061	2,786,017,628		23,325,462	327,374,907	60,000,000	410,700,369	2,375,317,259
2062	2,786,017,628		17,494,097	327,374,907	60,000,000	404,869,004	2,381,148,624
2063	2,786,017,628		11,662,731	327,374,907	60,000,000	399,037,638	2,386,979,990
2064	2,786,017,628		5,831,366	327,374,907	60,000,000	393,206,273	2,392,811,355
2065	2,786,017,628		0	327,374,907	60,000,000	387,374,907	2,398,642,721
						Financial IRR	25%
						NPV @ 9.3 ADR	12,619,410,971

Phase 3 (G3)

Phase 3	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2021		1,724,506,137	274,453,127			1,998,959,263	(1,998,959,263)
2022		883,696,518	274,453,127			1,158,149,645	(1,158,149,645)
2023		4,121,083,638	274,453,127			4,395,536,764	(4,395,536,764)
2024		965,045,270	274,453,127			1,239,498,396	(1,239,498,396)
2025	2,873,522,995		274,453,127		54,000,000	328,453,127	2,545,069,868
2026	2,873,522,995		274,453,127		54,000,000	328,453,127	2,545,069,868
2027	2,873,522,995		274,453,127		54,000,000	328,453,127	2,545,069,868
2028	2,873,522,995		274,453,127		54,000,000	328,453,127	2,545,069,868
2029	2,873,522,995		274,453,127		54,000,000	328,453,127	2,545,069,868
2030	2,873,522,995		274,453,127		54,000,000	328,453,127	2,545,069,868
2031	2,873,522,995		267,591,799	481,496,713	54,000,000	803,088,512	2,070,434,483
2032	2,873,522,995		260,730,470	481,496,713	54,000,000	796,227,184	2,077,295,811
2033	2,873,522,995		253,869,142	481,496,713	54,000,000	789,365,856	2,084,157,139
2034	2,873,522,995		247,007,814	481,496,713	54,000,000	782,504,527	2,091,018,468
2035	2,873,522,995		240,146,486	481,496,713	54,000,000	775,643,199	2,097,879,796
2036	2,873,522,995		233,285,158	481,496,713	54,000,000	768,781,871	2,104,741,124
2037	2,873,522,995		226,423,830	481,496,713	54,000,000	761,920,543	2,111,602,452
2038	2,873,522,995		219,562,501	481,496,713	54,000,000	755,059,215	2,118,463,780
2039	2,873,522,995		212,701,173	481,496,713	54,000,000	748,197,887	2,125,325,108
2040	2,873,522,995		205,839,845	481,496,713	54,000,000	741,336,558	2,132,186,437
2041	2,873,522,995		198,978,517	481,496,713	54,000,000	734,475,230	2,139,047,765
2042	2,873,522,995		192,117,189	481,496,713	54,000,000	727,613,902	2,145,909,093
2043	2,873,522,995		185,255,861	481,496,713	54,000,000	720,752,574	2,152,770,421
2044	2,873,522,995		178,394,532	481,496,713	54,000,000	713,891,246	2,159,631,749
2045	2,873,522,995		171,533,204	481,496,713	54,000,000	707,029,918	2,166,493,077
2046	2,873,522,995		164,671,876	481,496,713	54,000,000	700,168,589	2,173,354,406
2047	2,873,522,995		157,810,548	481,496,713	54,000,000	693,307,261	2,180,215,734
2048	2,873,522,995		150,949,220	481,496,713	54,000,000	686,445,933	2,187,077,062
2049	2,873,522,995		144,087,892	481,496,713	54,000,000	679,584,605	2,193,938,390
2050	2,873,522,995		137,226,563	481,496,713	54,000,000	672,723,277	2,200,799,718
2051	2,873,522,995		130,365,235	481,496,713	54,000,000	665,861,949	2,207,661,046
2052	2,873,522,995		123,503,907	481,496,713	54,000,000	659,000,620	2,214,522,375
2053	2,873,522,995		116,642,579	481,496,713	54,000,000	652,139,292	2,221,383,703
2054	2,873,522,995		109,781,251	481,496,713	54,000,000	645,277,964	2,228,245,031
2055	2,873,522,995		102,919,923	481,496,713	54,000,000	638,416,636	2,235,106,359
2056	2,873,522,995		96,058,594	481,496,713	54,000,000	631,555,308	2,241,967,687
2057	2,873,522,995		89,197,266	481,496,713	54,000,000	624,693,980	2,248,829,015
2058	2,873,522,995		82,335,938	481,496,713	54,000,000	617,832,651	2,255,690,344
2059	2,873,522,995		75,474,610	481,496,713	54,000,000	610,971,323	2,262,551,672
2060	2,873,522,995		68,613,282	481,496,713	54,000,000	604,109,995	2,269,413,000
2061	2,873,522,995		61,751,954	481,496,713	54,000,000	597,248,667	2,276,274,328
2062	2,873,522,995		54,890,625	481,496,713	54,000,000	590,387,339	2,283,135,656
2063	2,873,522,995		48,029,297	481,496,713	54,000,000	583,526,011	2,289,996,984
2064	2,873,522,995		41,167,969	481,496,713	54,000,000	576,664,682	2,296,858,313
2065	2,873,522,995		34,306,641	481,496,713	54,000,000	569,803,354	2,303,719,641
2066	2,873,522,995		27,445,313	481,496,713	54,000,000	562,942,026	2,310,580,969
2067	2,873,522,995		20,583,985	481,496,713	54,000,000	556,080,698	2,317,442,297
2068	2,873,522,995		13,722,656	481,496,713	54,000,000	549,219,370	2,324,303,625
2069	2,873,522,995		6,861,328	481,496,713	54,000,000	542,358,042	2,331,164,953
2070	2,873,522,995		0	481,496,713	54,000,000	535,496,713	2,338,026,282
						Financial IRR	19%
						NPV @ 9.3 ADR	5,653,279,686

Phase 4 (G4)

Phase 4	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2025		181,022,934	161,583,437			342,606,370.69	(342,606,370.69)
2026		537,265,678	161,583,437			698,849,114.21	(698,849,114.21)
2027		2,328,584,166	161,583,437			2,490,167,603.14	(2,490,167,603.14)
2028		590,627,202	161,583,437			752,210,638.76	(752,210,638.76)
2029	1,018,082,857		161,583,437		30,000,000	191,583,436.67	826,499,420.22
2030	1,018,082,857		161,583,437		30,000,000	191,583,436.67	826,499,420.22
2031	1,018,082,857		161,583,437		30,000,000	191,583,436.67	826,499,420.22
2032	1,018,082,857		161,583,437		30,000,000	191,583,436.67	826,499,420.22
2033	1,018,082,857		161,583,437		30,000,000	191,583,436.67	826,499,420.22
2034	1,018,082,857		161,583,437	85,043,914	30,000,000	276,627,350.70	741,455,506.18
2035	1,018,082,857		157,543,851	85,043,914	30,000,000	272,587,764.79	745,495,092.10
2036	1,018,082,857		153,504,265	85,043,914	30,000,000	268,548,178.87	749,534,678.01
2037	1,018,082,857		149,464,679	85,043,914	30,000,000	264,508,592.95	753,574,263.93
2038	1,018,082,857		145,425,093	85,043,914	30,000,000	260,469,007.04	757,613,849.85
2039	1,018,082,857		141,385,507	85,043,914	30,000,000	256,429,421.12	761,653,435.76
2040	1,018,082,857		137,345,921	85,043,914	30,000,000	252,389,835.20	765,693,021.68
2041	1,018,082,857		133,306,335	85,043,914	30,000,000	248,350,249.29	769,732,607.60
2042	1,018,082,857		129,266,749	85,043,914	30,000,000	244,310,663.37	773,772,193.51
2043	1,018,082,857		125,227,163	85,043,914	30,000,000	240,271,077.45	777,811,779.43
2044	1,018,082,857		121,187,578	85,043,914	30,000,000	236,231,491.54	781,851,365.35
2045	1,018,082,857		117,147,992	85,043,914	30,000,000	232,191,905.62	785,890,951.26
2046	1,018,082,857		113,108,406	85,043,914	30,000,000	228,152,319.70	789,930,537.18
2047	1,018,082,857		109,068,820	85,043,914	30,000,000	224,112,733.79	793,970,123.10
2048	1,018,082,857		105,029,234	85,043,914	30,000,000	220,073,147.87	798,009,709.01
2049	1,018,082,857		100,989,648	85,043,914	30,000,000	216,033,561.95	802,049,294.93
2050	1,018,082,857		96,950,062	85,043,914	30,000,000	211,993,976.04	806,088,880.85
2051	1,018,082,857		92,910,476	85,043,914	30,000,000	207,954,390.12	810,128,466.76
2052	1,018,082,857		88,870,890	85,043,914	30,000,000	203,914,804.20	814,168,052.68
2053	1,018,082,857		84,831,304	85,043,914	30,000,000	199,875,218.29	818,207,638.60
2054	1,018,082,857		80,791,718	85,043,914	30,000,000	195,835,632.37	822,247,224.51
2055	1,018,082,857		76,752,132	85,043,914	30,000,000	191,796,046.45	826,286,810.43
2056	1,018,082,857		72,712,547	85,043,914	30,000,000	187,756,460.54	830,326,396.35
2057	1,018,082,857		68,672,961	85,043,914	30,000,000	183,716,874.62	834,365,982.26
2058	1,018,082,857		64,633,375	85,043,914	30,000,000	179,677,288.70	838,405,568.18
2059	1,018,082,857		60,593,789	85,043,914	30,000,000	175,637,702.79	842,445,154.10
2060	1,018,082,857		56,554,203	85,043,914	30,000,000	171,598,116.87	846,484,740.01
2061	1,018,082,857		52,514,617	85,043,914	30,000,000	167,558,530.95	850,524,325.93
2062	1,018,082,857		48,475,031	85,043,914	30,000,000	163,518,945.04	854,563,911.85
2063	1,018,082,857		44,435,445	85,043,914	30,000,000	159,479,359.12	858,603,497.76
2064	1,018,082,857		40,395,859	85,043,914	30,000,000	155,439,773.20	862,643,083.68
2065	1,018,082,857		36,356,273	85,043,914	30,000,000	151,400,187.29	866,682,669.60
2066	1,018,082,857		32,316,687	85,043,914	30,000,000	147,360,601.37	870,722,255.51
2067	1,018,082,857		28,277,101	85,043,914	30,000,000	143,321,015.45	874,761,841.43
2068	1,018,082,857		24,237,516	85,043,914	30,000,000	139,281,429.54	878,801,427.35
2069	1,018,082,857		20,197,930	85,043,914	30,000,000	135,241,843.62	882,841,013.26
2070	1,018,082,857		16,158,344	85,043,914	30,000,000	131,202,257.70	886,880,599.18
2071	1,018,082,857		12,118,758	85,043,914	30,000,000	127,162,671.79	890,920,185.10
2072	1,018,082,857		8,079,172	85,043,914	30,000,000	123,123,085.87	894,959,771.01
2073	1,018,082,857		4,039,586	85,043,914	30,000,000	119,083,499.95	898,999,356.93
2074	1,018,082,857		0	85,043,914	30,000,000	115,043,914.04	903,038,942.85
						Financial IRR	16%
						NPV @ 9.3 ADR	2,813,017,569

Overall Project (G5)

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	229,532,457	283,076,884			512,609,341	(512,609,341)
2014	-	1,217,337,541	283,076,884			1,500,414,426	(1,500,414,426)
2015	-	4,508,231,353	283,076,884			4,791,308,237	(4,791,308,237)
2016	-	1,042,816,590	283,076,884			1,325,893,474	(1,325,893,474)
2017	3,076,180,623	574,376,057	516,331,505		70,000,000	1,160,707,562	1,915,473,061
2018	3,076,180,623	965,567,132	516,331,505		70,000,000	1,551,898,638	1,524,281,985
2019	3,076,180,623	3,960,207,346	516,331,505		70,000,000	4,546,538,851	(1,470,358,228)
2020	3,076,180,623	945,358,062	516,331,505		70,000,000	1,531,689,567	1,544,491,056
2021	5,659,540,623	1,724,506,137	790,784,632		130,000,000	2,645,290,769	3,014,249,854
2022	5,659,540,623	883,696,518	790,784,632		130,000,000	1,804,481,150	3,855,059,473
2023	5,659,540,623	4,121,083,638	783,707,710	724,675,797	130,000,000	5,759,467,145	(99,926,522)
2024	5,659,540,623	965,045,270	776,630,788	724,675,797	130,000,000	2,596,351,855	3,063,188,768
2025	8,735,721,246	181,022,934	931,137,303	724,675,797	184,000,000	2,020,836,034	6,714,885,212
2026	8,735,721,246	537,265,678	918,229,015	1,206,172,511	184,000,000	2,845,667,203	5,890,054,043
2027	8,735,721,246	2,328,584,166	905,320,727	1,206,172,511	184,000,000	4,624,077,404	4,111,643,842
2028	8,735,721,246	590,627,202	892,412,440	1,206,172,511	184,000,000	2,873,212,152	5,862,509,094
2029	8,735,721,246		879,504,152	1,206,172,511	214,000,000	2,299,676,663	6,436,044,583
2030	9,753,804,103		866,595,864	1,631,392,081	214,000,000	2,711,987,945	7,041,816,158
2031	9,753,804,103		846,826,249	1,631,392,081	214,000,000	2,692,218,329	7,061,585,774
2032	9,753,804,103		827,056,633	1,631,392,081	214,000,000	2,672,448,714	7,081,355,389
2033	9,753,804,103		807,287,017	1,631,392,081	214,000,000	2,652,679,098	7,101,125,005
2034	9,753,804,103		787,517,401	1,631,392,081	214,000,000	2,632,909,482	7,120,894,621
2035	9,753,804,103		763,708,199	1,631,392,081	214,000,000	2,609,100,280	7,144,703,823
2036	9,753,804,103		739,898,998	1,631,392,081	214,000,000	2,585,291,078	7,168,513,024
2037	9,753,804,103		716,089,796	1,631,392,081	214,000,000	2,561,481,877	7,192,322,226
2038	9,753,804,103		692,280,594	1,631,392,081	214,000,000	2,537,672,675	7,216,131,428
2039	9,753,804,103		668,471,393	1,631,392,081	214,000,000	2,513,863,473	7,239,940,630
2040	9,753,804,103		644,662,191	1,631,392,081	214,000,000	2,490,054,272	7,263,749,831
2041	9,753,804,103		620,852,989	1,631,392,081	214,000,000	2,466,245,070	7,287,559,033
2042	9,753,804,103		597,043,787	1,631,392,081	214,000,000	2,442,435,868	7,311,368,235
2043	9,753,804,103		573,234,586	1,631,392,081	214,000,000	2,418,626,666	7,335,177,437
2044	9,753,804,103		549,425,384	1,631,392,081	214,000,000	2,394,817,465	7,358,986,638
2045	9,753,804,103		525,616,182	1,631,392,081	214,000,000	2,371,008,263	7,382,795,840
2046	9,753,804,103		501,806,980	1,631,392,081	214,000,000	2,347,199,061	7,406,605,042
2047	9,753,804,103		477,997,779	1,631,392,081	214,000,000	2,323,389,860	7,430,414,243
2048	9,753,804,103		454,188,577	1,631,392,081	214,000,000	2,299,580,658	7,454,223,445
2049	9,753,804,103		430,379,375	1,631,392,081	214,000,000	2,275,771,456	7,478,032,647
2050	9,753,804,103		406,570,174	1,631,392,081	214,000,000	2,251,962,254	7,501,841,849
2051	9,753,804,103		382,760,972	1,631,392,081	214,000,000	2,228,153,053	7,525,651,050
2052	9,753,804,103		358,951,770	1,631,392,081	214,000,000	2,204,343,851	7,549,460,252
2053	9,753,804,103		335,142,568	1,631,392,081	214,000,000	2,180,534,649	7,573,269,454
2054	9,753,804,103		311,333,367	1,631,392,081	214,000,000	2,156,725,447	7,597,078,655
2055	9,753,804,103		287,524,165	1,631,392,081	214,000,000	2,132,916,246	7,620,887,857
2056	9,753,804,103		263,714,963	1,631,392,081	214,000,000	2,109,107,044	7,644,697,059
2057	9,753,804,103		239,905,762	1,631,392,081	214,000,000	2,085,297,842	7,668,506,261
2058	9,753,804,103		216,096,560	1,631,392,081	214,000,000	2,061,488,641	7,692,315,462
2059	9,753,804,103		192,287,358	1,631,392,081	214,000,000	2,037,679,439	7,716,124,664
2060	9,753,804,103		168,478,156	1,631,392,081	214,000,000	2,013,870,237	7,739,933,866
2061	9,753,804,103		144,668,955	1,631,392,081	214,000,000	1,990,061,035	7,763,743,067
2062	9,753,804,103		120,859,753	1,631,392,081	214,000,000	1,966,251,834	7,787,552,269
2063	9,753,804,103		104,127,473	1,631,392,081	214,000,000	1,949,519,554	7,804,284,549
2064	9,753,804,103		87,395,194	1,631,392,081	214,000,000	1,932,787,274	7,821,016,828
2065	9,753,804,103		70,662,914	1,631,392,081	214,000,000	1,916,054,995	7,837,749,108
2066	9,753,804,103		59,762,000	1,631,392,081	214,000,000	1,905,154,081	7,848,650,022
2067	9,753,804,103		48,861,086	1,631,392,081	214,000,000	1,894,253,167	7,859,550,936
2068	9,753,804,103		37,960,172	1,631,392,081	214,000,000	1,883,352,253	7,870,451,850
2069	9,753,804,103		27,059,257.75	1,631,392,081	214,000,000	1,872,451,339	7,881,352,764
2070	9,753,804,103		16,158,343.67	1,631,392,081	214,000,000	1,861,550,424	7,892,253,678
2071	9,753,804,103		12,118,757.75	1,631,392,081	214,000,000	1,857,510,839	7,896,293,264
2072	9,753,804,103		8,079,171.833	1,631,392,081	214,000,000	1,853,471,253	7,900,332,850
2073	9,753,804,103		4,039,586	1,631,392,081	214,000,000	1,849,431,667	7,904,372,436
2074	9,753,804,103		0	1,234,091,191	214,000,000	1,448,091,191	8,305,712,912
						Financial IRR	23%
						NPV @ 9.3 ADR	26,620,905,666.29

11.2 DBP (H)

(using the Two Step Loan thru DBP and Tariff from Environmental + Sewer Charges)

Phase 1 (H1)

Phase 1	Cash Inflow		Cash Outflow			Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2013		229,532,457	342,672,018			572,204,475	(572,204,475)
2014		1,217,337,541	342,672,018			1,560,009,559	(1,560,009,559)
2015		4,508,231,353	342,672,018			4,850,903,370	(4,850,903,370)
2016		1,042,816,590	342,672,018			1,385,488,608	(1,385,488,608)
2017	3,076,458,770		342,672,018		70,000,000	412,672,018	2,663,786,752
2018	3,076,458,770		342,672,018		70,000,000	412,672,018	2,663,786,752
2019	3,076,458,770		342,672,018		70,000,000	412,672,018	2,663,786,752
2020	3,076,458,770		342,672,018		70,000,000	412,672,018	2,663,786,752
2021	3,076,458,770		342,672,018		70,000,000	412,672,018	2,663,786,752
2022	3,076,458,770		342,672,018		70,000,000	412,672,018	2,663,786,752
2023	3,076,458,770		334,105,217	148,987,834	70,000,000	553,093,051	2,523,365,719
2024	3,076,458,770		325,538,417	148,987,834	70,000,000	544,526,251	2,531,932,519
2025	3,076,458,770		316,971,616	148,987,834	70,000,000	535,959,450	2,540,499,320
2026	3,076,458,770		308,404,816	148,987,834	70,000,000	527,392,650	2,549,066,120
2027	3,076,458,770		299,838,015	148,987,834	70,000,000	518,825,849	2,557,632,921
2028	3,076,458,770		291,271,215	148,987,834	70,000,000	510,259,049	2,566,199,721
2029	3,076,458,770		282,704,415	148,987,834	70,000,000	501,692,248	2,574,766,522
2030	3,076,458,770		274,137,614	148,987,834	70,000,000	493,125,448	2,583,333,322
2031	3,076,458,770		265,570,814	148,987,834	70,000,000	484,558,647	2,591,900,122
2032	3,076,458,770		257,004,013	148,987,834	70,000,000	475,991,847	2,600,466,923
2033	3,076,458,770		248,437,213	148,987,834	70,000,000	467,425,047	2,609,033,723
2034	3,076,458,770		239,870,412	148,987,834	70,000,000	458,858,246	2,617,600,524
2035	3,076,458,770		231,303,612	148,987,834	70,000,000	450,291,446	2,626,167,324
2036	3,076,458,770		222,736,811	148,987,834	70,000,000	441,724,645	2,634,734,125
2037	3,076,458,770		214,170,011	148,987,834	70,000,000	433,157,845	2,643,300,925
2038	3,076,458,770		205,603,211	148,987,834	70,000,000	424,591,044	2,651,867,725
2039	3,076,458,770		197,036,410	148,987,834	70,000,000	416,024,244	2,660,434,526
2040	3,076,458,770		188,469,610	148,987,834	70,000,000	407,457,443	2,669,001,326
2041	3,076,458,770		179,902,809	148,987,834	70,000,000	398,890,643	2,677,568,127
2042	3,076,458,770		171,336,009	148,987,834	70,000,000	390,323,843	2,686,134,927
2043	3,076,458,770		162,769,208	148,987,834	70,000,000	381,757,042	2,694,701,728
2044	3,076,458,770		154,202,408	148,987,834	70,000,000	373,190,242	2,703,268,528
2045	3,076,458,770		145,635,607	148,987,834	70,000,000	364,623,441	2,711,835,329
2046	3,076,458,770		137,068,807	148,987,834	70,000,000	356,056,641	2,720,402,129
2047	3,076,458,770		128,502,007	148,987,834	70,000,000	347,489,840	2,728,968,929
2048	3,076,458,770		119,935,206	148,987,834	70,000,000	338,923,040	2,737,535,730
2049	3,076,458,770		111,368,406	148,987,834	70,000,000	330,356,239	2,746,102,530
2050	3,076,458,770		102,801,605	148,987,834	70,000,000	321,789,439	2,754,669,331
2051	3,076,458,770		94,234,805	148,987,834	70,000,000	313,222,639	2,763,236,131
2052	3,076,458,770		85,668,004	148,987,834	70,000,000	304,655,838	2,771,802,932
2053	3,076,458,770		77,101,204	148,987,834	70,000,000	296,089,038	2,780,369,732
2054	3,076,458,770		68,534,404	148,987,834	70,000,000	287,522,237	2,788,936,533
2055	3,076,458,770		59,967,603	148,987,834	70,000,000	278,955,437	2,797,503,333
2056	3,076,458,770		51,400,803	148,987,834	70,000,000	270,388,636	2,806,070,133
2057	3,076,458,770		42,834,002	148,987,834	70,000,000	261,821,836	2,814,636,934
2058	3,076,458,770		34,267,202	148,987,834	70,000,000	253,255,036	2,823,203,734
2059	3,076,458,770		25,700,401	148,987,834	70,000,000	244,688,235	2,831,770,535
2060	3,076,458,770		17,133,601	148,987,834	70,000,000	236,121,435	2,840,337,335
2061	3,076,458,770		8,566,800	148,987,834	70,000,000	227,554,634	2,848,904,136
2062	3,076,458,770		0	148,987,834	70,000,000	218,987,834	2,857,470,936
Financial IRR							24%
NPV @ 9.3 ADR							14,174,031,213

Phase 2 (H2)

Phase 2	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2017		574,376,057	282,360,857			856,736,914	(856,736,914)
2018		965,567,132	282,360,857			1,247,927,990	(1,247,927,990)
2019		3,960,207,346	282,360,857			4,242,568,203	(4,242,568,203)
2020		945,358,062	282,360,857			1,227,718,919	(1,227,718,919)
2021	2,786,269,538		282,360,857		60,000,000	342,360,857	2,443,908,681
2022	2,786,269,538		282,360,857		60,000,000	342,360,857	2,443,908,681
2023	2,786,269,538		282,360,857		60,000,000	342,360,857	2,443,908,681
2024	2,786,269,538		282,360,857		60,000,000	342,360,857	2,443,908,681
2025	2,786,269,538		282,360,857		60,000,000	342,360,857	2,443,908,681
2026	2,786,269,538		282,360,857		60,000,000	342,360,857	2,443,908,681
2027	2,786,269,538		275,301,836	122,765,590	60,000,000	458,067,426	2,328,202,112
2028	2,786,269,538		268,242,815	122,765,590	60,000,000	451,008,405	2,335,261,134
2029	2,786,269,538		261,183,793	122,765,590	60,000,000	443,949,383	2,342,320,155
2030	2,786,269,538		254,124,772	122,765,590	60,000,000	436,890,362	2,349,379,176
2031	2,786,269,538		247,065,750	122,765,590	60,000,000	429,831,340	2,356,438,198
2032	2,786,269,538		240,006,729	122,765,590	60,000,000	422,772,319	2,363,497,219
2033	2,786,269,538		232,947,707	122,765,590	60,000,000	415,713,298	2,370,556,241
2034	2,786,269,538		225,888,686	122,765,590	60,000,000	408,654,276	2,377,615,262
2035	2,786,269,538		218,829,664	122,765,590	60,000,000	401,595,255	2,384,674,284
2036	2,786,269,538		211,770,643	122,765,590	60,000,000	394,536,233	2,391,733,305
2037	2,786,269,538		204,711,622	122,765,590	60,000,000	387,477,212	2,398,792,326
2038	2,786,269,538		197,652,600	122,765,590	60,000,000	380,418,190	2,405,851,348
2039	2,786,269,538		190,593,579	122,765,590	60,000,000	373,359,169	2,412,910,369
2040	2,786,269,538		183,534,557	122,765,590	60,000,000	366,300,147	2,419,969,391
2041	2,786,269,538		176,475,536	122,765,590	60,000,000	359,241,126	2,427,028,412
2042	2,786,269,538		169,416,514	122,765,590	60,000,000	352,182,105	2,434,087,434
2043	2,786,269,538		162,357,493	122,765,590	60,000,000	345,123,083	2,441,146,455
2044	2,786,269,538		155,298,472	122,765,590	60,000,000	338,064,062	2,448,205,476
2045	2,786,269,538		148,239,450	122,765,590	60,000,000	331,005,040	2,455,264,498
2046	2,786,269,538		141,180,429	122,765,590	60,000,000	323,946,019	2,462,323,519
2047	2,786,269,538		134,121,407	122,765,590	60,000,000	316,886,997	2,469,382,541
2048	2,786,269,538		127,062,386	122,765,590	60,000,000	309,827,976	2,476,441,562
2049	2,786,269,538		120,003,364	122,765,590	60,000,000	302,768,955	2,483,500,584
2050	2,786,269,538		112,944,343	122,765,590	60,000,000	295,709,933	2,490,559,605
2051	2,786,269,538		105,885,322	122,765,590	60,000,000	288,650,912	2,497,618,627
2052	2,786,269,538		98,826,300	122,765,590	60,000,000	281,591,890	2,504,677,648
2053	2,786,269,538		91,767,279	122,765,590	60,000,000	274,532,869	2,511,736,669
2054	2,786,269,538		84,708,257	122,765,590	60,000,000	267,473,847	2,518,795,691
2055	2,786,269,538		77,649,236	122,765,590	60,000,000	260,414,826	2,525,854,712
2056	2,786,269,538		70,590,214	122,765,590	60,000,000	253,355,805	2,532,913,734
2057	2,786,269,538		63,531,193	122,765,590	60,000,000	246,296,783	2,539,972,755
2058	2,786,269,538		56,472,171	122,765,590	60,000,000	239,237,762	2,547,031,777
2059	2,786,269,538		49,413,150	122,765,590	60,000,000	232,178,740	2,554,090,798
2060	2,786,269,538		42,354,129	122,765,590	60,000,000	225,119,719	2,561,149,819
2061	2,786,269,538		35,295,107	122,765,590	60,000,000	218,060,697	2,568,208,841
2062	2,786,269,538		28,236,086	122,765,590	60,000,000	211,001,676	2,575,267,862
2063	2,786,269,538		21,177,064	122,765,590	60,000,000	203,942,654	2,582,326,884
2064	2,786,269,538		14,118,043	122,765,590	60,000,000	196,883,633	2,589,385,905
2065	2,786,269,538		7,059,021	122,765,590	60,000,000	189,824,612	2,596,444,927
2066	2,786,269,538		0	122,765,590	60,000,000	182,765,590	2,603,503,948
Financial IRR						24%	
NPV @ 9,3 ADR						13,072,893,830	

Phase 3 (H3)

Phase 3	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2021		1,724,506,137	332,232,732			2,056,738,869	(2,056,738,869)
2022		883,696,518	332,232,732			1,215,929,250	(1,215,929,250)
2023		4,121,083,638	332,232,732			4,453,316,370	(4,453,316,370)
2024		965,045,270	332,232,732			1,297,278,002	(1,297,278,002)
2025	2,873,782,817		332,232,732		54,000,000	386,232,732	2,487,550,085
2026	2,873,782,817		332,232,732		54,000,000	386,232,732	2,487,550,085
2027	2,873,782,817		332,232,732		54,000,000	386,232,732	2,487,550,085
2028	2,873,782,817		332,232,732		54,000,000	386,232,732	2,487,550,085
2029	2,873,782,817		332,232,732		54,000,000	386,232,732	2,487,550,085
2030	2,873,782,817		332,232,732		54,000,000	386,232,732	2,487,550,085
2031	2,873,782,817		323,926,914	144,449,014	54,000,000	522,375,928	2,351,406,889
2032	2,873,782,817		315,621,096	144,449,014	54,000,000	514,070,110	2,359,712,708
2033	2,873,782,817		307,315,277	144,449,014	54,000,000	505,764,291	2,368,018,526
2034	2,873,782,817		299,009,459	144,449,014	54,000,000	497,458,473	2,376,324,344
2035	2,873,782,817		290,703,641	144,449,014	54,000,000	489,152,655	2,384,630,163
2036	2,873,782,817		282,397,822	144,449,014	54,000,000	480,846,836	2,392,935,981
2037	2,873,782,817		274,092,004	144,449,014	54,000,000	472,541,018	2,401,241,799
2038	2,873,782,817		265,786,186	144,449,014	54,000,000	464,235,200	2,409,547,618
2039	2,873,782,817		257,480,368	144,449,014	54,000,000	455,929,382	2,417,853,436
2040	2,873,782,817		249,174,549	144,449,014	54,000,000	447,623,563	2,426,159,254
2041	2,873,782,817		240,868,731	144,449,014	54,000,000	439,317,745	2,434,465,073
2042	2,873,782,817		232,562,913	144,449,014	54,000,000	431,011,927	2,442,770,891
2043	2,873,782,817		224,257,094	144,449,014	54,000,000	422,706,108	2,451,076,709
2044	2,873,782,817		215,951,276	144,449,014	54,000,000	414,400,290	2,459,382,527
2045	2,873,782,817		207,645,458	144,449,014	54,000,000	406,094,472	2,467,688,346
2046	2,873,782,817		199,339,639	144,449,014	54,000,000	397,788,653	2,475,994,164
2047	2,873,782,817		191,033,821	144,449,014	54,000,000	389,482,835	2,484,299,982
2048	2,873,782,817		182,728,003	144,449,014	54,000,000	381,177,017	2,492,605,801
2049	2,873,782,817		174,422,184	144,449,014	54,000,000	372,871,198	2,500,911,619
2050	2,873,782,817		166,116,366	144,449,014	54,000,000	364,565,380	2,509,217,437
2051	2,873,782,817		157,810,548	144,449,014	54,000,000	356,259,562	2,517,523,256
2052	2,873,782,817		149,504,730	144,449,014	54,000,000	347,953,744	2,525,829,074
2053	2,873,782,817		141,198,911	144,449,014	54,000,000	339,647,925	2,534,134,892
2054	2,873,782,817		132,893,093	144,449,014	54,000,000	331,342,107	2,542,440,711
2055	2,873,782,817		124,587,275	144,449,014	54,000,000	323,036,289	2,550,746,529
2056	2,873,782,817		116,281,456	144,449,014	54,000,000	314,730,470	2,559,052,347
2057	2,873,782,817		107,975,638	144,449,014	54,000,000	306,424,652	2,567,358,165
2058	2,873,782,817		99,669,820	144,449,014	54,000,000	298,118,834	2,575,663,984
2059	2,873,782,817		91,364,001	144,449,014	54,000,000	289,813,015	2,583,969,802
2060	2,873,782,817		83,058,183	144,449,014	54,000,000	281,507,197	2,592,275,620
2061	2,873,782,817		74,752,365	144,449,014	54,000,000	273,201,379	2,600,581,439
2062	2,873,782,817		66,446,546	144,449,014	54,000,000	264,895,560	2,608,887,257
2063	2,873,782,817		58,140,728	144,449,014	54,000,000	256,589,742	2,617,193,075
2064	2,873,782,817		49,834,910	144,449,014	54,000,000	248,283,924	2,625,498,894
2065	2,873,782,817		41,529,092	144,449,014	54,000,000	239,978,106	2,633,804,712
2066	2,873,782,817		33,223,273	144,449,014	54,000,000	231,672,287	2,642,110,530
2067	2,873,782,817		24,917,455	144,449,014	54,000,000	223,366,469	2,650,416,349
2068	2,873,782,817		16,611,637	144,449,014	54,000,000	215,060,651	2,658,722,167
2069	2,873,782,817		8,305,818	144,449,014	54,000,000	206,754,832	2,667,027,985
2070	2,873,782,817		0	144,449,014	54,000,000	198,449,014	2,675,333,803
Financial IRR						20%	
NPV @ 9.3 ADR						11,985,998,580	

Phase 4(H4)

Phase 4	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2025		181,022,934	195,601,002			376,623,936.31	(376,623,936.31)
2026		537,265,678	195,601,002			732,866,679.83	(732,866,679.83)
2027		2,328,584,166	195,601,002			2,524,185,168.75	(2,524,185,168.75)
2028		590,627,202	195,601,002			786,228,204.37	(786,228,204.37)
2029	1,018,174,911		195,601,002		30,000,000	225,601,002.28	792,573,909.14
2030	1,018,174,911		195,601,002		30,000,000	225,601,002.28	792,573,909.14
2031	1,018,174,911		195,601,002		30,000,000	225,601,002.28	792,573,909.14
2032	1,018,174,911		195,601,002		30,000,000	225,601,002.28	792,573,909.14
2033	1,018,174,911		195,601,002		30,000,000	225,601,002.28	792,573,909.14
2034	1,018,174,911		195,601,002		30,000,000	225,601,002.28	792,573,909.14
2035	1,018,174,911		190,710,977	85,043,914	30,000,000	305,754,891.26	712,420,020.16
2036	1,018,174,911		185,820,952	85,043,914	30,000,000	300,864,866.20	717,310,045.22
2037	1,018,174,911		180,930,927	85,043,914	30,000,000	295,974,841.14	722,200,070.27
2038	1,018,174,911		176,040,902	85,043,914	30,000,000	291,084,816.09	727,090,095.33
2039	1,018,174,911		171,150,877	85,043,914	30,000,000	286,194,791.03	731,980,120.39
2040	1,018,174,911		166,260,852	85,043,914	30,000,000	281,304,765.97	736,870,145.44
2041	1,018,174,911		161,370,827	85,043,914	30,000,000	276,414,740.92	741,760,170.50
2042	1,018,174,911		156,480,802	85,043,914	30,000,000	271,524,715.86	746,650,195.56
2043	1,018,174,911		151,590,777	85,043,914	30,000,000	266,634,690.80	751,540,220.62
2044	1,018,174,911		146,700,752	85,043,914	30,000,000	261,744,665.75	756,430,245.67
2045	1,018,174,911		141,810,727	85,043,914	30,000,000	256,854,640.69	761,320,270.73
2046	1,018,174,911		136,920,702	85,043,914	30,000,000	251,964,615.63	766,210,295.79
2047	1,018,174,911		132,030,677	85,043,914	30,000,000	247,074,590.57	771,100,320.84
2048	1,018,174,911		127,140,651	85,043,914	30,000,000	242,184,565.52	775,990,345.90
2049	1,018,174,911		122,250,626	85,043,914	30,000,000	237,294,540.46	780,880,370.96
2050	1,018,174,911		117,360,601	85,043,914	30,000,000	232,404,515.40	785,770,396.01
2051	1,018,174,911		112,470,576	85,043,914	30,000,000	227,514,490.35	790,660,421.07
2052	1,018,174,911		107,580,551	85,043,914	30,000,000	222,624,465.29	795,550,446.13
2053	1,018,174,911		102,690,526	85,043,914	30,000,000	217,734,440.23	800,440,471.19
2054	1,018,174,911		97,800,501	85,043,914	30,000,000	212,844,415.18	805,330,496.24
2055	1,018,174,911		92,910,476	85,043,914	30,000,000	207,954,390.12	810,220,521.30
2056	1,018,174,911		88,020,451	85,043,914	30,000,000	203,064,365.06	815,110,546.36
2057	1,018,174,911		83,130,426	85,043,914	30,000,000	198,174,340.00	820,000,571.41
2058	1,018,174,911		78,240,401	85,043,914	30,000,000	193,284,314.95	824,890,596.47
2059	1,018,174,911		73,350,376	85,043,914	30,000,000	188,394,289.89	829,780,621.53
2060	1,018,174,911		68,460,351	85,043,914	30,000,000	183,504,264.83	834,670,646.58
2061	1,018,174,911		63,570,326	85,043,914	30,000,000	178,614,239.78	839,560,671.64
2062	1,018,174,911		58,680,301	85,043,914	30,000,000	173,724,214.72	844,450,696.70
2063	1,018,174,911		53,790,276	85,043,914	30,000,000	168,834,189.66	849,340,721.76
2064	1,018,174,911		48,900,251	85,043,914	30,000,000	163,944,164.61	854,230,746.81
2065	1,018,174,911		44,010,226	85,043,914	30,000,000	159,054,139.55	859,120,771.87
2066	1,018,174,911		39,120,200	85,043,914	30,000,000	154,164,114.49	864,010,796.93
2067	1,018,174,911		34,230,175	85,043,914	30,000,000	149,274,089.43	868,900,821.98
2068	1,018,174,911		29,340,150	85,043,914	30,000,000	144,384,064.38	873,790,847.04
2069	1,018,174,911		24,450,125	85,043,914	30,000,000	139,494,039.32	878,680,872.10
2070	1,018,174,911		19,560,100	85,043,914	30,000,000	134,604,014.26	883,570,897.15
2071	1,018,174,911		14,670,075	85,043,914	30,000,000	129,713,989.21	888,460,922.21
2072	1,018,174,911		9,780,050	85,043,914	30,000,000	124,823,964.15	893,350,947.27
2073	1,018,174,911		4,890,025	85,043,914	30,000,000	119,933,939.09	898,240,972.33
2074	1,018,174,911		0	85,043,914	30,000,000	115,043,914.04	903,130,997.38
Financial IRR						15%	
NPV @ 9.3 ADR						2,499,062,349	

Overall Project (H5)

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	229,532,457	342,672,018			572,204,475	(572,204,475)
2014	-	1,217,337,541	342,672,018			1,560,009,559	(1,560,009,559)
2015	-	4,508,231,353	342,672,018			4,850,903,370	(4,850,903,370)
2016	-	1,042,816,590	342,672,018			1,385,488,608	(1,385,488,608)
2017	3,076,458,770	574,376,057	625,032,875		70,000,000	1,269,408,932	1,807,049,838
2018	3,076,458,770	965,567,132	625,032,875		70,000,000	1,660,600,007	1,415,858,762
2019	3,076,458,770	3,960,207,346	625,032,875		70,000,000	4,655,240,221	(1,578,781,451)
2020	3,076,458,770	945,358,062	625,032,875		70,000,000	1,640,390,937	1,436,067,833
2021	5,660,052,356	1,724,506,137	957,265,607		70,000,000	2,751,771,744	2,908,280,612
2022	5,660,052,356	883,696,518	957,265,607		130,000,000	1,970,962,125	3,689,090,230
2023	5,660,052,356	4,121,083,638	948,698,807	148,987,834	130,000,000	5,348,770,278	311,282,078
2024	5,660,052,356	965,045,270	940,132,006	148,987,834	130,000,000	2,184,165,110	3,475,887,246
2025	8,736,511,126	181,022,934	1,127,166,208	148,987,834	184,000,000	1,641,176,976	7,095,334,149
2026	8,736,511,126	537,265,678	1,118,599,408	148,987,834	184,000,000	1,988,852,919	6,747,658,206
2027	8,736,511,126	2,328,584,166	1,102,973,586	271,753,424	184,000,000	3,887,311,176	4,849,199,949
2028	8,736,511,126	590,627,202	1,087,347,764	271,753,424	184,000,000	2,133,728,390	6,602,782,735
2029	8,736,511,126		1,071,721,942	271,753,424	214,000,000	1,557,475,366	7,179,035,759
2030	9,754,686,037		1,056,096,120	271,753,424	214,000,000	1,541,849,544	8,212,836,493
2031	9,754,686,037		1,032,164,480	416,202,438	214,000,000	1,662,366,918	8,092,319,119
2032	9,754,686,037		1,008,232,840	416,202,438	214,000,000	1,638,435,278	8,116,250,759
2033	9,754,686,037		984,301,200	416,202,438	214,000,000	1,614,503,638	8,140,182,399
2034	9,754,686,037		960,369,560	416,202,438	214,000,000	1,590,571,998	8,164,114,039
2035	9,754,686,037		931,547,894	501,246,352	214,000,000	1,646,794,246	8,107,891,791
2036	9,754,686,037		902,726,229	501,246,352	214,000,000	1,617,972,581	8,136,713,456
2037	9,754,686,037		873,904,564	501,246,352	214,000,000	1,589,150,916	8,165,535,121
2038	9,754,686,037		845,082,899	501,246,352	214,000,000	1,560,329,251	8,194,356,786
2039	9,754,686,037		816,261,233	501,246,352	214,000,000	1,531,507,585	8,223,178,452
2040	9,754,686,037		787,439,568	501,246,352	214,000,000	1,502,685,920	8,252,000,117
2041	9,754,686,037		758,617,903	501,246,352	214,000,000	1,473,864,255	8,280,821,782
2042	9,754,686,037		729,796,238	501,246,352	214,000,000	1,445,042,590	8,309,643,447
2043	9,754,686,037		700,974,572	501,246,352	214,000,000	1,416,220,924	8,338,465,112
2044	9,754,686,037		672,152,907	501,246,352	214,000,000	1,387,399,259	8,367,286,778
2045	9,754,686,037		643,331,242	501,246,352	214,000,000	1,358,577,594	8,396,108,443
2046	9,754,686,037		614,509,577	501,246,352	214,000,000	1,329,755,929	8,424,930,108
2047	9,754,686,037		585,687,911	501,246,352	214,000,000	1,300,934,263	8,453,751,773
2048	9,754,686,037		556,866,246	501,246,352	214,000,000	1,272,112,598	8,482,573,439
2049	9,754,686,037		528,044,581	501,246,352	214,000,000	1,243,290,933	8,511,395,104
2050	9,754,686,037		499,222,916	501,246,352	214,000,000	1,214,469,268	8,540,216,769
2051	9,754,686,037		470,401,251	501,246,352	214,000,000	1,185,647,603	8,569,038,434
2052	9,754,686,037		441,579,585	501,246,352	214,000,000	1,156,825,937	8,597,860,100
2053	9,754,686,037		412,757,920	501,246,352	214,000,000	1,128,004,272	8,626,681,765
2054	9,754,686,037		383,936,255	501,246,352	214,000,000	1,099,182,607	8,655,503,430
2055	9,754,686,037		355,114,590	501,246,352	214,000,000	1,070,360,942	8,684,325,095
2056	9,754,686,037		326,292,924	501,246,352	214,000,000	1,041,539,276	8,713,146,761
2057	9,754,686,037		297,471,259	501,246,352	214,000,000	1,012,717,611	8,741,968,426
2058	9,754,686,037		268,649,594	501,246,352	214,000,000	983,895,946	8,770,790,091
2059	9,754,686,037		239,827,929	501,246,352	214,000,000	955,074,281	8,799,611,756
2060	9,754,686,037		211,006,263	501,246,352	214,000,000	926,252,615	8,828,433,422
2061	9,754,686,037		182,184,598	501,246,352	214,000,000	897,430,950	8,857,255,087
2062	9,754,686,037		153,362,933	501,246,352	214,000,000	868,609,285	8,886,076,752
2063	9,754,686,037		133,108,068	352,258,518	214,000,000	699,366,586	9,055,319,451
2064	9,754,686,037		112,853,203	352,258,518	214,000,000	679,111,722	9,075,574,315
2065	9,754,686,037		92,598,338	352,258,518	214,000,000	658,856,857	9,095,829,180
2066	9,754,686,037		72,343,474	352,258,518	214,000,000	638,601,992	9,116,084,045
2067	9,754,686,037		59,147,630	229,492,928	214,000,000	502,640,558	9,252,045,479
2068	9,754,686,037		45,951,787	229,492,928	214,000,000	489,444,715	9,265,241,322
2069	9,754,686,037		32,755,944	229,492,928	214,000,000	476,248,872	9,278,437,165
2070	9,754,686,037		19,560,100	229,492,928	214,000,000	463,053,028	9,291,633,009
2071	9,754,686,037		14,670,075	85,043,914	214,000,000	313,713,989	9,440,972,048
2072	9,754,686,037		9,780,050	85,043,914	214,000,000	308,823,964	9,445,862,073
2073	9,754,686,037		4,890,025	85,043,914	214,000,000	303,933,939	9,450,752,098
2074	9,754,686,037		0	85,043,914	214,000,000	299,043,914	9,455,642,123
						Financial IRR	23%
						NPV @ 9.3 ADR	29,974,910,416.02

11.3 JICA

11.3.1 Direct Financing Scheme Standard Preferential Term

Annex 13.1.1 Phase 1

Phase 1	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2013		630,003,378	104,291,484			734,294,862	(734,294,862)
2014		958,225,741	104,291,484			1,062,517,225	(1,062,517,225)
2015		2,396,984,756	104,291,484			2,501,276,240	(2,501,276,240)
2016		2,787,049,283	104,291,484			2,891,340,766	(2,891,340,766)
2017	3,076,464,245		104,291,484		70,000,000	174,291,484	2,902,172,761
2018	3,076,464,245		104,291,484		70,000,000	174,291,484	2,902,172,761
2019	3,076,464,245		104,291,484		70,000,000	174,291,484	2,902,172,761
2020	3,076,464,245		104,291,484		70,000,000	174,291,484	2,902,172,761
2021	3,076,464,245		104,291,484		70,000,000	174,291,484	2,902,172,761
2022	3,076,464,245		104,291,484		70,000,000	174,291,484	2,902,172,761
2023	3,076,464,245		101,684,197	148,987,834	70,000,000	320,672,030	2,755,792,214
2024	3,076,464,245		99,076,909	148,987,834	70,000,000	318,064,743	2,758,399,502
2025	3,076,464,245		96,469,622	148,987,834	70,000,000	315,457,456	2,761,006,789
2026	3,076,464,245		93,862,335	148,987,834	70,000,000	312,850,169	2,763,614,076
2027	3,076,464,245		91,255,048	148,987,834	70,000,000	310,242,882	2,766,221,363
2028	3,076,464,245		88,647,761	148,987,834	70,000,000	307,635,595	2,768,828,650
2029	3,076,464,245		86,040,474	148,987,834	70,000,000	305,028,308	2,771,435,937
2030	3,076,464,245		83,433,187	148,987,834	70,000,000	302,421,021	2,774,043,224
2031	3,076,464,245		80,825,900	148,987,834	70,000,000	299,813,734	2,776,650,511
2032	3,076,464,245		78,218,613	148,987,834	70,000,000	297,206,446	2,779,257,798
2033	3,076,464,245		75,611,326	148,987,834	70,000,000	294,599,159	2,781,865,085
2034	3,076,464,245		73,004,039	148,987,834	70,000,000	291,991,872	2,784,472,372
2035	3,076,464,245		70,396,751	148,987,834	70,000,000	289,384,585	2,787,079,660
2036	3,076,464,245		67,789,464	148,987,834	70,000,000	286,777,298	2,789,686,947
2037	3,076,464,245		65,182,177	148,987,834	70,000,000	284,170,011	2,792,294,234
2038	3,076,464,245		62,574,890	148,987,834	70,000,000	281,562,724	2,794,901,521
2039	3,076,464,245		59,967,603	148,987,834	70,000,000	278,955,437	2,797,508,808
2040	3,076,464,245		57,360,316	148,987,834	70,000,000	276,348,150	2,800,116,095
2041	3,076,464,245		54,753,029	148,987,834	70,000,000	273,740,863	2,802,723,382
2042	3,076,464,245		52,145,742	148,987,834	70,000,000	271,133,576	2,805,330,669
2043	3,076,464,245		49,538,455	148,987,834	70,000,000	268,526,288	2,807,937,956
2044	3,076,464,245		46,931,168	148,987,834	70,000,000	265,919,001	2,810,545,243
2045	3,076,464,245		44,323,881	148,987,834	70,000,000	263,311,714	2,813,152,530
2046	3,076,464,245		41,716,593	148,987,834	70,000,000	260,704,427	2,815,759,818
2047	3,076,464,245		39,109,306	148,987,834	70,000,000	258,097,140	2,818,367,105
2048	3,076,464,245		36,502,019	148,987,834	70,000,000	255,489,853	2,820,974,392
2049	3,076,464,245		33,894,732	148,987,834	70,000,000	252,882,566	2,823,581,679
2050	3,076,464,245		31,287,445	148,987,834	70,000,000	250,275,279	2,826,188,966
2051	3,076,464,245		28,680,158	148,987,834	70,000,000	247,667,992	2,828,796,253
2052	3,076,464,245		26,072,871	148,987,834	70,000,000	245,060,705	2,831,403,540
2053	3,076,464,245		23,465,584	148,987,834	70,000,000	242,453,418	2,834,010,827
2054	3,076,464,245		20,858,297	148,987,834	70,000,000	239,846,130	2,836,618,114
2055	3,076,464,245		18,251,010	148,987,834	70,000,000	237,238,843	2,839,225,401
2056	3,076,464,245		15,643,723	148,987,834	70,000,000	234,631,556	2,841,832,688
2057	3,076,464,245		13,036,435	148,987,834	70,000,000	232,024,269	2,844,439,976
2058	3,076,464,245		10,429,148	148,987,834	70,000,000	229,416,982	2,847,047,263
2059	3,076,464,245		7,821,861	148,987,834	70,000,000	226,809,695	2,849,654,550
2060	3,076,464,245		5,214,574	148,987,834	70,000,000	224,202,408	2,852,261,837
2061	3,076,464,245		2,607,287	148,987,834	70,000,000	221,595,121	2,854,869,124
2062	3,076,464,245		0	148,987,834	70,000,000	218,987,834	2,857,476,411
						Financial IRR	30%
						NPV @ 9.3 ADR	16,915,089,651

Annex 13.I.2 Phase 2

Phase 2	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2017		1,090,869,119	85,935,913			1,176,805,033	(1,176,805,033)
2018		1,226,342,517	85,935,913			1,312,278,430	(1,312,278,430)
2019		1,864,967,110	85,935,913			1,950,903,023	(1,950,903,023)
2020		2,049,347,570	85,935,913			2,135,283,483	(2,135,283,483)
2021	2,786,274,497		85,935,913		60,000,000	145,935,913	2,640,338,584
2022	2,786,274,497		85,935,913		60,000,000	145,935,913	2,640,338,584
2023	2,786,274,497		85,935,913		60,000,000	145,935,913	2,640,338,584
2024	2,786,274,497		85,935,913		60,000,000	145,935,913	2,640,338,584
2025	2,786,274,497		85,935,913		60,000,000	145,935,913	2,640,338,584
2026	2,786,274,497		85,935,913		60,000,000	145,935,913	2,640,338,584
2027	2,786,274,497		83,787,515	122,765,590	60,000,000	266,553,105	2,519,721,391
2028	2,786,274,497		81,639,117	122,765,590	60,000,000	264,404,708	2,521,869,789
2029	2,786,274,497		79,490,720	122,765,590	60,000,000	262,256,310	2,524,018,187
2030	2,786,274,497		77,342,322	122,765,590	60,000,000	260,107,912	2,526,166,585
2031	2,786,274,497		75,193,924	122,765,590	60,000,000	257,959,514	2,528,314,983
2032	2,786,274,497		73,045,526	122,765,590	60,000,000	255,811,116	2,530,463,380
2033	2,786,274,497		70,897,128	122,765,590	60,000,000	253,662,719	2,532,611,778
2034	2,786,274,497		68,748,731	122,765,590	60,000,000	251,514,321	2,534,760,176
2035	2,786,274,497		66,600,333	122,765,590	60,000,000	249,365,923	2,536,908,574
2036	2,786,274,497		64,451,935	122,765,590	60,000,000	247,217,525	2,539,056,972
2037	2,786,274,497		62,303,537	122,765,590	60,000,000	245,069,127	2,541,205,370
2038	2,786,274,497		60,155,139	122,765,590	60,000,000	242,920,729	2,543,353,767
2039	2,786,274,497		58,006,741	122,765,590	60,000,000	240,772,332	2,545,502,165
2040	2,786,274,497		55,858,344	122,765,590	60,000,000	238,623,934	2,547,650,563
2041	2,786,274,497		53,709,946	122,765,590	60,000,000	236,475,536	2,549,798,961
2042	2,786,274,497		51,561,548	122,765,590	60,000,000	234,327,138	
2043	2,786,274,497		49,413,150	122,765,590	60,000,000	232,178,740	
2044	2,786,274,497		47,264,752	122,765,590	60,000,000	230,030,342	
2045	2,786,274,497		45,116,354	122,765,590	60,000,000	227,881,945	
2046	2,786,274,497		42,967,957	122,765,590	60,000,000	225,733,547	
2047	2,786,274,497		40,819,559	122,765,590	60,000,000	223,585,149	
2048	2,786,274,497		38,671,161	122,765,590	60,000,000	221,436,751	
2049	2,786,274,497		36,522,763	122,765,590	60,000,000	219,288,353	
2050	2,786,274,497		34,374,365	122,765,590	60,000,000	217,139,955	
2051	2,786,274,497		32,225,967	122,765,590	60,000,000	214,991,558	
2052	2,786,274,497		30,077,570	122,765,590	60,000,000	212,843,160	
2053	2,786,274,497		27,929,172	122,765,590	60,000,000	210,694,762	
2054	2,786,274,497		25,780,774	122,765,590	60,000,000	208,546,364	
2055	2,786,274,497		23,632,376	122,765,590	60,000,000	206,397,966	
2056	2,786,274,497		21,483,978	122,765,590	60,000,000	204,249,568	
2057	2,786,274,497		19,335,580	122,765,590	60,000,000	202,101,171	
2058	2,786,274,497		17,187,183	122,765,590	60,000,000	199,952,773	
2059	2,786,274,497		15,038,785	122,765,590	60,000,000	197,804,375	
2060	2,786,274,497		12,890,387	122,765,590	60,000,000	195,655,977	
2061	2,786,274,497		10,741,989	122,765,590	60,000,000	193,507,579	
2062	2,786,274,497		8,593,591	122,765,590	60,000,000	191,359,181	2,594,915,315
2063	2,786,274,497		6,445,193	122,765,590	60,000,000	189,210,784	2,597,063,713
2064	2,786,274,497		4,296,796	122,765,590	60,000,000	187,062,386	2,599,212,111
2065	2,786,274,497		2,148,398	122,765,590	60,000,000	184,913,988	2,601,360,509
2066	2,786,274,497		0	122,765,590	60,000,000	182,765,590	2,603,508,907
						Financial IRR	28%
						NPV @ 9.3 ADR	13,123,283,979

Annex 13.I.3 Phase 3

Phase 3	Cash Inflow	Cash Outflow				Net Inflow	
	Revenues	Devt Cost	Interest	Principal	OM		Total
2021		1,411,860,161	101,114,310			1,512,974,471	(1,512,974,471)
2022		1,524,824,718	101,114,310			1,625,939,028	(1,625,939,028)
2023		2,114,163,456	101,114,310			2,215,277,765	(2,215,277,765)
2024		2,284,256,928	101,114,310			2,385,371,237	(2,385,371,237)
2025	2,873,787,932		101,114,310		54,000,000	155,114,310	2,718,673,622
2026	2,873,787,932		101,114,310		54,000,000	155,114,310	2,718,673,622
2027	2,873,787,932		101,114,310	144,449,014	54,000,000	299,563,324	2,574,224,608
2028	2,873,787,932		101,114,310	144,449,014	54,000,000	299,563,324	2,574,224,608
2029	2,873,787,932		101,114,310	144,449,014	54,000,000	299,563,324	2,574,224,608
2030	2,873,787,932		101,114,310	144,449,014	54,000,000	299,563,324	2,574,224,608
2031	2,873,787,932		98,586,452	144,449,014	54,000,000	297,035,466	2,576,752,466
2032	2,873,787,932		96,058,594	144,449,014	54,000,000	294,507,608	2,579,280,323
2033	2,873,787,932		93,530,737	144,449,014	54,000,000	291,979,751	2,581,808,181
2034	2,873,787,932		91,002,879	144,449,014	54,000,000	289,451,893	2,584,336,039
2035	2,873,787,932		88,475,021	144,449,014	54,000,000	286,924,035	2,586,863,897
2036	2,873,787,932		85,947,163	144,449,014	54,000,000	284,396,177	2,589,391,754
2037	2,873,787,932		83,419,306	144,449,014	54,000,000	281,868,320	2,591,919,612
2038	2,873,787,932		80,891,448	144,449,014	54,000,000	279,340,462	2,594,447,470
2039	2,873,787,932		78,363,590	144,449,014	54,000,000	276,812,604	2,596,975,328
2040	2,873,787,932		75,835,732	144,449,014	54,000,000	274,284,746	2,599,503,185
2041	2,873,787,932		73,307,875	144,449,014	54,000,000	271,756,889	2,602,031,043
2042	2,873,787,932		70,780,017	144,449,014	54,000,000	269,229,031	2,604,558,901
2043	2,873,787,932		68,252,159	144,449,014	54,000,000	266,701,173	2,607,086,759
2044	2,873,787,932		65,724,301	144,449,014	54,000,000	264,173,315	2,609,614,616
2045	2,873,787,932		63,196,444	144,449,014	54,000,000	261,645,458	2,612,142,474
2046	2,873,787,932		60,668,586	144,449,014	54,000,000	259,117,600	2,614,670,332
2047	2,873,787,932		58,140,728	144,449,014	54,000,000	256,589,742	2,617,198,190
2048	2,873,787,932		55,612,870	144,449,014	54,000,000	254,061,884	2,619,726,047
2049	2,873,787,932		53,085,013	144,449,014	54,000,000	251,534,027	2,622,253,905
2050	2,873,787,932		50,557,155	144,449,014	54,000,000	249,006,169	2,624,781,763
2051	2,873,787,932		48,029,297	144,449,014	54,000,000	246,478,311	2,627,309,621
2052	2,873,787,932		45,501,439	144,449,014	54,000,000	243,950,453	2,629,837,478
2053	2,873,787,932		42,973,582	144,449,014	54,000,000	241,422,596	2,632,365,336
2054	2,873,787,932		40,445,724	144,449,014	54,000,000	238,894,738	2,634,893,194
2055	2,873,787,932		37,917,866	144,449,014	54,000,000	236,366,880	2,637,421,052
2056	2,873,787,932		35,390,008	144,449,014	54,000,000	233,839,022	2,639,948,909
2057	2,873,787,932		32,862,151	144,449,014	54,000,000	231,311,165	2,642,476,767
2058	2,873,787,932		30,334,293	144,449,014	54,000,000	228,783,307	2,645,004,625
2059	2,873,787,932		27,806,435	144,449,014	54,000,000	226,255,449	2,647,532,482
2060	2,873,787,932		25,278,577	144,449,014	54,000,000	223,727,591	2,650,060,340
2061	2,873,787,932		22,750,720	144,449,014	54,000,000	221,199,734	2,652,588,198
2062	2,873,787,932		20,222,862	144,449,014	54,000,000	218,671,876	2,655,116,056
2063	2,873,787,932		17,695,004	144,449,014	54,000,000	216,144,018	2,657,643,913
2064	2,873,787,932		15,167,146	144,449,014	54,000,000	213,616,161	2,660,171,771
2065	2,873,787,932		12,639,289	144,449,014	54,000,000	211,088,303	2,662,699,629
2066	2,873,787,932		10,111,431	144,449,014	54,000,000	208,560,445	2,665,227,487
2067	2,873,787,932		7,583,573	192,598,685	54,000,000	254,182,259	2,619,605,673
2068	2,873,787,932		5,055,715	192,598,685	54,000,000	251,654,401	2,622,133,531
2069	2,873,787,932		2,527,858	192,598,685	54,000,000	249,126,543	2,624,661,389
2070	2,873,787,932		0	192,598,685	54,000,000	246,598,685	2,627,189,246
						Financial IRR	25%
						NPV @ 9.3 ADR	14,478,494,423

Annex 13.1.4 Phase 4

Phase 4	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2025		985,556,072	59,530,740			1,045,086,812.20	(1,045,086,812.20)
2026		1,028,778,245	59,530,740			1,088,308,984.56	(1,088,308,984.56)
2027		1,218,512,621	59,530,740			1,278,043,360.79	(1,278,043,360.79)
2028		1,280,153,062	59,530,740			1,339,683,801.75	(1,339,683,801.75)
2029	1,018,176,723		59,530,740		30,000,000	89,530,739.82	928,645,983.56
2030	1,018,176,723		59,530,740		30,000,000	89,530,739.82	928,645,983.56
2031	1,018,176,723		59,530,740		30,000,000	89,530,739.82	928,645,983.56
2032	1,018,176,723		59,530,740		30,000,000	89,530,739.82	928,645,983.56
2033	1,018,176,723		59,530,740		30,000,000	89,530,739.82	928,645,983.56
2034	1,018,176,723		59,530,740		30,000,000	89,530,739.82	928,645,983.56
2035	1,018,176,723		58,042,471	85,043,914	30,000,000	173,086,385.36	845,090,338.03
2036	1,018,176,723		56,554,203	85,043,914	30,000,000	171,598,116.87	846,578,606.52
2037	1,018,176,723		55,065,934	85,043,914	30,000,000	170,109,848.37	848,066,875.02
2038	1,018,176,723		53,577,666	85,043,914	30,000,000	168,621,579.88	849,555,143.51
2039	1,018,176,723		52,089,397	85,043,914	30,000,000	167,133,311.38	851,043,412.01
2040	1,018,176,723		50,601,129	85,043,914	30,000,000	165,645,042.89	852,531,680.50
2041	1,018,176,723		49,112,860	85,043,914	30,000,000	164,156,774.39	854,019,949.00
2042	1,018,176,723		47,624,592	85,043,914	30,000,000	162,668,505.89	855,508,217.49
2043	1,018,176,723		46,136,323	85,043,914	30,000,000	161,180,237.40	856,996,485.99
2044	1,018,176,723		44,648,055	85,043,914	30,000,000	159,691,968.90	858,484,754.49
2045	1,018,176,723		43,159,786	85,043,914	30,000,000	158,203,700.41	859,973,022.98
2046	1,018,176,723		41,671,518	85,043,914	30,000,000	156,715,431.91	861,461,291.48
2047	1,018,176,723		40,183,249	85,043,914	30,000,000	155,227,163.42	862,949,559.97
2048	1,018,176,723		38,694,981	85,043,914	30,000,000	153,738,894.92	864,437,828.47
2049	1,018,176,723		37,206,712	85,043,914	30,000,000	152,250,626.43	865,926,096.96
2050	1,018,176,723		35,718,444	85,043,914	30,000,000	150,762,357.93	867,414,365.46
2051	1,018,176,723		34,230,175	85,043,914	30,000,000	149,274,089.43	868,902,633.96
2052	1,018,176,723		32,741,907	85,043,914	30,000,000	147,785,820.94	870,390,902.45
2053	1,018,176,723		31,253,638	85,043,914	30,000,000	146,297,552.44	871,879,170.95
2054	1,018,176,723		29,765,370	85,043,914	30,000,000	144,809,283.95	873,367,439.44
2055	1,018,176,723		28,277,101	85,043,914	30,000,000	143,321,015.45	874,855,707.94
2056	1,018,176,723		26,788,833	85,043,914	30,000,000	141,832,746.96	876,343,976.43
2057	1,018,176,723		25,300,564	85,043,914	30,000,000	140,344,478.46	877,832,244.93
2058	1,018,176,723		23,812,296	85,043,914	30,000,000	138,856,209.96	879,320,513.42
2059	1,018,176,723		22,324,027	85,043,914	30,000,000	137,367,941.47	880,808,781.92
2060	1,018,176,723		20,835,759	85,043,914	30,000,000	135,879,672.97	882,297,050.42
2061	1,018,176,723		19,347,490	85,043,914	30,000,000	134,391,404.48	883,785,318.91
2062	1,018,176,723		17,859,222	85,043,914	30,000,000	132,903,135.98	885,273,587.41
2063	1,018,176,723		16,370,953	85,043,914	30,000,000	131,414,867.49	886,761,855.90
2064	1,018,176,723		14,882,685	85,043,914	30,000,000	129,926,598.99	888,250,124.40
2065	1,018,176,723		13,394,416	85,043,914	30,000,000	128,438,330.50	889,738,392.89
2066	1,018,176,723		11,906,148	85,043,914	30,000,000	126,950,062.00	891,226,661.39
2067	1,018,176,723		10,417,879	85,043,914	30,000,000	125,461,793.50	892,714,929.88
2068	1,018,176,723		8,929,611	85,043,914	30,000,000	123,973,525.01	894,203,198.38
2069	1,018,176,723		7,441,342	85,043,914	30,000,000	122,485,256.51	895,691,466.88
2070	1,018,176,723		5,953,074	85,043,914	30,000,000	120,996,988.02	897,179,735.37
2071	1,018,176,723		4,464,805	85,043,914	30,000,000	119,508,719.52	898,668,003.87
2072	1,018,176,723		2,976,537	85,043,914	30,000,000	118,020,451.03	900,156,272.36
2073	1,018,176,723		1,488,268	85,043,914	30,000,000	116,532,182.53	901,644,540.86
2074	1,018,176,723		0	85,043,914	30,000,000	115,043,914.04	903,132,809.35
						Financial IRR	15%
						NPV @ 9.3 ADR	3,057,589,254

Annex 13.15 Overall Project Financial Analysis

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	630,003,378	104,291,484			734,294,862	(734,294,862)
2014	-	958,225,741	104,291,484			1,062,517,225	(1,062,517,225)
2015	-	2,396,984,756	104,291,484			2,501,276,240	(2,501,276,240)
2016	-	2,787,049,283	104,291,484			2,891,340,766	(2,891,340,766)
2017	3,076,464,245	1,090,869,119	190,227,397		70,000,000	1,351,096,516	1,725,367,729
2018	3,076,464,245	1,226,342,517	190,227,397		70,000,000	1,486,569,913	1,589,894,331
2019	3,076,464,245	1,864,967,110	190,227,397		70,000,000	2,125,194,507	951,269,738
2020	3,076,464,245	2,049,347,570	190,227,397		70,000,000	2,309,574,967	766,889,278
2021	5,660,062,429	1,411,860,161	291,341,707		130,000,000	1,833,201,868	3,826,860,561
2022	5,660,062,429	1,524,824,718	291,341,707		130,000,000	1,946,166,425	3,713,896,003
2023	5,660,062,429	2,114,163,456	288,734,419	148,987,834	130,000,000	2,681,885,709	2,978,176,720
2024	5,660,062,429	2,284,256,928	286,127,132	148,987,834	130,000,000	2,849,371,894	2,810,690,535
2025	8,736,526,673	985,556,072	343,050,585	148,987,834	184,000,000	1,661,594,491	7,074,932,182
2026	8,736,526,673	1,028,778,245	340,443,298	148,987,834	184,000,000	1,702,209,377	7,034,317,297
2027	8,736,526,673	1,218,512,621	335,687,613	271,753,424	184,000,000	2,009,953,658	6,726,573,015
2028	8,736,526,673	1,280,153,062	330,931,928	271,753,424	184,000,000	2,066,838,414	6,669,688,259
2029	8,736,526,673		326,176,243	271,753,424	214,000,000	811,929,667	7,924,597,006
2030	9,754,703,397		321,420,558	271,753,424	214,000,000	807,173,982	8,947,529,414
2031	9,754,703,397		314,137,016	416,202,438	214,000,000	944,339,454	8,810,363,943
2032	9,754,703,397		306,853,473	416,202,438	214,000,000	937,055,911	8,817,647,486
2033	9,754,703,397		299,569,930	416,202,438	214,000,000	929,772,368	8,824,931,028
2034	9,754,703,397		292,286,388	416,202,438	214,000,000	922,488,826	8,832,214,571
2035	9,754,703,397		283,514,577	501,246,352	214,000,000	998,760,929	8,755,942,468
2036	9,754,703,397		274,742,765	501,246,352	214,000,000	989,989,117	8,764,714,279
2037	9,754,703,397		265,970,954	501,246,352	214,000,000	981,217,306	8,773,486,090
2038	9,754,703,397		257,199,143	501,246,352	214,000,000	972,445,495	8,782,257,902
2039	9,754,703,397		248,427,332	501,246,352	214,000,000	963,673,684	8,791,029,713
2040	9,754,703,397		239,655,521	501,246,352	214,000,000	954,901,873	8,799,801,524
2041	9,754,703,397		230,883,710	501,246,352	214,000,000	946,130,062	8,808,573,335
2042	9,754,703,397		222,111,898	501,246,352	214,000,000	937,358,250	8,817,345,146
2043	9,754,703,397		213,340,087	501,246,352	214,000,000	928,586,439	8,826,116,957
2044	9,754,703,397		204,568,276	501,246,352	214,000,000	919,814,628	8,834,888,769
2045	9,754,703,397		195,796,465	501,246,352	214,000,000	911,042,817	8,843,660,580
2046	9,754,703,397		187,024,654	501,246,352	214,000,000	902,271,006	8,852,432,391
2047	9,754,703,397		178,252,843	501,246,352	214,000,000	893,499,195	8,861,204,202
2048	9,754,703,397		169,481,031	501,246,352	214,000,000	884,727,383	8,869,976,013
2049	9,754,703,397		160,709,220	501,246,352	214,000,000	875,955,572	8,878,747,824
2050	9,754,703,397		151,937,409	501,246,352	214,000,000	867,183,761	8,887,519,636
2051	9,754,703,397		143,165,598	501,246,352	214,000,000	858,411,950	8,896,291,447
2052	9,754,703,397		134,393,787	501,246,352	214,000,000	849,640,139	8,905,063,258
2053	9,754,703,397		125,621,976	501,246,352	214,000,000	840,868,328	8,913,835,069
2054	9,754,703,397		116,850,165	501,246,352	214,000,000	832,096,517	8,922,606,880
2055	9,754,703,397		108,078,353	501,246,352	214,000,000	823,324,705	8,931,378,691
2056	9,754,703,397		99,306,542	501,246,352	214,000,000	814,552,894	8,940,150,502
2057	9,754,703,397		90,534,731	501,246,352	214,000,000	805,781,083	8,948,922,314
2058	9,754,703,397		81,762,920	501,246,352	214,000,000	797,009,272	8,957,694,125
2059	9,754,703,397		72,991,109	501,246,352	214,000,000	788,237,461	8,966,465,936
2060	9,754,703,397		64,219,298	501,246,352	214,000,000	779,465,650	8,975,237,747
2061	9,754,703,397		55,447,486	501,246,352	214,000,000	770,693,838	8,984,009,558
2062	9,754,703,397		46,675,675	501,246,352	214,000,000	761,922,027	8,992,781,369
2063	9,754,703,397		40,511,151	352,258,518	214,000,000	606,769,669	9,147,933,727
2064	9,754,703,397		34,346,627	352,258,518	214,000,000	600,605,145	9,154,098,251
2065	9,754,703,397		28,182,103	352,258,518	214,000,000	594,440,621	9,160,262,775
2066	9,754,703,397		22,017,579	352,258,518	214,000,000	588,276,097	9,166,427,299
2067	9,754,703,397		18,001,453	229,492,928	214,000,000	461,494,381	9,293,209,016
2068	9,754,703,397		13,985,326	229,492,928	214,000,000	457,478,255	9,297,225,142
2069	9,754,703,397		9,969,200	229,492,928	214,000,000	453,462,128	9,301,241,268
2070	9,754,703,397		5,953,074	229,492,928	214,000,000	449,446,002	9,305,257,395
2071	9,754,703,397		4,464,805	85,043,914	214,000,000	303,508,720	9,451,194,677
2072	9,754,703,397		2,976,537	85,043,914	214,000,000	302,020,451	9,452,682,946
2073	9,754,703,397		1,488,268	85,043,914	214,000,000	300,532,183	9,454,171,214
2074	9,754,703,397		0	85,043,914	214,000,000	299,043,914	9,455,659,483
						Financial IRR	28%
						NPV @ 9.3 ADR	35,785,280,439

11.3.2 Direct Loan Scheme-Option 1 and Tariff based on Environmental and Sewer Charges

Annex 13.J.1 Phase 1

Phase 1	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2013		630,003,378	98,331,970			728,335,348	(728,335,348)
2014		958,225,741	98,331,970			1,056,557,712	(1,056,557,712)
2015		2,396,984,756	98,331,970			2,495,316,726	(2,495,316,726)
2016		2,787,049,283	98,331,970			2,885,381,253	(2,885,381,253)
2017	3,076,464,245		98,331,970		70,000,000	168,331,970	2,908,132,274
2018	3,076,464,245		98,331,970		70,000,000	168,331,970	2,908,132,274
2019	3,076,464,245		98,331,970		70,000,000	168,331,970	2,908,132,274
2020	3,076,464,245		98,331,970		70,000,000	168,331,970	2,908,132,274
2021	3,076,464,245		98,331,970		70,000,000	168,331,970	2,908,132,274
2022	3,076,464,245		98,331,970		70,000,000	168,331,970	2,908,132,274
2023	3,076,464,245		95,054,238	198,650,445	70,000,000	363,704,683	2,712,759,562
2024	3,076,464,245		91,776,506	198,650,445	70,000,000	360,426,951	2,716,037,294
2025	3,076,464,245		88,498,773	198,650,445	70,000,000	357,149,218	2,719,315,027
2026	3,076,464,245		85,221,041	198,650,445	70,000,000	353,871,486	2,722,592,759
2027	3,076,464,245		81,943,309	198,650,445	70,000,000	350,593,754	2,725,870,491
2028	3,076,464,245		78,665,576	198,650,445	70,000,000	347,316,021	2,729,148,224
2029	3,076,464,245		75,387,844	198,650,445	70,000,000	344,038,289	2,732,425,956
2030	3,076,464,245		72,110,112	198,650,445	70,000,000	340,760,557	2,735,703,688
2031	3,076,464,245		68,832,379	198,650,445	70,000,000	337,482,824	2,738,981,421
2032	3,076,464,245		65,554,647	198,650,445	70,000,000	334,205,092	2,742,259,153
2033	3,076,464,245		62,276,915	198,650,445	70,000,000	330,927,360	2,745,536,885
2034	3,076,464,245		58,999,182	198,650,445	70,000,000	327,649,627	2,748,814,618
2035	3,076,464,245		55,721,450	198,650,445	70,000,000	324,371,895	2,752,092,350
2036	3,076,464,245		52,443,717	198,650,445	70,000,000	321,094,162	2,755,370,082
2037	3,076,464,245		49,165,985	198,650,445	70,000,000	317,816,430	2,758,647,815
2038	3,076,464,245		45,888,253	198,650,445	70,000,000	314,538,698	2,761,925,547
2039	3,076,464,245		42,610,520	198,650,445	70,000,000	311,260,965	2,765,203,279
2040	3,076,464,245		39,332,788	198,650,445	70,000,000	307,983,233	2,768,481,012
2041	3,076,464,245		36,055,056	198,650,445	70,000,000	304,705,501	2,771,758,744
2042	3,076,464,245		32,777,323	198,650,445	70,000,000	301,427,768	2,775,036,476
2043	3,076,464,245		29,499,591	198,650,445	70,000,000	298,150,036	2,778,314,209
2044	3,076,464,245		26,221,859	198,650,445	70,000,000	294,872,304	2,781,591,941
2045	3,076,464,245		22,944,126	198,650,445	70,000,000	291,594,571	2,784,869,673
2046	3,076,464,245		19,666,394	198,650,445	70,000,000	288,316,839	2,788,147,406
2047	3,076,464,245		16,388,662	198,650,445	70,000,000	285,039,107	2,791,425,138
2048	3,076,464,245		13,110,929	198,650,445	70,000,000	281,761,374	2,794,702,870
2049	3,076,464,245		9,833,197	198,650,445	70,000,000	278,483,642	2,797,980,603
2050	3,076,464,245		6,555,465	198,650,445	70,000,000	275,205,910	2,801,258,335
2051	3,076,464,245		3,277,732	198,650,445	70,000,000	271,928,177	2,804,536,067
Financial IRR							30%
NPV @ 9.3 ADR							16,139,510,230

Annex 13.J.2 Phase 2

Phase 2	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		1,090,869,119	81,025,290			1,171,894,409	(1,171,894,409)
2018		1,226,342,517	81,025,290			1,307,367,806	(1,307,367,806)
2019		1,864,967,110	81,025,290			1,945,992,399	(1,945,992,399)
2020		2,049,347,570	81,025,290			2,130,372,859	(2,130,372,859)
2021	2,786,274,497		81,025,290		60,000,000	141,025,290	2,645,249,207
2022	2,786,274,497		81,025,290		60,000,000	141,025,290	2,645,249,207
2023	2,786,274,497		81,025,290		60,000,000	141,025,290	2,645,249,207
2024	2,786,274,497		81,025,290		60,000,000	141,025,290	2,645,249,207
2025	2,786,274,497		81,025,290		60,000,000	141,025,290	2,645,249,207
2026	2,786,274,497		81,025,290		60,000,000	141,025,290	2,645,249,207
2027	2,786,274,497		78,324,447	163,687,454	60,000,000	302,011,900	2,484,262,597
2028	2,786,274,497		75,623,604	163,687,454	60,000,000	299,311,057	2,486,963,440
2029	2,786,274,497		72,922,761	163,687,454	60,000,000	296,610,214	2,489,664,283
2030	2,786,274,497		70,221,918	163,687,454	60,000,000	293,909,371	2,492,365,126
2031	2,786,274,497		67,521,075	163,687,454	60,000,000	291,208,528	2,495,065,969
2032	2,786,274,497		64,820,232	163,687,454	60,000,000	288,507,685	2,497,766,812
2033	2,786,274,497		62,119,389	163,687,454	60,000,000	285,806,842	2,500,467,655
2034	2,786,274,497		59,418,546	163,687,454	60,000,000	283,105,999	2,503,168,498
2035	2,786,274,497		56,717,703	163,687,454	60,000,000	280,405,156	2,505,869,341
2036	2,786,274,497		54,016,860	163,687,454	60,000,000	277,704,313	2,508,570,184
2037	2,786,274,497		51,316,017	163,687,454	60,000,000	275,003,470	2,511,271,027
2038	2,786,274,497		48,615,174	163,687,454	60,000,000	272,302,627	2,513,971,869
2039	2,786,274,497		45,914,331	163,687,454	60,000,000	269,601,784	2,516,672,712
2040	2,786,274,497		43,213,488	163,687,454	60,000,000	266,900,941	2,519,373,555
2041	2,786,274,497		40,512,645	163,687,454	60,000,000	264,200,098	2,522,074,398
2042	2,786,274,497		37,811,802	163,687,454	60,000,000	261,499,255	2,524,775,241
2043	2,786,274,497		35,110,959	163,687,454	60,000,000	258,798,412	2,527,476,084
2044	2,786,274,497		32,410,116	163,687,454	60,000,000	256,097,569	2,530,176,927
2045	2,786,274,497		29,709,273	163,687,454	60,000,000	253,396,726	2,532,877,770
2046	2,786,274,497		27,008,430	163,687,454	60,000,000	250,695,883	2,535,578,613
2047	2,786,274,497		24,307,587	163,687,454	60,000,000	247,995,040	2,538,279,456
2048	2,786,274,497		21,606,744	163,687,454	60,000,000	245,294,197	2,540,980,299
2049	2,786,274,497		18,905,901	163,687,454	60,000,000	242,593,354	2,543,681,142
2050	2,786,274,497		16,205,058	163,687,454	60,000,000	239,892,511	2,546,381,985
2051	2,786,274,497		13,504,215	163,687,454	60,000,000	237,191,668	2,549,082,828
2052	2,786,274,497		10,803,372	163,687,454	60,000,000	234,490,826	2,551,783,671
2053	2,786,274,497		8,102,529	163,687,454	60,000,000	231,789,983	2,554,484,514
2054	2,786,274,497		5,401,686	163,687,454	60,000,000	229,089,140	2,557,185,357
2055	2,786,274,497		2,700,843	163,687,454	60,000,000	226,388,297	2,559,886,200
2056	2,786,274,497		0	163,687,454	60,000,000	223,687,454	2,562,587,043
						Financial IRR	28%
						NPV @ 9,3 ADR	14,647,846,171

Annex 13.J .3 Phase 3

	Cash Inflow	Cash Outflow				Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2021		1,411,860,161	95,336,349			1,507,196,511	(1,507,196,511)
2022		1,524,824,718	95,336,349			1,620,161,068	(1,620,161,068)
2023		2,114,163,456	95,336,349			2,209,499,805	(2,209,499,805)
2024		2,284,256,928	95,336,349			2,379,593,277	(2,379,593,277)
2025	2,873,787,932		95,336,349		54,000,000	149,336,349	2,724,451,582
2026	2,873,787,932		95,336,349		54,000,000	149,336,349	2,724,451,582
2027	2,873,787,932		95,336,349	192,598,685	54,000,000	341,935,035	2,531,852,897
2028	2,873,787,932		95,336,349	192,598,685	54,000,000	341,935,035	2,531,852,897
2029	2,873,787,932		95,336,349	192,598,685	54,000,000	341,935,035	2,531,852,897
2030	2,873,787,932		95,336,349	192,598,685	54,000,000	341,935,035	2,531,852,897
2031	2,873,787,932		92,158,471	192,598,685	54,000,000	338,757,156	2,535,030,775
2032	2,873,787,932		88,980,593	192,598,685	54,000,000	335,579,278	2,538,208,654
2033	2,873,787,932		85,802,714	192,598,685	54,000,000	332,401,400	2,541,386,532
2034	2,873,787,932		82,624,836	192,598,685	54,000,000	329,223,521	2,544,564,410
2035	2,873,787,932		79,446,958	192,598,685	54,000,000	326,045,643	2,547,742,289
2036	2,873,787,932		76,269,079	192,598,685	54,000,000	322,867,765	2,550,920,167
2037	2,873,787,932		73,091,201	192,598,685	54,000,000	319,689,886	2,554,098,045
2038	2,873,787,932		69,913,323	192,598,685	54,000,000	316,512,008	2,557,275,924
2039	2,873,787,932		66,735,444	192,598,685	54,000,000	313,334,130	2,560,453,802
2040	2,873,787,932		63,557,566	192,598,685	54,000,000	310,156,252	2,563,631,680
2041	2,873,787,932		60,379,688	192,598,685	54,000,000	306,978,373	2,566,809,558
2042	2,873,787,932		57,201,810	192,598,685	54,000,000	303,800,495	2,569,987,437
2043	2,873,787,932		54,023,931	192,598,685	54,000,000	300,622,617	2,573,165,315
2044	2,873,787,932		50,846,053	192,598,685	54,000,000	297,444,738	2,576,343,193
2045	2,873,787,932		47,668,175	192,598,685	54,000,000	294,266,860	2,579,521,072
2046	2,873,787,932		44,490,296	192,598,685	54,000,000	291,088,982	2,582,698,950
2047	2,873,787,932		41,312,418	192,598,685	54,000,000	287,911,103	2,585,876,828
2048	2,873,787,932		38,134,540	192,598,685	54,000,000	284,733,225	2,589,054,707
2049	2,873,787,932		34,956,661	192,598,685	54,000,000	281,555,347	2,592,232,585
2050	2,873,787,932		31,778,783	192,598,685	54,000,000	278,377,468	2,595,410,463
2051	2,873,787,932		28,600,905	192,598,685	54,000,000	275,199,590	2,598,588,342
2052	2,873,787,932		25,423,026	192,598,685	54,000,000	272,021,712	2,601,766,220
2053	2,873,787,932		22,245,148	192,598,685	54,000,000	268,843,834	2,604,944,098
2054	2,873,787,932		19,067,270	192,598,685	54,000,000	265,665,955	2,608,121,977
2055	2,873,787,932		15,889,392	192,598,685	54,000,000	262,488,077	2,611,299,855
2056	2,873,787,932		12,711,513	192,598,685	54,000,000	259,310,199	2,614,477,733
2057	2,873,787,932		9,533,635	192,598,685	54,000,000	256,132,320	2,617,655,611
2058	2,873,787,932		6,355,757	192,598,685	54,000,000	252,954,442	2,620,833,490
2059	2,873,787,932		3,177,878	192,598,685	54,000,000	249,776,564	2,624,011,368
2060	2,873,787,932		(0)	192,598,685	54,000,000	246,598,685	2,627,189,246
						Financial IRR	25%
						NPV @ 9.3 ADR	13,733,675,077

Annex 13.J.4 Phase 4 based on

Phase 4	Cash Inflow		Cash Outflow			Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2025		985,556,072	56,128,983			1,041,685,056	(1,041,685,056)
2026		1,028,778,245	56,128,983			1,084,907,228	(1,084,907,228)
2027		1,218,512,621	56,128,983			1,274,641,604	(1,274,641,604)
2028		1,280,153,062	56,128,983			1,336,282,045	(1,336,282,045)
2029	1,018,176,723		56,128,983		30,000,000	86,128,983	932,047,740
2030	1,018,176,723		56,128,983		30,000,000	86,128,983	932,047,740
2031	1,018,176,723		56,128,983		30,000,000	86,128,983	932,047,740
2032	1,018,176,723		56,128,983		30,000,000	86,128,983	932,047,740
2033	1,018,176,723		56,128,983		30,000,000	86,128,983	932,047,740
2034	1,018,176,723		56,128,983		30,000,000	86,128,983	932,047,740
2035	1,018,176,723		54,258,017	113,391,885	30,000,000	197,649,903	820,526,821
2036	1,018,176,723		52,387,051	113,391,885	30,000,000	195,778,936	822,397,787
2037	1,018,176,723		50,516,085	113,391,885	30,000,000	193,907,970	824,268,753
2038	1,018,176,723		48,645,119	113,391,885	30,000,000	192,037,004	826,139,719
2039	1,018,176,723		46,774,153	113,391,885	30,000,000	190,166,038	828,010,685
2040	1,018,176,723		44,903,187	113,391,885	30,000,000	188,295,072	829,881,651
2041	1,018,176,723		43,032,221	113,391,885	30,000,000	186,424,106	831,752,618
2042	1,018,176,723		41,161,254	113,391,885	30,000,000	184,553,140	833,623,584
2043	1,018,176,723		39,290,288	113,391,885	30,000,000	182,682,174	835,494,550
2044	1,018,176,723		37,419,322	113,391,885	30,000,000	180,811,208	837,365,516
2045	1,018,176,723		35,548,356	113,391,885	30,000,000	178,940,241	839,236,482
2046	1,018,176,723		33,677,390	113,391,885	30,000,000	177,069,275	841,107,448
2047	1,018,176,723		31,806,424	113,391,885	30,000,000	175,198,309	842,978,414
2048	1,018,176,723		29,935,458	113,391,885	30,000,000	173,327,343	844,849,380
2049	1,018,176,723		28,064,492	113,391,885	30,000,000	171,456,377	846,720,346
2050	1,018,176,723		26,193,526	113,391,885	30,000,000	169,585,411	848,591,312
2051	1,018,176,723		24,322,559	113,391,885	30,000,000	167,714,445	850,462,279
2052	1,018,176,723		22,451,593	113,391,885	30,000,000	165,843,479	852,333,245
2053	1,018,176,723		20,580,627	113,391,885	30,000,000	163,972,513	854,204,211
2054	1,018,176,723		18,709,661	113,391,885	30,000,000	162,101,546	856,075,177
2055	1,018,176,723		16,838,695	113,391,885	30,000,000	160,230,580	857,946,143
2056	1,018,176,723		14,967,729	113,391,885	30,000,000	158,359,614	859,817,109
2057	1,018,176,723		13,096,763	113,391,885	30,000,000	156,488,648	861,688,075
2058	1,018,176,723		11,225,797	113,391,885	30,000,000	154,617,682	863,559,041
2059	1,018,176,723		9,354,831	113,391,885	30,000,000	152,746,716	865,430,007
2060	1,018,176,723		7,483,864	113,391,885	30,000,000	150,875,750	867,300,974
2061	1,018,176,723		5,612,898	113,391,885	30,000,000	149,004,784	869,171,940
2062	1,018,176,723		3,741,932	113,391,885	30,000,000	147,133,818	871,042,906
2063	1,018,176,723		1,870,966	113,391,885	30,000,000	145,262,851	872,913,872
2064	1,018,176,723		0	113,391,885	30,000,000	143,391,885	874,784,838
						Financial IRR	15%
						NPV @ 9.3 ADR	2,808,585,267

Annex 13.J .5 Overall Project Financial Analysis

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	630,003,378	98,331,970			728,335,348	(728,335,348)
2014	-	958,225,741	98,331,970			1,056,557,712	(1,056,557,712)
2015	-	2,396,984,756	98,331,970			2,495,316,726	(2,495,316,726)
2016	-	2,787,049,283	98,331,970			2,885,381,253	(2,885,381,253)
2017	3,076,464,245	1,090,869,119	179,357,260		70,000,000	1,340,226,379	1,736,237,865
2018	3,076,464,245	1,226,342,517	179,357,260		70,000,000	1,475,699,776	1,600,764,468
2019	3,076,464,245	1,864,967,110	179,357,260		70,000,000	2,114,324,370	962,139,875
2020	3,076,464,245	2,049,347,570	179,357,260		70,000,000	2,298,704,830	777,759,415
2021	5,660,062,429	1,411,860,161	274,693,609		130,000,000	1,816,553,770	3,843,508,658
2022	5,660,062,429	1,524,824,718	274,693,609		130,000,000	1,929,518,328	3,730,544,101
2023	5,660,062,429	2,114,163,456	271,415,877	198,650,445	130,000,000	2,714,229,777	2,945,832,651
2024	5,660,062,429	2,284,256,928	268,138,144	198,650,445	130,000,000	2,881,045,517	2,779,016,911
2025	8,736,526,673	985,556,072	320,989,395	198,650,445	184,000,000	1,689,195,913	7,047,330,761
2026	8,736,526,673	1,028,778,245	317,711,663	198,650,445	184,000,000	1,729,140,353	7,007,386,321
2027	8,736,526,673	1,218,512,621	311,733,088	362,337,899	184,000,000	2,076,583,607	6,659,943,066
2028	8,736,526,673	1,280,153,062	305,754,512	362,337,899	184,000,000	2,132,245,473	6,604,281,200
2029	8,736,526,673		299,775,937	362,337,899	214,000,000	876,113,836	7,860,412,838
2030	9,754,703,397		293,797,362	362,337,899	214,000,000	870,135,260	8,884,568,136
2031	9,754,703,397		284,640,908	554,936,584	214,000,000	1,053,577,492	8,701,125,905
2032	9,754,703,397		275,484,454	554,936,584	214,000,000	1,044,421,038	8,710,282,358
2033	9,754,703,397		266,328,001	554,936,584	214,000,000	1,035,264,585	8,719,438,812
2034	9,754,703,397		257,171,547	554,936,584	214,000,000	1,026,108,131	8,728,595,266
2035	9,754,703,397		246,144,127	668,328,469	214,000,000	1,128,472,597	8,626,230,800
2036	9,754,703,397		235,116,708	668,328,469	214,000,000	1,117,445,177	8,637,258,220
2037	9,754,703,397		224,089,288	668,328,469	214,000,000	1,106,417,757	8,648,285,639
2038	9,754,703,397		213,061,868	668,328,469	214,000,000	1,095,390,337	8,659,313,059
2039	9,754,703,397		202,034,448	668,328,469	214,000,000	1,084,362,918	8,670,340,479
2040	9,754,703,397		191,007,029	668,328,469	214,000,000	1,073,335,498	8,681,367,899
2041	9,754,703,397		179,979,609	668,328,469	214,000,000	1,062,308,078	8,692,395,318
2042	9,754,703,397		168,952,189	668,328,469	214,000,000	1,051,280,658	8,703,422,738
2043	9,754,703,397		157,924,769	668,328,469	214,000,000	1,040,253,239	8,714,450,158
2044	9,754,703,397		146,897,350	668,328,469	214,000,000	1,029,225,819	8,725,477,578
2045	9,754,703,397		135,869,930	668,328,469	214,000,000	1,018,198,399	8,736,504,997
2046	9,754,703,397		124,842,510	668,328,469	214,000,000	1,007,170,980	8,747,532,417
2047	9,754,703,397		113,815,090	668,328,469	214,000,000	996,143,560	8,758,559,837
2048	9,754,703,397		102,787,671	668,328,469	214,000,000	985,116,140	8,769,587,257
2049	9,754,703,397		91,760,251	668,328,469	214,000,000	974,088,720	8,780,614,676
2050	9,754,703,397		80,732,831	668,328,469	214,000,000	963,061,301	8,791,642,096
2051	9,754,703,397		69,705,411	668,328,469	214,000,000	952,033,881	8,802,669,516
2052	9,754,703,397		58,677,992	668,328,469	214,000,000	941,006,461	8,813,696,936
2053	9,754,703,397		50,928,304	469,678,024	214,000,000	734,606,329	9,020,097,068
2054	9,754,703,397		43,178,617	469,678,024	214,000,000	726,856,641	9,027,846,755
2055	9,754,703,397		35,428,930	469,678,024	214,000,000	719,106,954	9,035,596,443
2056	9,754,703,397		27,679,242	469,678,024	214,000,000	711,357,266	9,043,346,130
2057	9,754,703,397		22,630,398	305,990,571	214,000,000	542,620,968	9,212,082,428
2058	9,754,703,397		17,581,553	305,990,571	214,000,000	537,572,124	9,217,131,273
2059	9,754,703,397		12,532,709	305,990,571	214,000,000	532,523,280	9,222,180,117
2060	9,754,703,397		7,483,864	305,990,571	214,000,000	527,474,435	9,227,228,961
2061	9,754,703,397		5,612,898	113,391,885	214,000,000	333,004,784	9,421,698,613
2062	9,754,703,397		3,741,932	113,391,885	214,000,000	331,133,818	9,423,569,579
2063	9,754,703,397		1,870,966	113,391,885	214,000,000	329,262,851	9,425,440,545
2064	9,754,703,397		0	113,391,885	214,000,000	327,391,885	9,427,311,511
						Financial IRR	29%
						NPV @ 9.3 ADR	34,924,866,806

11.3.3 Direct Loan Scheme-Option 2 and Tariff based on Environmental and Sewer Charges

Annex 13.K.1 Phase 1

Phase 1	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013		229,532,457	95,352,214			324,884,671	(324,884,671)
2014		1,217,337,541	95,352,214			1,312,689,755	(1,312,689,755)
2015		4,508,231,353	95,352,214			4,603,583,566	(4,603,583,566)
2016		1,042,816,590	95,352,214			1,138,168,804	(1,138,168,804)
2017	3,076,473,136		95,352,214		70,000,000	165,352,214	2,911,120,923
2018	3,076,473,136		95,352,214		70,000,000	165,352,214	2,911,120,923
2019	3,076,473,136		95,352,214	297,975,668	70,000,000	463,327,881	2,613,145,255
2020	3,076,473,136		95,352,214	297,975,668	70,000,000	463,327,881	2,613,145,255
2021	3,076,473,136		95,352,214	297,975,668	70,000,000	463,327,881	2,613,145,255
2022	3,076,473,136		95,352,214	297,975,668	70,000,000	463,327,881	2,613,145,255
2023	3,076,473,136		22,348,175	297,975,668	70,000,000	390,323,843	2,686,149,294
2024	3,076,473,136		20,858,297	297,975,668	70,000,000	388,833,964	2,687,639,172
2025	3,076,473,136		19,368,418	297,975,668	70,000,000	387,344,086	2,689,129,050
2026	3,076,473,136		17,878,540	297,975,668	70,000,000	385,854,208	2,690,618,929
2027	3,076,473,136		16,388,662	297,975,668	70,000,000	384,364,329	2,692,108,807
2028	3,076,473,136		14,898,783	297,975,668	70,000,000	382,874,451	2,693,598,685
2029	3,076,473,136		13,408,905	297,975,668	70,000,000	381,384,573	2,695,088,564
2030	3,076,473,136		11,919,027	297,975,668	70,000,000	379,894,694	2,696,578,442
2031	3,076,473,136		10,429,148	297,975,668	70,000,000	378,404,816	2,698,068,320
2032	3,076,473,136		8,939,270	297,975,668	70,000,000	376,914,938	2,699,558,199
2033	3,076,473,136		7,449,392	297,975,668	70,000,000	375,425,059	2,701,048,077
2034	3,076,473,136		5,959,513	297,975,668	70,000,000	373,935,181	2,702,537,955
2035	3,076,473,136		4,469,635	297,975,668	70,000,000	372,445,303	2,704,027,834
2036	3,076,473,136		2,979,757	297,975,668	70,000,000	370,955,424	2,705,517,712
2037	3,076,473,136		1,489,878	297,975,668	70,000,000	369,465,546	2,707,007,590
2038	3,076,473,136		0	297,975,668	70,000,000	367,975,668	2,708,497,469
						Financial IRR	28%
						NPV @ 9.3 ADR	12,924,129,759

Annex 13.K.2. Phase 2

Phase 2	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		574,376,057	78,569,978			652,946,034	(652,946,034)
2018		965,567,132	78,569,978			1,044,137,110	(1,044,137,110)
2019		3,960,207,346	78,569,978			4,038,777,323	(4,038,777,323)
2020		945,358,062	78,569,978			1,023,928,040	(1,023,928,040)
2021	2,786,282,550		78,569,978		60,000,000	138,569,978	2,647,712,572
2022	2,786,282,550		78,569,978		60,000,000	138,569,978	2,647,712,572
2023	2,786,282,550		74,641,479	245,531,180	60,000,000	380,172,659	2,406,109,890
2024	2,786,282,550		70,712,980	245,531,180	60,000,000	376,244,160	2,410,038,389
2025	2,786,282,550		66,784,481	245,531,180	60,000,000	372,315,661	2,413,966,888
2026	2,786,282,550		62,855,982	245,531,180	60,000,000	368,387,163	2,417,895,387
2027	2,786,282,550		58,927,483	245,531,180	60,000,000	364,458,664	2,421,823,886
2028	2,786,282,550		54,998,984	245,531,180	60,000,000	360,530,165	2,425,752,385
2029	2,786,282,550		51,070,486	245,531,180	60,000,000	356,601,666	2,429,680,884
2030	2,786,282,550		47,141,987	245,531,180	60,000,000	352,673,167	2,433,609,383
2031	2,786,282,550		43,213,488	245,531,180	60,000,000	348,744,668	2,437,537,881
2032	2,786,282,550		39,284,989	245,531,180	60,000,000	344,816,169	2,441,466,380
2033	2,786,282,550		35,356,490	245,531,180	60,000,000	340,887,670	2,445,394,879
2034	2,786,282,550		31,427,991	245,531,180	60,000,000	336,959,171	2,449,323,378
2035	2,786,282,550		27,499,492	245,531,180	60,000,000	333,030,673	2,453,251,877
2036	2,786,282,550		23,570,993	245,531,180	60,000,000	329,102,174	2,457,180,376
2037	2,786,282,550		19,642,494	245,531,180	60,000,000	325,173,675	2,461,108,875
2038	2,786,282,550		15,713,996	245,531,180	60,000,000	321,245,176	2,465,037,374
2039	2,786,282,550		11,785,497	245,531,180	60,000,000	317,316,677	2,468,965,873
2040	2,786,282,550		7,856,998	245,531,180	60,000,000	313,388,178	2,472,894,371
2041	2,786,282,550		3,928,499	245,531,180	60,000,000	309,459,679	2,476,822,870
2042	2,786,282,550		-	245,531,180	60,000,000	305,531,180	2,480,751,369
						Financial IRR	27%
						NPV @ 9.3 ADR	11,714,465,868

Annex 13.K.3 Phase 3

Phase 3	Cash Inflow		Cash Outflow			Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2021		1,724,506,137	92,447,369			1,816,953,506	(1,816,953,506)
2022		883,696,518	92,447,369			976,143,887	(976,143,887)
2023		4,121,083,638	92,447,369			4,213,531,007	(4,213,531,007)
2024		965,045,270	92,447,369			1,057,492,639	(1,057,492,639)
2025	2,873,796,237		92,447,369		54,000,000	146,447,369	2,727,348,868
2026	2,873,796,237		92,447,369		54,000,000	146,447,369	2,727,348,868
2027	2,873,796,237		87,825,001	288,898,028	54,000,000	430,723,029	2,443,073,209
2028	2,873,796,237		83,202,632	288,898,028	54,000,000	426,100,660	2,447,695,577
2029	2,873,796,237		78,580,264	288,898,028	54,000,000	421,478,292	2,452,317,946
2030	2,873,796,237		73,957,895	288,898,028	54,000,000	416,855,923	2,456,940,314
2031	2,873,796,237		69,335,527	288,898,028	54,000,000	412,233,555	2,461,562,683
2032	2,873,796,237		64,713,158	288,898,028	54,000,000	407,611,186	2,466,185,051
2033	2,873,796,237		60,090,790	288,898,028	54,000,000	402,988,818	2,470,807,420
2034	2,873,796,237		55,468,421	288,898,028	54,000,000	398,366,449	2,475,429,788
2035	2,873,796,237		50,846,053	288,898,028	54,000,000	393,744,081	2,480,052,156
2036	2,873,796,237		46,223,684	288,898,028	54,000,000	389,121,713	2,484,674,525
2037	2,873,796,237		41,601,316	288,898,028	54,000,000	384,499,344	2,489,296,893
2038	2,873,796,237		36,978,948	288,898,028	54,000,000	379,876,976	2,493,919,262
2039	2,873,796,237		32,356,579	288,898,028	54,000,000	375,254,607	2,498,541,630
2040	2,873,796,237		27,734,211	288,898,028	54,000,000	370,632,239	2,503,163,999
2041	2,873,796,237		23,111,842	288,898,028	54,000,000	366,009,870	2,507,786,367
2042	2,873,796,237		18,489,474	288,898,028	54,000,000	361,387,502	2,512,408,736
2043	2,873,796,237		13,867,105	288,898,028	54,000,000	356,765,133	2,517,031,104
2044	2,873,796,237		9,244,737	288,898,028	54,000,000	352,142,765	2,521,653,472
2045	2,873,796,237		4,622,368	288,898,028	54,000,000	347,520,397	2,526,275,841
2046	2,873,796,237		-	288,898,028	54,000,000	342,898,028	2,530,898,209
						Financial IRR	23%
						NPV @ 9.3 ADR	10,785,881,607

Annex 13.K.4 Phase 4

Phase 4	Cash Inflow		Cash Outflow			Total	Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM		
2025		181,022,934	54,428,105			235,451,039.01	(235,451,039.01)
2026		537,265,678	54,428,105			591,693,782.53	(591,693,782.53)
2027		2,328,584,166	54,428,105			2,383,012,271.45	(2,383,012,271.45)
2028		590,627,202	54,428,105			645,055,307.07	(645,055,307.07)
2029	1,018,179,666		54,428,105		30,000,000	84,428,104.98	933,751,561.10
2030	1,018,179,666		54,428,105		30,000,000	84,428,104.98	933,751,561.10
2031	1,018,179,666		54,428,105	170,087,828	30,000,000	254,515,933.05	763,663,733.03
2032	1,018,179,666		48,985,294	170,087,828	30,000,000	249,073,122.55	769,106,543.53
2033	1,018,179,666		46,263,889	170,087,828	30,000,000	246,351,717.31	771,827,948.78
2034	1,018,179,666		43,542,484	170,087,828	30,000,000	243,630,312.06	774,549,354.03
2035	1,018,179,666		40,821,079	170,087,828	30,000,000	240,908,906.81	777,270,759.28
2036	1,018,179,666		38,099,673	170,087,828	30,000,000	238,187,501.56	779,992,164.53
2037	1,018,179,666		35,378,268	170,087,828	30,000,000	235,466,096.31	782,713,569.78
2038	1,018,179,666		32,656,863	170,087,828	30,000,000	232,744,691.06	785,434,975.02
2039	1,018,179,666		29,935,458	170,087,828	30,000,000	230,023,285.81	788,156,380.27
2040	1,018,179,666		27,214,052	170,087,828	30,000,000	227,301,880.56	790,877,785.52
2041	1,018,179,666		24,492,647	170,087,828	30,000,000	224,580,475.31	793,599,190.77
2042	1,018,179,666		21,771,242	170,087,828	30,000,000	221,859,070.06	796,320,596.02
2043	1,018,179,666		19,049,837	170,087,828	30,000,000	219,137,664.81	799,042,001.27
2044	1,018,179,666		16,328,431	170,087,828	30,000,000	216,416,259.56	801,763,406.52
2045	1,018,179,666		13,607,026	170,087,828	30,000,000	213,694,854.32	804,484,811.77
2046	1,018,179,666		10,885,621	170,087,828	30,000,000	210,973,449.07	807,206,217.02
2047	1,018,179,666		8,164,216	170,087,828	30,000,000	208,252,043.82	809,927,622.27
2048	1,018,179,666		5,442,810	170,087,828	30,000,000	205,530,638.57	812,649,027.52
2049	1,018,179,666		2,721,405	170,087,828	30,000,000	202,809,233.32	815,370,432.77
2050	1,018,179,666		(0)	170,087,828	30,000,000	200,087,828.07	818,091,838.01
						Financial IRR	17%
						NPV @ 9.3 ADR	2,480,581,502

Annex 13.K .5 Overall Project Financial Analysis

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	229,532,457	95,352,214			324,884,671	(324,884,671)
2014	-	1,217,337,541	95,352,214			1,312,689,755	(1,312,689,755)
2015	-	4,508,231,353	95,352,214			4,603,583,566	(4,603,583,566)
2016	-	1,042,816,590	95,352,214			1,138,168,804	(1,138,168,804)
2017	3,076,473,136	574,376,057	173,922,191		70,000,000	818,298,248	2,258,174,888
2018	3,076,473,136	965,567,132	173,922,191	297,975,668	70,000,000	1,507,464,991	1,569,008,145
2019	3,076,473,136	3,960,207,346	173,922,191	297,975,668	70,000,000	4,502,105,204	(1,425,632,068)
2020	3,076,473,136	945,358,062	173,922,191	297,975,668	70,000,000	1,487,255,921	1,589,217,215
2021	5,660,078,787	1,724,506,137	266,369,560	297,975,668	130,000,000	2,418,851,364	3,241,227,423
2022	5,660,078,787	883,696,518	266,369,560	543,506,848	130,000,000	1,823,572,926	3,836,505,861
2023	5,660,078,787	4,121,083,638	189,437,023	543,506,848	130,000,000	4,984,027,508	676,051,279
2024	5,660,078,787	965,045,270	184,018,646	543,506,848	130,000,000	1,822,570,763	3,837,508,024
2025	8,736,551,923	181,022,934	233,028,373	543,506,848	184,000,000	1,141,558,155	7,594,993,768
2026	8,736,551,923	537,265,678	227,609,996	832,404,876	184,000,000	1,781,280,550	6,955,271,374
2027	8,736,551,923	2,328,584,166	217,569,251	832,404,876	184,000,000	3,562,558,293	5,173,993,630
2028	8,736,551,923	590,627,202	207,528,505	832,404,876	184,000,000	1,814,560,583	6,921,991,340
2029	8,736,551,923		197,487,759	832,404,876	214,000,000	1,243,892,635	7,492,659,288
2030	9,754,731,589		187,447,013	1,002,492,704	214,000,000	1,403,939,718	8,350,791,872
2031	9,754,731,589		177,406,268	1,002,492,704	214,000,000	1,393,898,972	8,360,832,617
2032	9,754,731,589		161,922,712	1,002,492,704	214,000,000	1,378,415,416	8,376,316,174
2033	9,754,731,589		149,160,561	1,002,492,704	214,000,000	1,365,653,265	8,389,078,325
2034	9,754,731,589		136,398,410	1,002,492,704	214,000,000	1,352,891,114	8,401,840,475
2035	9,754,731,589		123,636,259	1,002,492,704	214,000,000	1,340,128,963	8,414,602,626
2036	9,754,731,589		110,874,108	1,002,492,704	214,000,000	1,327,366,812	8,427,364,777
2037	9,754,731,589		98,111,957	1,002,492,704	214,000,000	1,314,604,661	8,440,126,928
2038	9,754,731,589		85,349,806	704,517,037	214,000,000	1,003,866,843	8,750,864,747
2039	9,754,731,589		74,077,534	704,517,037	214,000,000	992,594,570	8,762,137,019
2040	9,754,731,589		62,805,261	704,517,037	214,000,000	981,322,297	8,773,409,292
2041	9,754,731,589		51,532,988	704,517,037	214,000,000	970,050,025	8,784,681,564
2042	9,754,731,589		40,260,716	458,985,856	214,000,000	713,246,572	9,041,485,017
2043	9,754,731,589		32,916,942	458,985,856	214,000,000	705,902,798	9,048,828,791
2044	9,754,731,589		25,573,168	458,985,856	214,000,000	698,559,025	9,056,172,565
2045	9,754,731,589		18,229,395	458,985,856	214,000,000	691,215,251	9,063,516,338
2046	9,754,731,589		10,885,621	170,087,828	214,000,000	394,973,449	9,359,758,140
2047	9,754,731,589		8,164,216	170,087,828	214,000,000	392,252,044	9,362,479,546
2048	9,754,731,589		5,442,810	170,087,828	214,000,000	389,530,639	9,365,200,951
2049	9,754,731,589		2,721,405	668,328,469	214,000,000	885,049,875	8,869,681,715
2050	9,754,731,589		(0)	668,328,469	214,000,000	882,328,469	8,872,403,120
						Financial IRR	26%
						NPV @ 9.3 ADR	30,193,541,959

11.3.4 Direct Loan Scheme-Option 3 and Tariff based on Environmental and Sewer Charges

Annex 13.L.1 Phase 1

Phase 1	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013		229,532,457	89,392,700			318,925,157	(318,925,157)
2014		1,217,337,541	89,392,700			1,306,730,242	(1,306,730,242)
2015		4,508,231,353	89,392,700			4,597,624,053	(4,597,624,053)
2016		1,042,816,590	89,392,700			1,132,209,290	(1,132,209,290)
2017	3,076,458,770		89,392,700		70,000,000	159,392,700	2,917,066,070
2018	3,076,458,770		83,433,187	397,300,890	70,000,000	550,734,077	2,525,724,693
2019	3,076,458,770		77,473,674	397,300,890	70,000,000	544,774,564	2,531,684,206
2020	3,076,458,770		71,514,160	397,300,890	70,000,000	538,815,050	2,537,643,720
2021	3,076,458,770		65,554,647	397,300,890	70,000,000	532,855,537	2,543,603,233
2022	3,076,458,770		59,595,134	397,300,890	70,000,000	526,896,024	2,549,562,746
2023	3,076,458,770		53,635,620	397,300,890	70,000,000	520,936,510	2,555,522,260
2024	3,076,458,770		47,676,107	397,300,890	70,000,000	514,976,997	2,561,481,773
2025	3,076,458,770		41,716,593	397,300,890	70,000,000	509,017,483	2,567,441,286
2026	3,076,458,770		35,757,080	397,300,890	70,000,000	503,057,970	2,573,400,800
2027	3,076,458,770		29,797,567	397,300,890	70,000,000	497,098,457	2,579,360,313
2028	3,076,458,770		23,838,053	397,300,890	70,000,000	491,138,943	2,585,319,826
2029	3,076,458,770		17,878,540	397,300,890	70,000,000	485,179,430	2,591,279,340
2030	3,076,458,770		11,919,027	397,300,890	70,000,000	479,219,917	2,597,238,853
2031	3,076,458,770		5,959,513	397,300,890	70,000,000	473,260,403	2,603,198,366
2032	3,076,458,770		0	397,300,890	70,000,000	467,300,890	2,609,157,880
Financial IRR							26%
NPV @ 9.3 ADR							10,008,045,451

Annex 13.L.2 Phase 2

Phase 2	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2017		574,376,057	73,659,354			648,035,411	(648,035,411)
2018		965,567,132	73,659,354			1,039,226,486	(1,039,226,486)
2019		3,960,207,346	73,659,354			4,033,866,700	(4,033,866,700)
2020		945,358,062	73,659,354			1,019,017,416	(1,019,017,416)
2021	2,786,269,538		73,659,354		60,000,000	133,659,354	2,652,610,184
2022	2,786,269,538		68,748,731	327,374,907	60,000,000	456,123,638	2,330,145,901
2023	2,786,269,538		63,838,107	327,374,907	60,000,000	451,213,014	2,335,056,524
2024	2,786,269,538		58,927,483	327,374,907	60,000,000	446,302,390	2,339,967,148
2025	2,786,269,538		54,016,860	327,374,907	60,000,000	441,391,767	2,344,877,771
2026	2,786,269,538		49,106,236	327,374,907	60,000,000	436,481,143	2,349,788,395
2027	2,786,269,538		44,195,612	327,374,907	60,000,000	431,570,520	2,354,699,019
2028	2,786,269,538		39,284,989	327,374,907	60,000,000	426,659,896	2,359,609,642
2029	2,786,269,538		34,374,365	327,374,907	60,000,000	421,749,272	2,364,520,266
2030	2,786,269,538		29,463,742	327,374,907	60,000,000	416,838,649	2,369,430,889
2031	2,786,269,538		24,553,118	327,374,907	60,000,000	411,928,025	2,374,341,513
2032	2,786,269,538		19,642,494	327,374,907	60,000,000	407,017,402	2,379,252,137
2033	2,786,269,538		14,731,871	327,374,907	60,000,000	402,106,778	2,384,162,760
2034	2,786,269,538		9,821,247	327,374,907	60,000,000	397,196,154	2,389,073,384
2035	2,786,269,538		4,910,624	327,374,907	60,000,000	392,285,531	2,393,984,007
2036	2,786,269,538		0	327,374,907	60,000,000	387,374,907	2,398,894,631
Financial IRR							26%
NPV @ 9.3 ADR							9,180,282,843

Annex 13.L.3 Phase 3

Phase 3	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2021		1,724,506,137	86,669,408			1,811,175,545	(1,811,175,545)
2022		883,696,518	86,669,408			970,365,926	(970,365,926)
2023		4,121,083,638	86,669,408			4,207,753,046	(4,207,753,046)
2024		965,045,270	86,669,408			1,051,714,678	(1,051,714,678)
2025	2,873,782,817		86,669,408		54,000,000	140,669,408	2,733,113,409
2026	2,873,782,817		80,891,448	385,197,371	54,000,000	520,088,819	2,353,693,999
2027	2,873,782,817		75,113,487	385,197,371	54,000,000	514,310,858	2,359,471,959
2028	2,873,782,817		69,335,527	385,197,371	54,000,000	508,532,897	2,365,249,920
2029	2,873,782,817		63,557,566	385,197,371	54,000,000	502,754,937	2,371,027,881
2030	2,873,782,817		57,779,606	385,197,371	54,000,000	496,976,976	2,376,805,841
2031	2,873,782,817		52,001,645	385,197,371	54,000,000	491,199,016	2,382,583,802
2032	2,873,782,817		46,223,684	385,197,371	54,000,000	485,421,055	2,388,361,762
2033	2,873,782,817		40,445,724	385,197,371	54,000,000	479,643,095	2,394,139,723
2034	2,873,782,817		34,667,763	385,197,371	54,000,000	473,865,134	2,399,917,683
2035	2,873,782,817		28,889,803	385,197,371	54,000,000	468,087,174	2,405,695,644
2036	2,873,782,817		23,111,842	385,197,371	54,000,000	462,309,213	2,411,473,604
2037	2,873,782,817		17,333,882	385,197,371	54,000,000	456,531,252	2,417,251,565
2038	2,873,782,817		11,555,921	385,197,371	54,000,000	450,753,292	2,423,029,526
2039	2,873,782,817		5,777,961	385,197,371	54,000,000	444,975,331	2,428,807,486
2040	2,873,782,817		0	385,197,371	54,000,000	439,197,371	2,434,585,447
						Financial IRR	22%
						NPV @ 9.3 ADR	8,122,562,054

Annex 13.L.4 Phase 4

Phase 4	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2025		181,022,934	51,026,348			232,049,282.45	(232,049,282.45)
2026		537,265,678	51,026,348			588,292,025.97	(588,292,025.97)
2027		2,328,584,166	51,026,348			2,379,610,514.89	(2,379,610,514.89)
2028		590,627,202	51,026,348			641,653,550.51	(641,653,550.51)
2029	1,018,174,911		51,026,348		30,000,000	81,026,348.42	937,148,563.00
2030	1,018,174,911		51,026,348	226,783,771	30,000,000	307,810,119.18	710,364,792.24
2031	1,018,174,911		44,222,835	226,783,771	30,000,000	301,006,606.06	717,168,305.36
2032	1,018,174,911		40,821,079	226,783,771	30,000,000	297,604,849.50	720,570,061.92
2033	1,018,174,911		37,419,322	226,783,771	30,000,000	294,203,092.94	723,971,818.48
2034	1,018,174,911		34,017,566	226,783,771	30,000,000	290,801,336.37	727,373,575.04
2035	1,018,174,911		30,615,809	226,783,771	30,000,000	287,399,579.81	730,775,331.60
2036	1,018,174,911		27,214,052	226,783,771	30,000,000	283,997,823.25	734,177,088.17
2037	1,018,174,911		23,812,296	226,783,771	30,000,000	280,596,066.69	737,578,844.73
2038	1,018,174,911		20,410,539	226,783,771	30,000,000	277,194,310.13	740,980,601.29
2039	1,018,174,911		17,008,783	226,783,771	30,000,000	273,792,553.57	744,382,357.85
2040	1,018,174,911		13,607,026	226,783,771	30,000,000	270,390,797.01	747,784,114.41
2041	1,018,174,911		10,205,270	226,783,771	30,000,000	266,989,040.44	751,185,870.97
2042	1,018,174,911		6,803,513	226,783,771	30,000,000	263,587,283.88	754,587,627.53
2043	1,018,174,911		3,401,757	226,783,771	30,000,000	260,185,527.32	757,989,384.10
2044	1,018,174,911		0	226,783,771	30,000,000	256,783,770.76	761,391,140.66
						Financial IRR	15.0%
						NPV @ 9.3 ADR	1,463,490,429

Annex 13.L.5 Overall Project Financial Analysis

Overall Project	Cash Inflow		Cash Outflow				Net Inflow
	Revenues	Devt Cost	Interest	Principal	OM	Total	
2013	-	229,532,457	89,392,700			318,925,157	(318,925,157)
2014	-	1,217,337,541	89,392,700			1,306,730,242	(1,306,730,242)
2015	-	4,508,231,353	89,392,700			4,597,624,053	(4,597,624,053)
2016	-	1,042,816,590	89,392,700			1,132,209,290	(1,132,209,290)
2017	3,076,458,770	574,376,057	163,052,054		70,000,000	807,428,111	2,269,030,659
2018	3,076,458,770	965,567,132	157,092,541	397,300,890	70,000,000	1,589,960,563	1,486,498,206
2019	3,076,458,770	3,960,207,346	151,133,028	397,300,890	70,000,000	4,578,641,263	(1,502,182,494)
2020	3,076,458,770	945,358,062	145,173,514	397,300,890	70,000,000	1,557,832,466	1,518,626,303
2021	5,660,052,356	1,724,506,137	225,883,409	397,300,890	130,000,000	2,477,690,436	3,182,361,920
2022	5,660,052,356	883,696,518	215,013,272	724,675,797	130,000,000	1,953,385,588	3,706,666,768
2023	5,660,052,356	4,121,083,638	204,143,135	724,675,797	130,000,000	5,179,902,570	480,149,786
2024	5,660,052,356	965,045,270	193,272,999	724,675,797	130,000,000	2,012,994,066	3,647,058,290
2025	8,736,511,126	181,022,934	233,429,210	724,675,797	184,000,000	1,323,127,941	7,413,383,184
2026	8,736,511,126	537,265,678	216,781,112	1,109,873,168	184,000,000	2,047,919,958	6,688,591,168
2027	8,736,511,126	2,328,584,166	200,133,015	1,109,873,168	184,000,000	3,822,590,349	4,913,920,776
2028	8,736,511,126	590,627,202	183,484,917	1,109,873,168	184,000,000	2,067,985,287	6,668,525,838
2029	8,736,511,126		166,836,820	1,109,873,168	214,000,000	1,490,709,988	7,245,801,138
2030	9,754,686,037		150,188,722	1,336,656,939	214,000,000	1,700,845,661	8,053,840,376
2031	9,754,686,037		126,737,112	1,336,656,939	214,000,000	1,677,394,050	8,077,291,987
2032	9,754,686,037		106,687,258	1,336,656,939	214,000,000	1,657,344,196	8,097,341,841
2033	9,754,686,037		92,596,917	939,356,049	214,000,000	1,245,952,966	8,508,733,071
2034	9,754,686,037		78,506,576	939,356,049	214,000,000	1,231,862,625	8,522,823,412
2035	9,754,686,037		64,416,235	939,356,049	214,000,000	1,217,772,284	8,536,913,753
2036	9,754,686,037		50,325,895	939,356,049	214,000,000	1,203,681,943	8,551,004,094
2037	9,754,686,037		41,146,178	611,981,142	214,000,000	867,127,319	8,887,558,718
2038	9,754,686,037		31,966,460	611,981,142	214,000,000	857,947,602	8,896,738,435
2039	9,754,686,037		22,786,743	611,981,142	214,000,000	848,767,885	8,905,918,152
2040	9,754,686,037		13,607,026	611,981,142	214,000,000	839,588,168	8,915,097,869
2041	9,754,686,037		10,205,270	226,783,771	214,000,000	450,989,040	9,303,696,997
2042	9,754,686,037		6,803,513	226,783,771	214,000,000	447,587,284	9,307,098,753
2043	9,754,686,037		3,401,757	226,783,771	214,000,000	444,185,527	9,310,500,510
2044	9,754,686,037		0	226,783,771	214,000,000	440,783,771	9,313,902,266
						Financial IRR	26%
						NPV @ 9.3 ADR	27,003,492,235.74

12. Economic Cost-Benefit Analysis

Annex 13.M.1 Phase 1

Phase 1	Costs (in Php)			Benefits (in Php)				Net Benefits in Php
	Economic Capital Cost	Economic Operating Cost	Total Economic Costs	Avoided Cost on Medical Expense due to Water-Related Disease	Savings due to Reduction in Morbidity	Savings due to Reduction in Mortality	Total Benefits	
2013	215,760,510		215,760,510	0	0	0	-	(215,760,510)
2014	1,144,297,289		1,144,297,289	0	0	0	-	(1,144,297,289)
2015	4,237,737,471		4,237,737,471	0	0	0	-	(4,237,737,471)
2016	980,247,595		980,247,595	0	0	0	-	(980,247,595)
2017		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2018		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2019		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2020		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2021		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2022		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2023		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2024		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2025		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2026		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2027		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2028		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2029		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2030		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2031		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2032		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2033		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2034		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2035		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2036		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2037		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2038		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2039		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2040		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2041		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2042		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2043		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2044		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2045		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2046		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2047		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2048		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2049		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2050		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2051		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2052		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2053		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2054		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2055		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2056		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2057		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2058		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2059		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2060		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
2062		61,600,000	61,600,000	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,901,236,020
							Economic IRR	32%
							NPV @ 15 DR	7,634,125,293

Annex 13.M.2 : Phase 2

Phase 2	Costs (in Php)			Benefits (in Php)				Net Benefits in Php
	Economic Capital Cost	Economic Operating Cost	Total Economic Costs	Avoided Cost on Medical Expense due to Water-Related	Savings due to Reduction in Morbidity	Savings due to Reduction in Mortality	Total Benefits	
2017	539,913,493		539,913,493	0	0	0	-	(539,913,493)
2018	907,633,104		907,633,104	0	0	0	-	(907,633,104)
2019	3,722,594,905		3,722,594,905	0	0	0	-	(3,722,594,905)
2020	888,636,578		888,636,578	0	0	0	-	(888,636,578)
2021		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2022		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2023		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2024		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2025		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2026		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2027		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2028		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2029		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2030		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2031		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2032		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2033		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2034		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2035		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2036		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2037		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2038		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2039		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2040		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2041		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2042		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2043		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2044		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2045		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2046		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2047		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2048		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2049		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2050		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2051		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2052		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2053		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2054		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2055		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2057		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2058		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2059		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2060		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2061		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2062		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2063		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2064		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2065		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
2066		52,800,000	52,800,000	4,650,804	2,391,708,513	287,005,022	2,683,364,338	2,630,564,338
							Economic IRR	31%
							NPV @ 15 DR	6,781,253,466

Annex 13.M.4 : Phase 4

Phase 4	Costs (in Php)			Benefits (in Php)				Net Benefits in Php
	Economic Capital Cost	Economic Operating Cost	Total Economic Costs	Avoided Cost on Medical Expense due to Water-Related Disease	Savings due to Reduction in Morbidity	Savings due to Reduction in Mortality	Total Benefits	
2025	170,161,558		170,161,558	0	0	0	-	(170,161,558)
2026	505,029,737		505,029,737	0	0	0	-	(505,029,737)
2027	2,188,869,116		2,188,869,116	0	0	0	-	(2,188,869,116)
2028	555,189,570		555,189,570	0	0	0	-	(555,189,570)
2029		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2030		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2031		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2032		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2033		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2034		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2035		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2036		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2037		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2038		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2039		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2040		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2041		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2042		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2043		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2044		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2045		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2046		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2047		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2048		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2049		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2050		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2051		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2052		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2053		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2054		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2055		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2056		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2056		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2057		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2058		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2059		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2060		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2061		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2062		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2063		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2064		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2065		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2066		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2067		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2068		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2069		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2070		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2071		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2072		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2073		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
2074		26,400,000	26,400,000	1,699,524	873,992,114	104,879,054	980,570,691	954,170,691
							Economic IRR	22%
							NPV @ 15 DR	1,547,217,864

Annex 13.M.5 OVERALL PROJECT ECONOMIC COST-BENEFIT ANALYSIS

Overall Project	Costs (in Php)			Benefits (in Php)				Net Benefits in Php
	Economic Capital Cost	Economic Operating Cost	Total Economic Costs	Avoided Cost on Medical Expense due to Water-Related Disease	Savings due to Reduction in Morbidity	Savings due to Reduction in Mortality	Total Benefits	
2013	215,760,510		215,760,510	0	0	0	-	(215,760,510)
2014	1,144,297,289		1,144,297,289	0	0	0	-	(1,144,297,289)
2015	4,237,737,471		4,237,737,471	0	0	0	-	(4,237,737,471)
2016	980,247,595		980,247,595	0	0	0	-	(980,247,595)
2017	539,913,493	61,600,000	601,513,493	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,361,322,527
2018	907,633,104	61,600,000	969,233,104	5,135,184	2,640,804,318	316,896,518	2,962,836,020	1,993,602,916
2019	3,722,594,905	61,600,000	3,784,194,905	5,135,184	2,640,804,318	316,896,518	2,962,836,020	(821,358,884)
2020	888,636,578	61,600,000	950,236,578	5,135,184	2,640,804,318	316,896,518	2,962,836,020	2,012,599,442
2021	1,621,035,768	114,400,000	1,735,435,768	9,785,988	5,032,512,831	603,901,540	5,646,200,359	3,910,764,590
2022	830,674,727	114,400,000	945,074,727	9,785,988	5,032,512,831	603,901,540	5,646,200,359	4,701,125,632
2023	3,873,818,619	114,400,000	3,988,218,619	9,785,988	5,032,512,831	603,901,540	5,646,200,359	1,657,981,739
2024	907,142,554	114,400,000	1,021,542,554	9,785,988	5,032,512,831	603,901,540	5,646,200,359	4,624,657,805
2025	170,161,558	161,920,000	332,081,558	14,582,868	7,499,341,949	899,921,034	8,413,845,851	8,081,764,293
2026	505,029,737	161,920,000	666,949,737	14,582,868	7,499,341,949	899,921,034	8,413,845,851	7,746,896,114
2027	2,188,869,116	161,920,000	2,350,789,116	14,582,868	7,499,341,949	899,921,034	8,413,845,851	6,063,056,734
2028	555,189,570	161,920,000	717,109,570	14,582,868	7,499,341,949	899,921,034	8,413,845,851	7,696,736,281
2029		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2030		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2031		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2032		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2033		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2034		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2035		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2036		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2037		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2038		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2039		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2040		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2041		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2042		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2043		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2044		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2045		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2046		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2047		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2048		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2049		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2050		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2051		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2052		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2053		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2054		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2055		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2056		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2056		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2057		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2058		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2059		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2060		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2061		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2062		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2063		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2064		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2065		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2066		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2067		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2068		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2069		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2070		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2071		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2072		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2073		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
2074		188,320,000	188,320,000	16,282,392	8,373,334,063	1,004,800,088	9,394,416,542	9,206,096,542
							Economic IRR	31%
							NPV @ 15 DR	13,806,102,939

Annex 4A

ENVIRONMENTAL CHECKLIST

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1. ENVIRONMENTAL CHECKLIST
 (Social and Environmental Consideration)
ENVIRONMENTAL CHECKLIST (1/3)

Category	Environmental Item	Main Check Items	Yes: Y/ No:	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process?	(a) No (b) No (c) No (d) NA	MWSI should be the one to apply for the ECC as the principal Proponent of the project. The ECC application needs to be detailed. As long as MWSI already has been identified the final site of the STP (including the capacity) and the final alignment, MWSI can already apply for an ECC. The processing will take 2 to 3 months. Thus MWSI intends to apply for the ECC
		(b) Have EIA reports been approved by authorities of the host country's government?		
		(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?		
(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?				
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders?	(a) Yes	During the FS preparation, a series of consultations with stakeholders was conducted. The MWSI, MWSS and NEDA were consulted on the general features of the project. Local government offices, such as engineering and planning were also consulted by OEC to determine compatibility of the project to existing land use. The barangay leaders in the areas where the proposed project will be constructed were also consulted in a series of focus group discussions (FGDs) and
			(B) Yes	A perception survey was also conducted for the areas in Las Piñas and Paranaque where the sewage treatment plant are proposed. The issues and concerns of the residents particularly on odor and noise control during construction and operation were considered in the design concept on how the STP will be constructed and operated.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Yes	(a) As much as possible, minimal ROW acquisition was considered in the project design. The shortest route possible with minimal pipe laying to was considered to avoid disturbance and nuisance. The candidate sites for the STP were free from informal settlers to avoid any displacement or relocation.
2 Pollution Control	(1) Water Quality	(a) Do pollutants, such as SS, BOD, COD, pH contained in treated effluent from a sewage treatment plant comply with the country's effluent standards?	(a) Yes	SS, BOD, COD and pH are all used as design parameters for the STP. All of these parameters are included in the Philippine effluent criteria and must be met by the STP discharge at all times.
		(b) Does untreated water contain heavy metals?	(b) No	The domestic sewage does not contain significant levels of heavy metals.
	(2) Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed of in accordance with the country's standards?	(a) Yes	As per design, the STP will have its own sludge processing equipment to stabilize and dry the biosolids to be generated by the STP prior to disposal. The sludge will be processed on site and converted to a Class B biosolids meeting the standards being imposed by the Department of Agriculture.
	(3) Soil Contamination	(a) If wastes, such as sludge are suspected to contain heavy metals, are adequate measures taken to prevent contamination of soil and groundwater by leachates from the wastes?	(a) NA	The sludges will not contain heavy metals thus soil and groundwater contamination is not likely.
	(4) Noise and Vibration	(a) Do noise and vibrations generated from the facilities, such as sludge treatment facilities and pumping stations comply with the country's	(a) Yes	The noise generating equipment will be put in enclosure and provided with noise reduction mechanisms such as mufflers and silencers. The noise generation shall be ensured to meet the DENR standards at all times.
(5) Odor	(a) Are adequate control measures taken for odor sources, such as sludge treatment facilities?	(a) Yes	As brought out during the conduct of public consultation, odor will be a primary concern of the nearby residents. Odor mitigating measures will be incorporated as early as in the design stage (i.e., all sumps and raw sewage tanks will be covered) as well as during operation. Proper operation of the equipment will be ensured at all times to prevent septic	
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) No	The proposed STP sites are not located on any protected areas designated by the GPH through the DENR.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	(a) No	The project does not include any ecologically valuable habitat.
		(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	(b) No	There are no know endangered species (both flora and fauna) in the area.
		(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	(c) Yes	The project will make sure that all ecological impact (if any) will be minimize or avoided.
(d) Is there a possibility that the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?		(d) Yes	The effluent will be discharged directly to rivers and creeks but these are already clean (relatively cleaner the the rivers) and will not impose any risk to the surrounding environment. This is an environmental enhancing project and is expected to greatly improve the water quality of the surrounding rivers (and Manila Bay) during eth full operation.	

ENVIRONMENTAL CHECKLIST (2/3)

4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	(a) No	There is no individual who will be displaced by the project.
		(b) NA	Compensation plan is not necessary since no one will be displaced by the project.	
		(c) NA	Resettlement plan is not necessary since no individual will be displaced by the project.	
		(d) NA	Compensation plan is not necessary since no one will be displaced by the project.	
		(e) NA	Compensation plan is not necessary since no one will be displaced by the project.	
		(f) NA	Resettlement plan is not necessary since no individual will be displaced by the project.	
		(g) NA	Resettlement plan is not necessary since no individual will be displaced by the project.	
		(h) NA	Resettlement plan is not necessary since no individual will be displaced by the project.	
		(i) NA	Resettlement plan is not necessary since no individual will be displaced by the project.	
		(j) yes	MWSI has Program Management Group in their program planning department that responsible for the grievance redress. They engage with from the beginning of land acquisition negotiations to the period after completion of land procurement.	
(2) Living and Livelihood	(a) Is there a possibility that changes in land uses and water uses due to the project will adversely affect the living conditions of inhabitants?	(a) No	There will be no change in water use. The land will be designated as a utility (public service) area by the LGU. Once the STP sites are finalized, LGU approval shall be secured in terms of development clearance prior to the construction.	
	(b) Yes	The operation and maintenance of the STP is included as one environment aspect in the prepared Environmental Management Plan of the Project.		
(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) No	There will be no local archeological, historical, cultural and religious sites that will be affected by the project.	
(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(b) No	The terrain is relatively flat and the local landscape will be maintained if not be enhanced.	
(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(a) NA	There are no indigenous people (IP) in the project area.	
	(b) NA	There are no indigenous people (IP) in the project area.		
(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	(a) Yes	Safety of workers and health risks are included in the Environmental Management Plan which will be implemented strictly by MWSI thru its designated contractor.	
	(b) Yes	Such features will be included in the contractors' environmental work program during the entire period of the construction. This will be monitored regularly by MWSI.		
	(c) Yes	Such features will be included in the contractors' environmental work program during the entire period of the construction. This will be monitored regularly by MWSI.		
	(d) Yes	Such features will be included in the contractors' environmental work program during the entire period of the construction. This will be monitored regularly by MWSI.		

ENVIRONMENTAL CHECKLIST (3/3)

5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	(a) Yes	Such features will be included in the contractors' environmental work program during the entire period of the construction.
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	(b) Yes	Such features will be included in the contractors' environmental work program during the entire period of the construction. This will be monitored regularly by MWSI.
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(c) Yes	Such features will be included in the contractors' environmental work program during the entire period of the construction. This will be monitored regularly by MWSI.
			(d) Yes	Such features will be included in the contractors' environmental work program during the entire period of the construction. This will be monitored regularly by MWSI.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	(a) Yes	The Environmental Monitoring Plan is included in the submitted report. This will be submitted to DENR for approval and monitoring. MWSI thru its designated Contractor shall implement all the necessary measures during construction phase. During the operation phase, MWSI will guarantee all the commitments and shall conduct regular assessment and
			(b) Yes	The Environmental Monitoring Plan is included in the submitted report. This will be submitted to DENR for approval and monitoring. MWSI thru its designated Contractor shall implement all the necessary measures during construction phase. During the operation phase, MWSI will guarantee all the commitments and shall conduct regular assessment and
			(c) Yes	The Environmental Monitoring Plan is included in the submitted report. This will be submitted to DENR for approval and monitoring. MWSI thru its designated Contractor shall implement all the necessary measures during construction phase. During the operation phase, MWSI will guarantee all the commitments and shall conduct regular assessment and
			(d) Yes	DENR or EMB shall be the designated agency to see regulatory compliance of MWSI.
6 Note	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) NA	Transboundary and global issues are not significant aspect of this project.

Legend: NA: Not Applicable

Notes:

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.

In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

2. Initial Environmental Examination Checklist (ECC FORMAT)

Name of Project : _____
 Project Location : _____
 Name of Proponent : _____
 Address : _____

This IEE Checklist shall be filled up once the location of the STP has been finalized. As a preliminary submittal, this form may be submitted to DENR-EMB for the project's Environmental Compliance Certificate (ECC). However, this may be subject to EMB's review in which the agency may require a regional submission of ECC applications for all project's components: STP, pump stations and pipe laying activities.

A. General Information

1. Project Ownership

Single Proprietorship		Partnership		Corporation	
--------------------------	--	-------------	--	-------------	--

2. Capitalization and Project Cost

Authorized	N.A.	Paid up	N.A.
Project Cost			

3. Project Components

3.1 Main Features

Plant Capacity	
----------------	--

Activity	Brief Description
Construction	
Conveyance	
Wastewater Treatment Plant Operation	
Sludge Handling and Effluent Disposal	

3.2 Manpower Requirements

Construction	
Operation	

3.3 Power Requirements

Local power utility	
Generator	

3.4 Water Supply

Local water utility	
Deepwell	

4. Project Site Area

4.a Total land area	
4.b Land area to be occupied	
4.c Is the area to be leased?	
If Yes, what is the period covered by the agreement?	

4.d Land/zoning classification	
Residential	
Commercial	
Industrial	
Others, pls. specify	

5. Description of Project Phases

5.1 Pre-operations/Construction

Activity	Timeframe (months)
Feasibility Study/Land Acquisition/Engineering Designs	
Permits/clearances	
Site preparation/clearing	
Civil and finishing works	
Electro mechanical works	
Commissioning	

5.2 Operations

Process	Description

5.3 Abandonment (to be determined later, since the Project is intended to be operated and maintained as long as possible)

B. Description of Environmental Setting

1. Physical Environment

1.a Description of Terrain	(%) slope	
Flat or level	0-3	
Level to undulating	3-8	
Undulating to rolling	8-18	
Rolling to moderately steep	18-30	
Moderately steep to steeply mountainous	30-50	
Very steeply mountainous	>50	

1.b Is the area erosion-prone?				Yes		No	
If Yes, what is the status?		Slight		Moderate		Severe	

1.c Are there existing natural hazards in the area (e.g. landslides, gulying, subsidence, etc.				Yes		No	
If Yes, please enumerate							

1.d Is the site situated in along a flood-prone area				Yes		No	
--	--	--	--	-----	--	----	--

1.e Is the Project near the shoreline?				Yes		No	
If Yes, how far?							

1.f Are there water bodies found inside or near the Project site?				Yes		No	
If Yes, please enumerate							

1.g What is the quality of the water body?		Fresh		Brackish		Saline/Salt	
--	--	-------	--	----------	--	-------------	--

1.h What is the quality of air		Poor		Fair		Good	
--------------------------------	--	------	--	------	--	------	--

2. Biological Environment

2.a Is the Project immediately adjacent to a natural ecosystem?				Yes		No	
If Yes, please identify?		Forest		Coastal		Marshland	
		Grassland		Mangrove		Wetland	
Others, pls. specify							

2.b Are there any wildlife in the area				Yes		No	
If Yes, please enumerate							

2.c Are there any trees within the Project site?				Yes		No	
If Yes, please identify and enumerate							

2.d Are there any vegetation within the Project site?	Yes		No	
If Yes, please identify and enumerate				

3. Socio-Economic Environment

3.a Total no. of households to be affected	None			
--	------	--	--	--

3.b Will the Project employ vulnerable groups?	Yes		No	
If Yes, what is the status?	Elderly		Children	Handicapped

3.c Are there health facilities within the Project site?	Yes		No	
--	-----	--	----	--

3.d Are there required benefits under the Labor Code to be enjoyed by the staff	Yes		No	
If Yes, please identify and enumerate				

3.e Are there required benefits under the Labor Code to be enjoyed by the staff	Yes		No	
If Yes, please identify and enumerate	Minimum wage law, Occupational health and safety code, Health insurance packages			

3.f Are the local inhabitants to be benefited by the Project?	Yes		No	
Pls. elaborate	The project will reduce pollution load, thus improving the water quality of the nearby Paete River and Laguna Lake			

3.g Are the cultural norm/morals and lifestyles of the local inhabitants to be affected by the Project?	Yes		No	
Pls. elaborate	The stakeholders will be informed and educated about the importance of having proper wastewater facilities within their community, thus will be more conscious in the use of water resources.			

3.h Are there any oppositions on the Project	Yes		No	
--	-----	--	----	--

4. Project Impacts

Components/ Parameters	Answer		Describe Impacts	Describe your Mitigating/ Enhancement Measures
	Y	N		
Construction				
Will it affect ambient air quality/noise in the area?				
Will there be land clearing?				
Will there be vegetation clearing?				
Will there be tree cutting?				
Will there be topsoil removal/replacement?				
Will there be excavation works and cut & fill activities?				
Will there be other earthmoving activities?				
Will there be stockpiling of sand gravel material on the site?				
Will there be drilling, boring, & hammering activities?				
Will there be any slope modification or ground leveling?				
Will there be an increased traffic movement in the area?				
Will the public/community have access to/through the area affected?				
Will there be an increase economic activity in the area?				
Will there be an increase in the availability of employment?				
Will there be displacement of people in the area?				
Will the displacement involved relocation of affected parties?				
Operation				
Will it affect ambient air / noisequality in the area?				
Will the project generate wastewater?				
Will there be an effect on the quality of the receiving body of water?				
Will there be an increase in surface run- off to other areas?				
Will there be increase in water demand?				
Will there be dust emission into the environment?				
Will there be air pollution sources equipment to be installed?				
Will there be any pollution complaint from the nearby residents?				
Will there be an increased in crime / security concern in the area?				
Abandonment/Rehabilitation				
Will any of the facilities be abandoned or demolished after the project life?				
Will any of the facilities need to be rehabilitated after a certain period of time?				
Will there be an increase traffic movement in the area?				

Components/ Parameters	Answer		Describe Impacts	Describe your Mitigating/ Enhancement Measures
	Y	N		
Will there be an effect on the road system of the community?				

Annex 4B

INITIL SCOPING PLAN

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ABBREVIATIONS

BIBLIOGRAPHY

Annexes

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 Manila Sewerage & Sanitation Improvement Phase 2

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ANNEX E: OTHER RELEVANT STATISTICS FOR PORT OF MANILA

Reference: for Figure 3-15

ABBREVIATIONS

ADB - Asian Development Bank
BDT - Bureau of Domestic Trade
BOD - Biological Oxygen Demand
BSWM - Bureau of Soil and Water Management
CA – Coastal Guard
CAS - Conventional Activated Sludge
CARP - Comprehensive Agrarian Reform Program
CBR - Crude Birth Rate
CDR - Crude death rate
CO - Carbon Monoxide
CO₂ - Carbon Dioxide
CWA - Clean Water Act
DA - Department of Agriculture
DAO - DENR Administrative Order
DAR - Department of Agrarian Reform
DENR - Department of Environment and Natural Resources
DOLE - Department of Labour and Employment
DOE - Department of Energy
DOH - Department of Health
DPWH - Department of Public Works and Highways
ECC - Environmental Compliance Certificate
EGF - Environmental Guarantee Fund
EIS - Environmental Impact Statement
EMB - Environmental Management Bureau
EMF - Environmental Monitoring Fund
GDP - Gross Domestic Product
HCPTI - Harbour Centre Port Terminal Inc.
HLURB - Housing and Land Use Regulatory Board
IEC - Information Education and Communication
IEE - Initial Environmental Examination
IMR - Infant Mortality Rate
IRR - Implementing Rules and Regulations
JICA - Japan International Cooperation Agency
LGU - Local Government Unit

LLDA - Laguna Lake Development Authority
MG – Municipal Government
MIAA - Manila International Airport Authority
MICT - Manila International Container Terminal
MMDA – Metro Manila Development Authority
MMR-Maternal Mortality Rate
MMT - Multi-partite Monitoring Team
MWCI- Manila Water Company, Inc.
MWSI- Maynilad Water Services Inc.
MWSS- Metropolitan Waterworks and Sewerage System
NAIA-Ninoy Aquino International Airport
NCR-National Capital Region
NESSAP-National Emission Standards for Source Specific Air Pollutants
NO₂ . Nitrogen Dioxide
NPCC-National Pollution Control Commission
NSO-National Statistics Office
NWRB - National Water Resources Board
OEC - Original Engineering Consultants Co., Ltd.
Ox - Photochemical Oxidant
PFZ-Philippine Fault Zone
PHIVOLCS-Philippine Institute of Volcanology and Seismology
PMB-Philippine Mobile Belt
PTMO-Parañaque Traffic Management Office
PRRC-Pasig River Rehabilitation Commission
RA - Republic Act
SEC - Securities and Exchange Commission
SpTP - Septage Treatment Plants
STP-Sewage Treatment Sludge
VFS - Valley Fault System

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1. PROJECT IMPLEMENTATION AGENCY

1.1 Appellation of the Agency

MEYNILAD WATER SERVICES INC.

1.2 Address of the Agency

Engineering Building, MWSS Compound, Katipunan Road, Balara,
Quezon City, Philippines

2. Title and Objectives of the Project

2.1 Title of the Project and Business Enterprise Sector

2.1.1 Title of the Project

Preparatory Survey for Metro Manila Sewerage and Sanitation Improvement Project
Project-Phase 2

2.1.2 Business Enterprise Sector

Sewerage and Sanitation System Construction and Services in Paranaque and Las
Pinas City

2.2 Environmental Category

This project shall require land procurements for constructing sewerage treatment plants with sewerage sludge treatment process. Current vacant lands owned by private or Government shall be selected for sewerage treatment plants according to the basic policy for Sewerage Treatment System Establishment by MWSS and MWSI, Project Implementation Agency, and sewer collection lines as interceptor shall be installed under the public roads. As such, any permanent resettlement of the residents including informal settlers in the project target cities will not be requested, though the environmental category has initially been categorized as Category A based on JICA Guidelines for Environmental and Social Considerations issued April 2010.

Judging from the fact findings and land procurement candidates for sewage treatment plant project sites, identified by the precise field survey conducted about 45 days by two survey teams, all site candidates, which are vacant areas without any residents or facilities, including area or site candidates for alternative or future extension project components, would be unlikely to have significant adverse impacts on the environment and society, and any impact affecting an area broader than the sites or facilities subject to physical construction would not be predicted. Sewage treatment plant (STP) is the plant that collects contaminated wastewater

generated in households' ordinal life mainly consisting of bio materials and gets rid of those down to water quality level regulated by the environmental standard defined by DENR, and then the treated water is discharging into the rivers or creeks, that is, the plant is quite different from manufacturing factories which would have possibilities to discharge hazardous water or materials like chemical plants. Those hazardous materials are also regulated by industrial environmental standards, and the sewage treatment plant in this project using bio-process for treatment basically does not use any chemical materials but Biological micro organisms for treatment. The buildings for the process are basically concrete water tanks heighted 5 meters or less, and administration building, if provided, is basically single or two floors. The maximum plant area size possibly is of 4ha or less and STP process would occupy only half of the area.

Therefore such concerns or possibilities as described hereunder, which are essential affections rose in the Category A, will not be taken consideration as described in Paragraph 3 and 4.

- Sensitive Sectors

Large-scale projects in the following sectors:

- (1) Mining, including oil and natural gas development
- (2) Oil and gas pipelines
- (3) Industrial development
- (4) Thermal power, including geothermal power
- (5) Hydropower, dams, and reservoirs
- (6) Power transmission and distribution lines involving large-scale involuntary resettlement, large-scale logging, or submarine electrical cables
- (7) River/erosion control
- (8) Roads, railways, and bridges
- (9) Airports
- (10) Ports and harbors
- (11) Water supply, sewage, and wastewater treatment that have sensitive characteristics or that are located in sensitive areas or in their vicinity
- (12) Waste management and disposal
- (13) Agriculture involving large-scale land clearing or irrigation

- Sensitive Characteristics

- (1) Large-scale involuntary resettlement
- (2) Large-scale groundwater pumping
- (3) Large-scale land reclamation, land development, and land clearing

(4) Large-scale logging

- Sensitive Areas

Projects in the following areas or their vicinity:

- (1) National parks, nationally-designated protected areas (coastal areas, wetlands, areas for ethnic minorities or indigenous peoples and cultural heritage, etc. designated by national governments)
- (2) Areas that are thought to require careful consideration by the country or locality

- Natural Environment

- (1) Primary forests or natural forests in tropical areas
- (2) Habitats with important ecological value (coral reefs, mangrove wetlands, tidal flats, etc.)
- (3) Habitats of rare species that require protection under domestic legislation, international treaties, etc.
- (4) Areas in danger of large-scale salt accumulation or soil erosion e) Areas with a remarkable tendency towards desertification

- Social Environment

- (1) Areas with unique archeological, historical, or cultural value
- (2) Areas inhabited by ethnic minorities, indigenous peoples, or nomadic peoples with traditional ways of life, and other areas with special social value

2.3 Objectives of the Project

The goals of the preparatory survey are, through providing a safe environmental setting for the long-term growth of Metro Manila to assist:

- economic and industrial growth in Metro Manila, and
- improvement of public health and hygienic situation in the urban environment.

Within this framework, the specific objectives of the project are to:

- enhance wastewater, municipal solid waste management, human waste and storm water management,
- reduce pollution, facilitating pollution control,
- expand wastewater treatment and water quality monitoring,

- improve municipal, wastewater utility financial management, and
- support training, feasibility studies and future investment for the sewerage and sanitation improvement project in the project area.

Thus, the direct objectives of this survey and study works are;

- supplemental assistance for MWSS to update the current master plan
- conduct feasibility study for sewerage and sanitation improvement project in Paranaque and Las Pinas City,
- Prepare alternatives of sewerage and sanitation system project components in Paranaque and Las Pinas catchment areas with conceptual designs and cost estimates as investment project packages, and
- prepare the project implementation and operation/maintenance plan in the project areas to be realized by Japan ODA fund.

2.4 Description of the Project

2.4.1 The Purpose of Investment Projects to be proposed

Wastewater generated in the cities is currently discharged directly into waterways or Manila Bay without any water treatment process. Septic tanks installed in many houses, but those are not effective because of poor or no maintenance. Therefore, In order to realize environmental improvement in Paranaque and Las Pinas City, total four sewage treatment plants with sewerage sludge treatment process shall be established. All wastewater generated in the cities shall be intercepted before discharging in to Manila Bay, rivers, creeks, or esteros, and conveyed to the sewage treatment plant to treat, and effluent water quality from the plants into the water bodies shall keep the water quality level less than figures required by environmental regulations. Sewerage sludge shall be digested and treated by firing or as power generation energy source.

2.4.2 The Project Areas covered by the Sewerage System

Figure 2-1 shows the project areas, Paranaque and Las Pinas Cities and locations of the sewage treatment plant and interceptor routes.

2.4.3 Sewerage Treatment System

Sewage treatment process shall be of bio-treatment systems, such as activated sludge (aerobic) process, and/or non aerobic process. This process will generate excess sewerage sludge and the excess sludge shall be treated by digesting process. The methane gas generated in the treatment process shall be collected and used for bio-energy of power generation system or fired. In any case, this process will dedicate to reduce greenhouse gas reduction.

Maximum capacity of sewage treatment plants are 133,357 m³/d in total for Paranaque and 117,493 m³/d in total for Las Pinãs. Maximum excess sludge volume generated in the project areas is about 5,000m³/d (concentration:3%) in total, which would produce methane gas of 18,000m³/d for 1,200kw of power generation. The digested sludge shall be dewatered and used for solid development, otherwise reclaimed in dump site.

Interceptors of 31km in total length shall be installed in the existing roads and conversion manholes shall be installed under the roads in vicinity of the wastewater discharging points.

Total capacity for sewage treatment plants and service population is predicted as shown in **Table 2-1**

Table 2-1 Projection of Wastewater Generation

Year		2011	2016	2021	2016	2031	2036
Paranaque	Population	592,440	633,857	669,860	700,130	724,267	740,871
	Wastewater (m ³ /d)	106,639	114,094	120,575	126,023	130,368	133,357
Laspinas	Population	562,490	591,540	615,070	633,127	645,662	652,737
	Wastewater (m ³ /d)	101,248	106,477	110,713	113,963	116,219	117,493

(Population: Maynilad Business Plan 2009)

2.4.4 Plant Construction Plan

Outline of the sewage plants are shown in **Table 2-2**. Principal building consists of sewage treatment process (equalizer, treatment reactor, excess sludge tank), sewerage sludge treatment process (sludge thickener, digesting tanks) and administration house including laboratory. In the plant site, ambit access road, rainwater drains, parking lot, and green space will be provided. As a work piece, digesting tanks, methane gas firing pipe and desulfurization facility.

Table 2-2 Sewage Treatment Plant Plan

Facilities		Note
Buildings	Sewage Treatment Administration House Laboratory	Height: GL + 10m
Work Piece	Gas Firing Pipe Desulfurization Cabinet	Height: GL + 10m
Access Road	Ambit Road Parking Lot	Pavement
Green Space	Including green buffer	
Others	Iron Fence, Gate, Guardsman House	

Note: Plant design will be decided at detail design stage. Therefore, the description in the table shall be tentative. Plant constructed near NAIA shall follow the regulation of building height limit.

2.4.5 Facility Plan

This project shall be designed and implemented as a part of Maynilad Business Plan, and the construction shall be staged to reflect the population growth and Maynilad sanitation service development plan.

The plant design shall be especially taken consideration followings.

- a) Utilization of sewerage excess sludge,
- b) Minimization of plant running cost,
- c) Utilization of treated water,
- d) Simpler operation mechanism,
- e) Protection of reactor from garbage inflow in to the system, and
- f) Over flood protection.

2.4.6 Anti-pollution Plan

Facilities for countermeasure of pollution shall be incorporated into the system for environmental conservation. Effluent water quality and other plant emission parameters shall comply with relative regulations, laws. Mitigation and counter measures to clear the relative environmental regulations shall be studied at the plant design stage.

2.4.7 Interceptor Routes

The sewer collection pipe shall be installed in the public roads, and conversion manholes shall also be installed in the roads (refer Figure 2-2 and 2-3)

2.4.8 Land Improvement

The current vacant lands will be used for the sewage treatment plant installation, therefore any specific land improvement would not be required, and however, foundation works are necessary. Underground sump water is predicted during foundation construction, and then appropriate provision shall be made to prevent the sump water from discharging as murky waters.

2.4.9 Disaster Prevention Plan

The works will be executed according to the work categories shown in **Table 2-3**. When executing the civil engineering and building works, first disaster prevention measures shall be taken. Effort should be made to minimize impacts on the surrounding environment while paying attention to local environmental preservation; for example, a works enclosure should be erected around the site with the objectives of clarifying the site perimeter and insulating against noise, etc.

In order to counter natural disasters, etc. during works, measures to prevent fly-off or collapse of building materials should be taken, while appropriate steps are needed to prevent cranes and other construction machinery from toppling over.

In addition to adopting appropriate works methods, construction machinery models that are quiet and entail as little vibration as possible should be adopted, while steps should be taken to minimize exhaust gases from heavy machinery.

Table 2-3 Work Contents and Construction Machinery in Each Work Category

Work Category	Work Contents	Construction Machinery
Civil engineering works	Temporary installation works Foundation excavation, etc.	Bulldozer, backhoe, dump truck, etc.
	Pile placement Water sealing	Pile driver, crawler crane, etc.
Building works	Reinforcing bar assembly Concrete placement	Raw concrete truck, concrete pump truck, tower crane, etc.
Plant works	Equipment assembly Installation, etc.	Tower crane, etc.
Landscaping works	Leveling, compaction, haulage	Bulldozer, dump truck, etc.

2.4.10 Investment Project Implementation Plan

The first stage plant construction is planned to complete within 6 years including interceptor installation works.

Table 2-4 Implementation Schedule

Year	2012	2013	2014	2015	2016
Sewage Treatment Plant					
Design	■				
Manufacturing		■			
Installation			■		
Construction		■	■		
Commissioning Test				■	
Operation				■	■
Interceptors					
Design	■				
Procurement		■			
Construction			■	■	■

2.4.11 Water Supply and Wastewater Discharge Plan

Water supply after the plant operation shall be of civil water, and groundwater shall not be used. Wastewater generated in the site shall be treated by the sewage treatment plant and effluent water quality from the plant shall comply with relevant standards and regulations.

Rainwater drainage shall be treated according to relevant laws and regulations.

2.5 The Others

2.5.1 Site Afforestation Plan

Peripheral spaces of the plant buildings and parking lot shall be afforested in order to match to the building design and include to the outside scenic attraction.

The plant classification to be planted shall be selected in the local species in order that scenery synechism may be kept.

2.5.2 Facility Operation Plan

The plant is of 24 hours operation, thus after the plant is put in service, the maintenance and operation shall comply with the relevant laws, taking consideration environmental protection.

Figure 2-1 Paranaque and Las Piñas Business Area (Project Area)

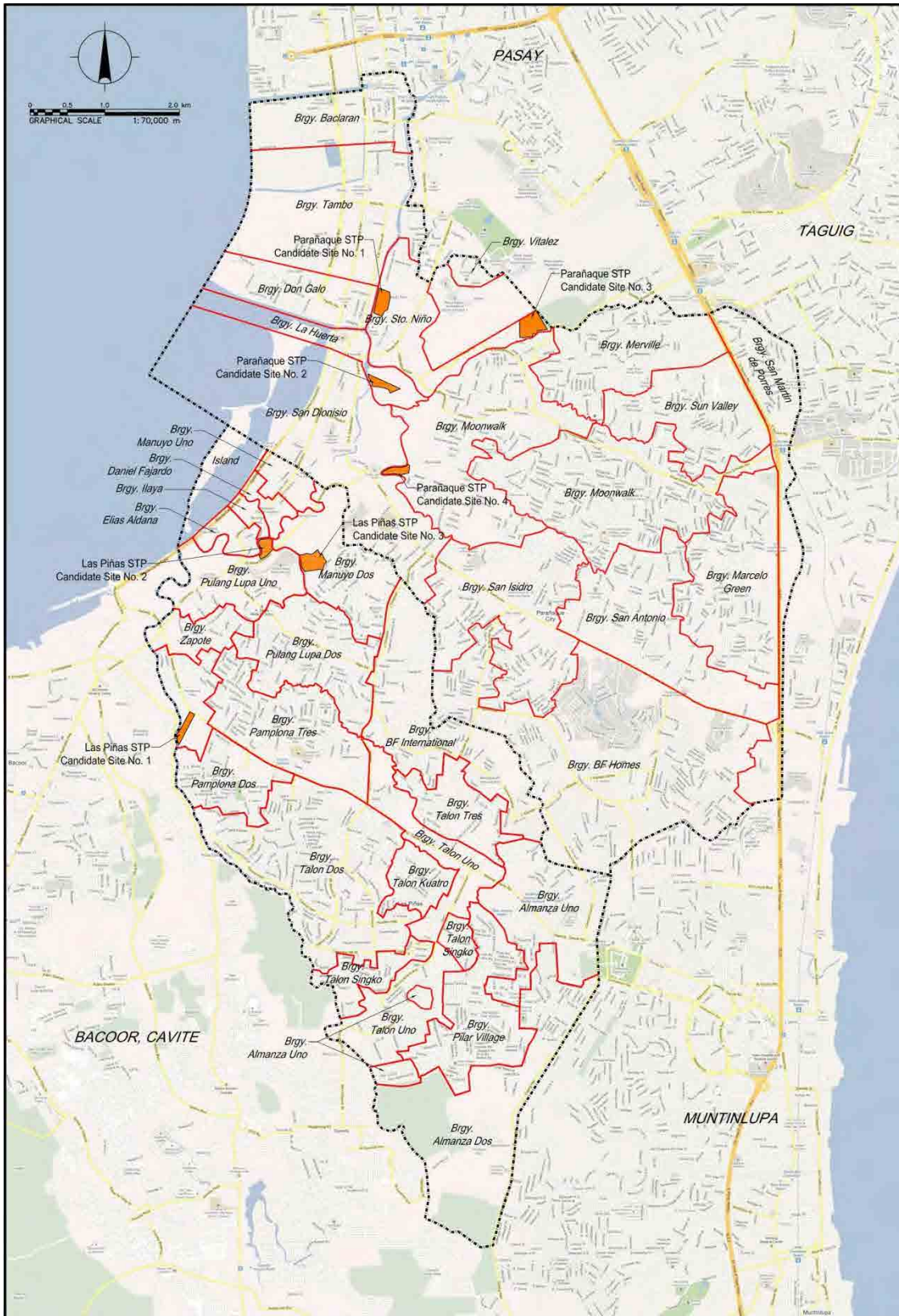
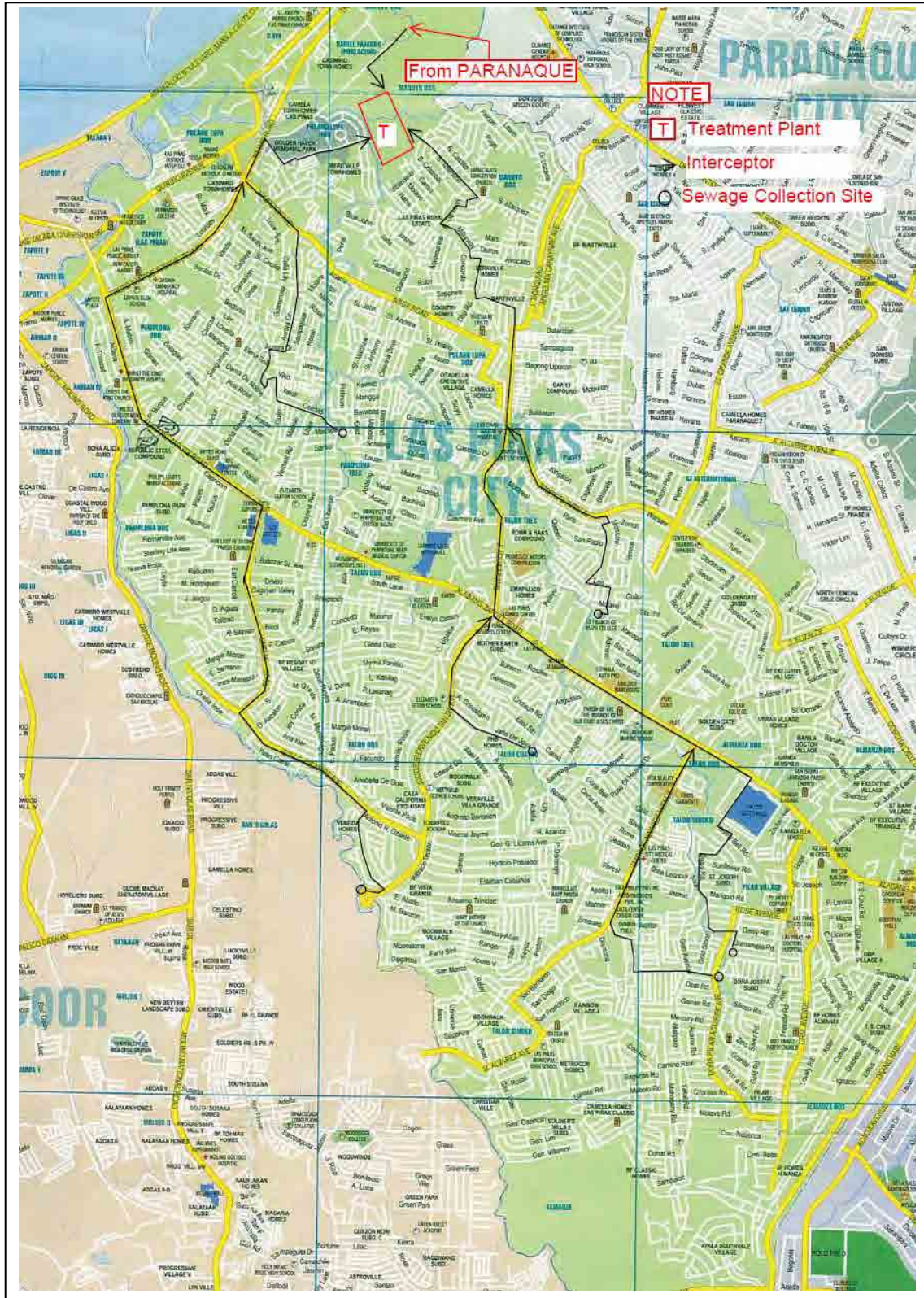


Figure 2-2 Interceptor Root in Paran que



Figure 2-3 Interceptor Root in Las Pinás



3. Socio-Economic and Environmental Situation in the Project Areas

3.1 Socio-Economic Profile

3.1.1 Local Administration

The Metro Manila or the National Capital Region (NCR) has been divided into four districts according to geographical basis in reference to the Pasig River mainly for fiscal and statistical purposes. These districts were created in 1976 but have no local government and no congressional representation. Based on **Table 3-1**, both cities of Las Piñas and Parañaque belong to the Southern Manila District.

Table 3-1 Cities and Municipalities under the Four Districts of NCR

Alternate Name		City/Cities
1	The Capital District	Manila
2	Eastern Manila District	Mandaluyong City, Marikina City, Pasig City, Quezon City, and San Juan City
3	CAMANAVA District	Caloocan City, Malabon City, Navotas City, and Valenzuela City
4	Southern Manila District	Las Piñas City, Makati City, Muntinlupa City, Parañaque City, Pasay City, Pateros, and Taguig City

Source: http://en.wikipedia.org/wiki/Metro_Manila

Parañaque City

Parañaque (Palanyag) is among the oldest city of Luzon. It was founded in 1572 and was accepted as a municipal Town on May 11, 1580 through the endeavor of Augustinian Missionary Superior, Fr. Diego de Espinar. Its geographic location made it socio-economical and politically strategic, especially during the time of the Lima Hong, Spanish-British conflict, the American-Japanese occupation, the Philippine revolution based in Kawit, Cavite and until today. It received its cityhood on February 15, 1998 as the 11th city of Metro Manila by Pres. Fidel V. Ramos during its 426th founding anniversary. Currently, Parañaque is considered as one of the fastest growing urban community in terms of commercial, industrial and housing development investment.

Parañaque City is nestled on the southern portion of Metro Manila, approximately 9.5 kilometers south of the Center of the City of Manila. It is measured at the geographical coordinates of 121° 01 longitude and 14°30 latitude. It has a total land area of about 46.57 square kilometers (sq. kms.). It is politically subdivided into two congressional districts and two legislative districts which are further subdivided into 16 barangays. Legislative District One contains eight barangays in the western half of the city which are Barangay Baclaran, Tambo, Don Galo, and Sto. Nino, La Huerta, San Dionisio, Vitalez and San Isidro. Legislative District Two contains the other eight barangays in the eastern portion of the city which includes Barangay BF, San Antonio, Marcelo Green, Sun Valley, Don Bosco, Moonwalk, Merville and San Martin de Porres.

The political life is administered by a Republican political structure headed by the City Mayor. The two Legislators, represent Parañaque to the Philippine Congress, while the local and domestic legislation and ordinance creation are facilitated by the Vice-Mayor and the Sanguniang Panglungsod (City Legislative Council).

Las Piñas City

Las Piñas City (Laspeñas) used to be a barrio of Parañaque City during the early 1700s. It was known as the center of salt production and fishing because of its Spanish port. It was also popular as a commercial trading site for pineapple from Batangas and Cavite, where historians believe it derived its name. It was incorporated to Rizal Province on 1901 pursuant to the Philippine Commission Act No. 137, which apparently merged with Parañaque two years after. On February 12, 1997, President Fidel V. Ramos signed the bill declaring Las Piñas a new city. A plebiscite held a month after found the residents in approval of cityhood and Las Piñas became the 10th city of Metro Manila on March 26, 1997.

Las Piñas is geographically located at latitude 14° 25' 5" North of the Equator and longitude 121° 0' 41" East of the Prime Meridian on the Map of Manila. It is bounded on the north and northeast by the Parañaque City; on the east and southeast by Muntinlupa City; on the south by the Municipality of Imus, Cavite; on the southwest and west by the Municipality of Bacoor, Cavite; and on the northwest by Manila Bay. Half of its land area is residential and the remaining half is used for commercial, industrial and institutional purposes. The present physiography of Las Piñas City consists of three zones: Manila Bay, coastal margin and Guadalupe Plateau. Las Piñas City comprises two districts and twenty barangays. District 1 includes CAA-BF International Village, Daniel Fajardo, Elias Aldana, Ilaya, Manuyo Uno, Manuyo Dos, Pamplona Uno, Pamplona Tres, Pulanglupa Uno, Pulanglupa Dos and Zapote found in the northwestern half of the city. District II consists of Almanza Uno, Almanza Dos, Pamplona Dos, Pilar Village, Talon Uno, Talon Dos, Talon Tres, Talon Kwarto, Talon Singko and Island.

Similar to Parañaque city and other cities in the Philippines, Las Piñas City is a local government unit whose powers and functions are specified by the Local Government Code of the Philippines. It is headed by a mayor who heads the city's executive function and the vice mayor who heads the city's legislative function, which is composed of twelve councilors, six each from the city's two city council districts. For representation, the city is considered as one district with one representative in the country's House of Representatives.

Fig. 3-1 Administrative Territory of Parañaque and Las Piñas



3.1.2 Populations

3.1.2.1 Population of the Service Area

Table 3-2 presents the total population and annual population growth rate for both Parañaque City and Las Piñas City. Among all cities and municipalities in the NCR, Parañaque and Las Piñas city ranked 7th and 8th respectively in terms of population size in 2007. The combined population of these two cities represents about 9.4% of the population in NCR and about 1.3% of the Philippine population.

Table 3-2 Population of Respective Cities

City	Year			
	2007	2008	2009	2010
Parañaque	585,971	608,531	631,959	656,289
Laspiñás	578,699	595,655	613,108	631,072

Sources: NSO & Local development Plan of Parañaque 2009-10

3.1.2.2 Population Density

The population density refers to the ratio of the number of people inhabiting an area to the total land area. Often, a high population density depicts urbanization in a particular area.

As shown in **Table 3-3**, the population density of Parañaque City currently stands at 125.83 persons per hectare. In terms of current density, Brgy. Don Galo is the most populated among all the barangays at 532.46 persons per hectare followed by Brgy. Baclaran with 522.46 persons per hectare. Brgy. Tambo is the least populated with only 52.96 persons per hectare.

Table 3-3 Population Density of Parañaque City by Barangay as of 2007

Barangay	Population	Land Area (Ha.)	Population Density (Persons/ha.)	Rank in terms of density
Baclaran	33,291	63.72	522.46	2
Tambo	35,090	662.56	52.96	16
Don Galo	12,357	23.22	532.46	1
La Huerta	53,72	9,823	182.85	5
Sto. Niño	30,345	245.97	123.37	10
Vitalez	4,125	57.20	72.11	14
San Dionisio	59,292	309.69	191.46	4
San Isidro	60,344	365.22	165.23	8
San Antonio	50,320	287.19	175.22	6
BF Homes	84,333	769.50	109.59	12
Sun valley	40,622	177.75	228.53	3
Marcelo Green	23,253	306.19	75.94	13
Don Bosco	44,063	384.75	114.52	11
Merville	17,250	304.40	56.67	15
San Martin de Porres	27,212	155.65	174.83	7
Moonwalk	54,251	391.80	138.47	9
Undeclared Area		152.99		
TOTAL	585,971	4,657.00	125.83	

In the case of Las Piñas City, as presented in **Table 3-4**, the barangays of Almanza Dos and Daniel Fajardo ranked 1st and 2nd in terms of population density, with 507.13 and 477.41 persons per hectare, respectively. Barangay Talon Dos have the least population density of 121.24 person/ hectare.

Table 3-4 Population density of Las Piñas by Barangay as of 2007

Barangay	Total Population	Land Area (Ha.)	Population Density (person/hectare)	Rank in terms of density
Almanza Uno	30,074	247.44	121.54	18
Daniel Fajardo	14,690	30.77	477.41	2
Elias Aldana	10,342	33.36	310.01	7
Ilaya	6,196	13.32	465.16	3
Manuyo Uno	12,057	74.85	161.08	14
Pamplona Uno	15,272	72.64	210.24	13
Pulang Lupa Uno	33,838	143.56	235.70	11
Talon Uno	28,109	209.62	134.09	16
Zapote	17,944	69.68	257.52	10
Almanza Dos	35,337	69.68	507.13	1
B. F. International Village	68,912	216.65	318.07	6
Manuyo Dos	26,094	69.68	374.48	5
Pamplona Dos	8,408	69.68	120.66	20
Pamplona Tres	31,215	235.31	132.65	17
Pilar	31,583	204.09	154.75	15
Pulang Lupa Dos	31,922	69.68	458.122	4
Talon Dos	47,479	391.61	121.24	19
Talon Tres	25,083	115.22	217.69	12
Talon Kuatro	21,547	70.77	304.46	8
Talon Singko	36,228	137.25	263.95	9
TOTAL	532,330	2,544.86	209.18	

3.1.2.3 Dynamic Trends of Population

Population dynamics refers to the characterization of short- and long-term changes with respect to the size and age composition of populations and the biological and environmental processes influencing those changes. Population dynamics usually deals with the effects of birth and death rates and by immigration and emigration on the population decline. Measuring the city's crude birth rate (CBR) and mortality rate will scale the population and present an actual picture of the populace.

Table 3- 5 shows the trend on population growth of the Parañaque City for the past thirty (30) years while other vital statistics are presented in **Table 3-6**. Evidently, the growth rate of Parañaque reflects 1-2% per annum.

Table 3- 5 Parañaque City Population Growth Trend, 1980-2000

Census Year	Population	Growth rate
1980	208,552	5.58
1990	308,236	3.98
1995	391,296	4.57
2000	449,811	3.03

(Sources: National Statistics Office)

Based from **Table 3-6**, Paranaque city recorded 7,382 live births by a CBR of 12.80 per thousand live births in 2007. This figure is slightly smaller than the previous year, which is 14.02 per one thousand. Of these live births, 3,889 (52%) were male while 3,492 (47%) were female. There were 2,289 deaths from all causes in 2007 with a crude death rate (CDR) of 3.91 per 1,000 population. This was 13% lower compared to the average rate for the past five years. In 2007, biggest proportion (24%) of deaths was due to coronary artery disease followed by hypertension (13%) and pneumonia (10%). Six percent (6%) of the total deaths belong to age group 0 to 1 year. Of which, 61% were males and 39% were females.

Majority of the leading causes of morbidity were communicable diseases such as upper respiratory infection, bronchitis, wound, diarrhea, hypertension, parasitism, acute tonsillopharyngitis, pneumonia, urinary tract infection and tuberculosis. On the other hand, the leading causes of infant mortality include: pneumonia, prematurity; diarrhea; septicemia/sepsis; pulmonary arrest; malnutrition and aspiration and parasitism; meningitis; bronchial asthma; and dengue fever.

Table 3-6 Trend of Vital Health Indices in Parañaque City

Health Indices	2001	2002	2004	2005	2006	2007
Crude Birth Rate (CBR)	14.47	21.27	16.3	12.31	14.02	12.80
Crude Death Rate (CDR)	5.47	5.36	3.63	3.48	4.48	3.91
Maternal Mortality Rate (MMR)	0.32	1.92	0.22	0.29	0.13	1.24
Infant Mortality Rate (IMR)	28.60	25.80	12.70	19.90	19.10	18.56

Source: City Health Office, Parañaque City

During year 2000, Las Piñas City registered a total count of 472,780 of populace with a growth rate of 2.93%, compared to a total population of 413,086 and a consequent growth rate of 6.39% in 1995. Vis-à-vis with Parañaque, Las Piñas presents a higher population growth trend varying from 2-4% per annum.

Table 3-7 Las Piñas City Population Growth Trends, 1980-2000

Census Year	Population	Annual growth rate
1980	136,514	10.84
1990	296,851	8.08
1995	413,086	6.39
2000	472,780	2.93

Source: National Statistics Office

Based from **Table 3-7**, Las Piñas City has a CBR of 13 per thousand of live births and a CDR of 4 per 1000 population as of 2006. Infant mortality rate was 12/1,000, child mortality rate (1 to 4 years old) was 10/1,000 and the maternal mortality rate was 41/100,000. The period from 2002 to 2004 had the highest death counts among children 0-4 years old and among mothers. Maternal and under 5 mortality improved in 2005 and all the more in 2006. Mortalities are normally caused by heart diseases, cancer, pneumonia, hypertension, tuberculosis, diabetes mellitus, cerebrovascular accident, sepsis, congestive heart failure and renal disease.

Further, from 2005 to 2006, the leading causes of morbidity recorded are acute upper respiratory tract infection, bronchitis, diarrhea, skin diseases, influenza, pneumonia, urinary tract infection, hypertension, parasitism and arthritis. The leading causes of infant mortality include: pneumonia; diarrhea; heart disease; liver disease; septicemia/sepsis; bronchial asthma; cancer all forms; and dengue fever.

Its fast population growth was due to rapid urbanization influenced by the construction of major infrastructure such as the South Expressway in the late 1960s. The population continued to grow especially in the 1970s and 1980s when a lot of migrants from the provinces came to Las Piñas to seek greener pastures in what is now known as Metro Manila.

However, a decline in growth rate was experienced in the 1990s due to the increased land prices in Las Piñas. As a result, people moved out of the city and into nearby municipalities where land and rent were more affordable.

Table 3-7 Multi-year Birth and Death Statistics of Las Piñas City, 2002-2006

Indicator	2002	2003	2004	2005	2006
Registered live births	8,024	7,789	8,000	7,632	7,319
Total deaths	2,034	2,075	2,173	2,292	2,251
Fetal deaths	36	73	111	72	49
Deaths under 1 year old	168	213	186	165	88
Child mortality (1-4 years old)	75	59	49	69	70
Under 5 mortality	243	272	235	234	158
Maternal deaths	4	7	12	9	3

Source: City Health Office, Las Piñas

3.1.3 Industries

3.1.3.1 Industrial Population

A Labor Force Survey conducted in 2002 (refer to **Table 3-8**) reveals that among the cities in Metro Manila, Las Piñas had the highest unemployment rate while Parañaque had the lowest unemployment rate.

Table 3-8 Unemployment and underemployment rates in the NCR by city/ municipality, October 2002

City/ Municipality	Labor force	Labor force participation rate	Unemployment rate	Under- employment rate	Ranking in terms of unemployment
Las Piñas City	417,000	62.5	20.8	0.3	1
Parañaque City	332,000	70.0	6.1	0	16

Source : Labor Force Survey

The labor force in Parañaque is estimated at 61.3% or 348,741 persons subdivided into economically active persons with 70.60% and 246,211 persons not economically active persons (house-keepers, students, aged and others with 29.39% or 102,530 persons. Employment rate among the economically active persons is estimated at 89.3% or 219,860 employed persons and the unemployment rate is 10.7% or 26,345 unemployed persons. The labor force is composed of 52.68% or 129,704 male and 47.32% or 116,507 females.

The total number of persons in Las Piñas City within the productive ages (15 to under 65 years old) was 417,000. This was higher than the 2000 count by roughly 113,000. The labor force participation rate was pegged at 62.5%. Of those in the labor force, 86,736 individuals were unemployed and 1,251 residents were considered underemployed. The unemployment and underemployment rates in the city were higher than the rates achieved in the NCR.

3.1.3.2 Industrial Structure

Parañaque's industrial sites were originally situated at the northern barangays of Baclaran and Tambo. However the apparent expansion and commercialization in these areas, factories were moved to the Southern and Eastern Barangay of San Antonio, B.F. Homes, Sun Valley, Marcelo Green, Merville, and San Martin de Porres. These areas became centers of industries in Parañaque. Moreover, multinational companies have situated themselves at the same center, contributing to the number of business players in the zone. While in Las Piñas, Barangays Pamplona Tres, Talon Dos, Talon Uno, Talon Singko, Pulang Lupa Dos, Pilar Village and CAA-BF International, mostly houses industries, businesses and commercial activities.

In 2005, Parañaque gathered 13,640 businesses and commercial establishments where business permits and licenses were issued by the City of Parañaque. Out of 13,640 establishments, 130 banks are registered. There are also one hundred and eighty one (181) manufacturers in the city. However, during 1991- 98, Las Piñas though recorded a remarkable growth in investments and industry establishments, their 1999 statistics expresses an exodus of manufacturers, where medium and heavy industries relocated to Calabarazon. Consequently, the City's economics were spurred by Micro and Small and Medium Enterprises.

3.1.3.3 Commercial Centers

Both cities of Parañaque and Las Piñas present notable growth in commercial development.

The giant mall retailer, Shoe Mart (SM Prime Holdings) built three SM malls in Parañaque. They are the SM City Bicutan situated along Doña Soledad Avenue in Barangay Don Bosco and SM Sucat that stands on Dr. A. Santos Avenue in Barangay San Dionisio while the renowned “Mall of Asia” stands in its city-limits. Parañaque is also home to Fiesta Shopping Mall, which is the country’s centre for duty Free shopping, located near the Ninoy Aquino International Airport. Other shopping malls found in the city are the Pearl Plaza located along Quirino Avenue in Barangay Tambo, and features several retail shops and a bowling center which often hosts tournaments, Uniwide Coastal Mall which stands near the Manila-Cavite Road and Roxas Boulevard, and the large retail centers of Waltermart which stands on the corner of Quirino Avenue and Katigbak Drive in Baclaran, and Shopwise in Sucat.

Aside from these distinguished commercial markers are other big players such as UNIWIDE, JP Holdings and other retail malls. Further, stretching roadways from the North side Barangay of Baclaran to the Southern Barangay of San Antonio and B.F. Homes is occupied by stores, shops, banks, offices, supermarkets, restaurant, schools, service stations and other related establishments. In some areas, as in the beautifully luxurious Barangay of B.F. Homes and Don Bosco, commercial establishments are found further in the interiors and along roadways, thereby providing a welcome treat to the population of the adjoining residential and/or industrial community.

Las Piñas caters the suburban elite communities while having SM SouthMall Alabang-Zapote and SM Center Las Piñas. Two other smaller malls are found in the city, namely the Star Mall Las Piñas situated along CV Starr Avenue in Pamplona, and M Star, which is located at the Philamlife Village just within the same vicinity. Further medium size malls, restaurants, supermarkets and service offices are prominent in the old “Calle Real”.

3.1.3.4 Agriculture and Fisheries

Parañaque City is producing both agricultural and fishery products with an annual production of 108.33 metric tons pechay, mustard and kinchay. Statistical recordings reflect that there are (67) fisherfolks sourcing their livelihood along the coastal line. Further, the 277 registered small fishing boats, suggests an active marine life. An average catch of Banak, Salinyasi, Buging, Kapak, Alimasag, Galunggong, Dilis, Kitang, Bangus and Hipon reached to 155 Metric Tons in 2005 (refer to **Table 3-9**).

Table 3-9 Municipal Fisheries Production (MT/ year)

Year	Municipal (MT)
2000	133,850
2001	124,663
2002	217,952
2003	103,765
2004	115,862
2005 (January – December)	155,725

Source: Parañaque Local Development Plan, CY 2008-2010

3.1.4 Land Use

Table 3-11 shows a comparative description of the land use of the cities of Las Piñas and Parañaque. Both cities are predominantly residential areas. **Table 3-11** and **Table 3-12** further specify the distribution of land area with respect to land use for Parañaque and Las Piñas, respectively while **Figure 3-2** and **Figure 3-3** illustrates the land use map for Parañaque and Las Piñas, respectively.

Table 3-10 Metro Manila Land Use as of 2007

Cities	Land Area by Land Use Type, sq. km					Total
	Residential	Commercial	Industrial	Institutional	Open Spaces, Parks and Roads	
Parañaque	22.82	14.04	5.33	0.6	3.78	46.57
Las Piñas	22.68	6.41	1.42	0.68	0.8	32.99

Source: Mega Manila Public Transport Study, JICA, April 2007 as cited in <http://www.mmda.gov.ph/metromla.html>

Table 3-11 Land Use of Parañaque as of 2008

Land Use	Area Hectare	Percentage (%)
Residential 1	16.956	0.36
Residential 2	2,072.687	44.51
Residential 3	112.086	2.41
Residential 4	35.617	0.76
Commercial 1	102.994	2.21
Commercial 2	118.260	2.54
Commercial 3	392.190	8.42
Industrial 1	166.728	3.58
Industrial 2	370.085	7.95
Institutional	57.810	1.24
Parks & Playground	122.748	2.64
Cemetery	124.615	2.68
Utilities	103.154	2.22
Creeks & Rivers	34.080	0.73
PUD	827.000	17.76
TOTAL	4,657.000	100

Source: City Planning & Development Office, Parañaque City

Table 3-12 Land Use of Las Piñas City as of 2002

Land Use	Area (has.)	Percent
Commercial 1	136.48	4.14
Commercial 2	100.19	3.04
Commercial 3	297.68	9.02
Industrial	131.29	4
Institutional	72.17	2.19
Residential 1	462.96	14.04
Residential 2	1,753.54	53
Residential 3	146.37	4.44
Tourist Area	9.08	0.28
Utility	3	0.09
Cemetery	16.43	0.5
Parks & open spaces	82.61	2.5
Mixed Use	24.68	0.75
Promenade	18.68	0.57
PUD	43.45	1.32
TOTAL	3,298.60	100

Source: City Planning & Development Office, Las Piñas City

EXISTING LAND USE & ZONING PLAN OF PARAÑAQUE CITY
 (Ordinance No. 97-08 series of 1997)

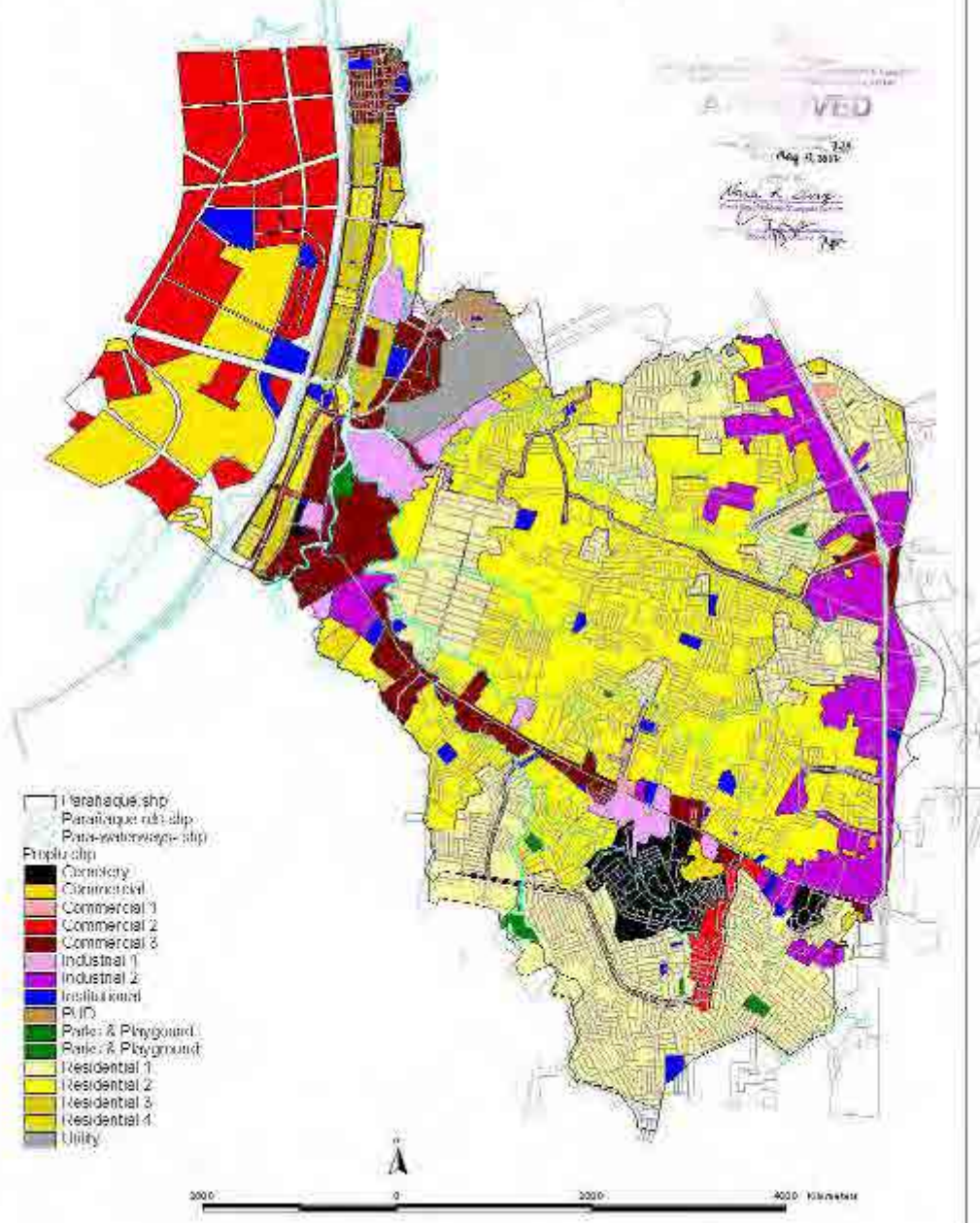


FIGURE NO.:
3-2

FIGURE TITLE:
Land Use Map of Parañaque

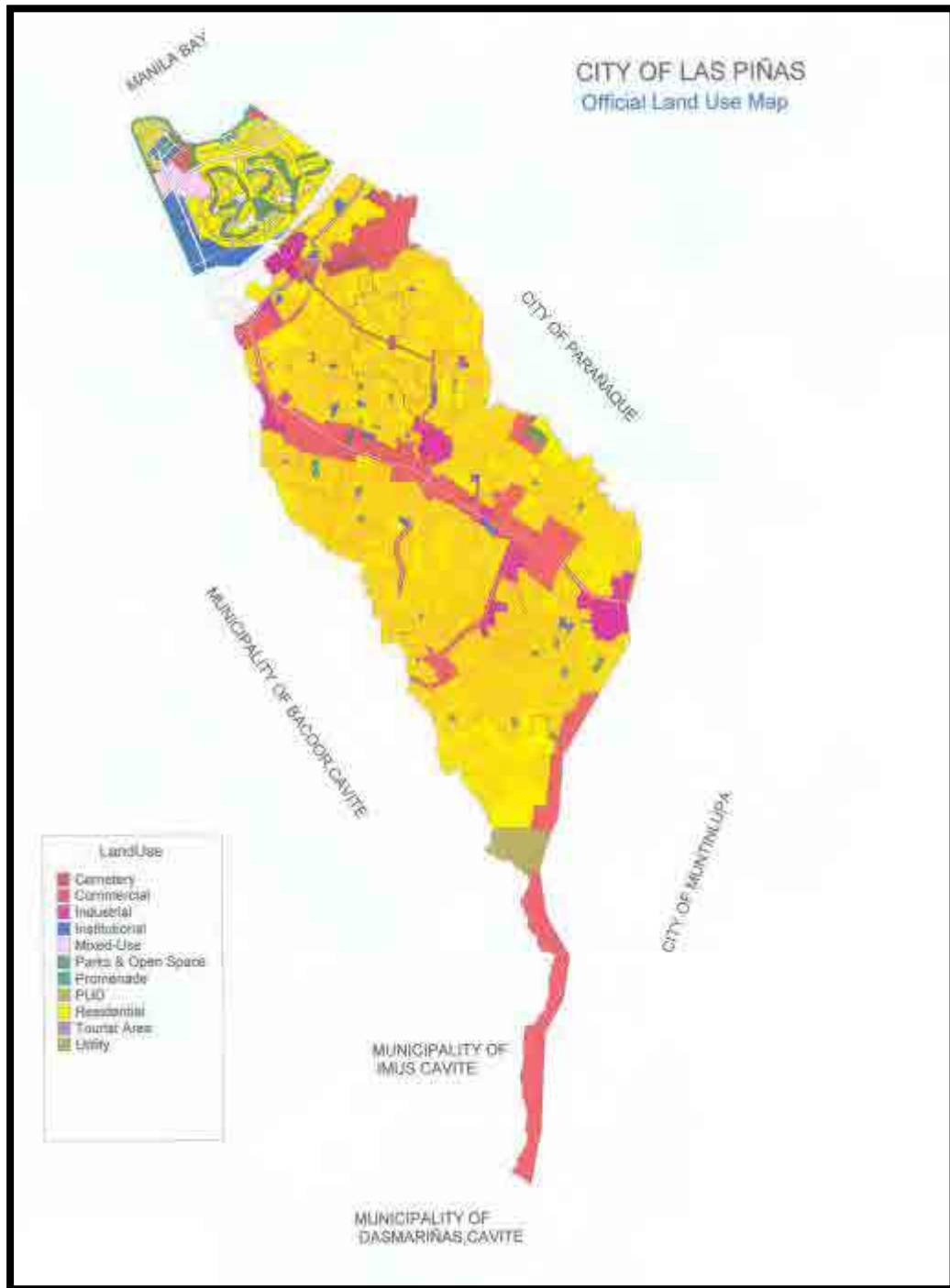


FIGURE NO.:
3-3

FIGURE TITLE:
Land Use Map of Las Piñas

3.1.5 Infrastructure of Public Facilities to be Considered with Special Environmental Attention

3.1.5.1 Education

Parañaque City is home to various schools and colleges. Because of this, the city registered a literacy rate of 96.3%. The city currently houses one hundred and eight (108) Day Care Centres in sixteen (16) barangays of Parañaque with one hundred and thirty three (133) Day Care Workers. The City government supports eighty-four (84) Day Care Teachers; and forty three (43) Day Care Workers are funded by the barangays.

Formal education in elementary and secondary levels is served by both public and private schools. There are (21) elementary schools and (9) high schools in various barangays of Parañaque. Tertiary education is being served by fourteen (11) private schools and one (1) public college that is the Parañaque City College of Science and Technology. The listing of schools in Parañaque City is presented in **Annex B**.

Las Piñas city prides with 99% literacy rate across age group and sex. It is highest among residents between 35 and 39 years old (99.38%) and lowest among those who are 70 and over (95.21%). Males are slightly more literate than females. Females, however, are more functionally literate than males.

Las Piñas City has a total of (68) elementary schools, (42) high schools and (15) tertiary schools. **Table 3- 13** provides a breakdown of the number and classification of learning institutions in the city. The listing of schools in Las Piñas City is presented in **Annex B**.

Table 3- 13 Number of schools and learning institutions in Las Piñas by level, SY 2006-2007

Level	Public	Private	Total	Percent
Pre-School	20	71	91	39.39
Elementary	20	63	83	35.93
Secondary	7	39	46	19.91
College	1	10	11	4.76
Total	48	183	231	100

Source : Department of Education (DepEd) Division of City Schools; Commission on Higher Education (CHED)

3.1.5.2 Health Care Facilities

The City Health Office of Parañaque deliver its health services through promotion, protection, preservation and restoration of health of the people in sixteen (16) health centers in three (3) barangay stations. The curative aspect on the other hand is attended by (9) hospitals.

The City of Las Piñas has (10) hospital facilities available for the residents for their health-related needs. These includes (29) health centers found in different barangays, a lying-in clinic located in BF International, a social hygiene clinic, a health laboratory, and a women’s clinic. Las Piñas Integrated District Hospital is the only government hospital in the area available to serve the people. Residents of Las Piñas City are entitled to free consultation and medicines at health centers in their respective barangays. The complete listing of the health care facilities for both Parañaque and Las Piñas can be found in **Annex C**.

3.1.5.3 Churches

A listing of churches in both Parañaque and Las Piñas can be found in **Annex D** and **Annex F**, respectively.

3.1.5.4 Peace, Order and Environmental Security

Parañaque City has five (5) community precincts listed in **Table 3-14**. Moreover, the Police Headquarters at Coastal, La Huerta has a total strength of three hundred and fifty five (355) police officers with a ration of one (1) police officer for every one thousand nine hundred and ninety (1,990) inhabitants (1:1,990).

Table 3-14 Parañaque Community Precincts

Parañaque Police Precinct	Location
No.1	Quezon Avenue, Barangay Baclaran, Parañaque City corner Taft Avenue, Pasay City
No. 2	Quirino avenue, corner M. Rodriguez Street, Barangay La Huerta
No. 3	No. 62 Doña Soledad Street, barangay Don Bosco
No.4	Dr. A. Santos Avenue, Corner FiliPiñas Avenue, Barangay San Isidro
No. 5	Merville

The Las Piñas City Police Station is located in Pamplona while the 11 precincts and 3 substations are situated in Padre Diego Cerra Avenue; Viaduct in Zapote; Pamplona Uno; CAA; Barrio Hall in Almanza Uno; M. Alvarez Avenue in Talon; BF Resort Villa; Gatchalian Subdivision; San Antonio Valley 17, Talon Uno; Daang Hari in Almanza II; and Real Street in E. Aldana.

Traffic Enforcement

The Parañaque Traffic Management Office (PTMO) primarily addresses the traffic congestion and intense commercial activity especially near the Redemptorist church due to the daily influx of devotees.

Traffic congestion is an usual menace in Las Piñas especially during the rush hours because of the heavy volume of vehicles plying the Alabang-Zapote Road. The average speed during peak hours is 20 kph while the average time of travel in the main artery is 40 minutes. The lack of loading bays and the unavailability of off-road parking despite a high demand for parking are two of the causes of congestion.

The common types of vehicles used for public transport are jeepneys, buses, tricycles, AUVs, and taxis. Aside from private vehicles, buses and jeepneys also contribute to road congestion especially when drivers do not comply with traffic regulations. Jeepneys are the more dominant means of public transport within the city. Also available to commuters are tricycles and “pedicabs” which can be found at the entrances of many subdivisions.

Fire Protection

Las Piñas has one central fire station which is located in the Las Piñas Municipality Hall.

In 2008, Parañaque Fire Station records five (5) sub-stations including one (1) Central Fire Station with a total strength of sixty three (63) BFP Personnel which are as follows:

1. Central Fire Station (Mother Unit) Dr. A. Santos Ave., San Dionisio
2. LGPMS Volunteer Team Dr. A. Santos Ave. near Holy Trinity Chapel
3. La Huerta Sub-Station No.1 Quirino, La Huerta
4. BF Homes Fire Sub-Station No. 2 Elsie Gaches St. Phase I, BF
5. BLS Fire Sub-Station No. 3 Bermuda St. Annex 40 Better Living Subdivision, Bgy. Don Bosco
6. Baclaran Fire Sub-Station No. 4 Bagong Ilog near Barangay Hall

The City Fire Station has four (4) units of Super Tanker contains three thousand five hundred (3,500) gallons of water, two (2) units of FMC Pump one thousand (1,000) gallons capacity, three (3) of mini fire truck which was assigned to barangays, one (1) unit EMS Ambulance.

Figure 3-4 Paran aque: Schools and Churches

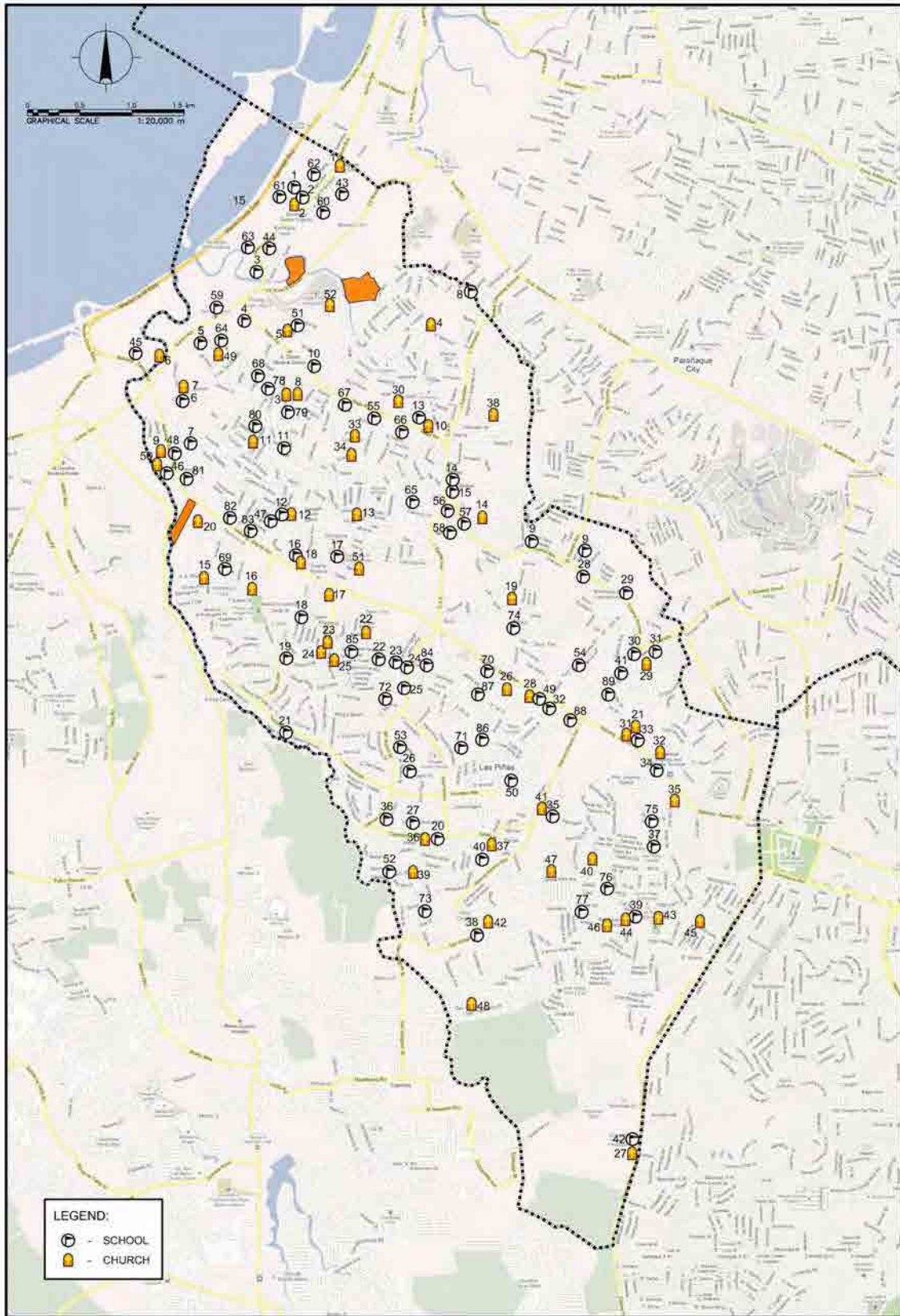


Figure 3-5 Pranãque: Hospitals and Social Welfare Facilities

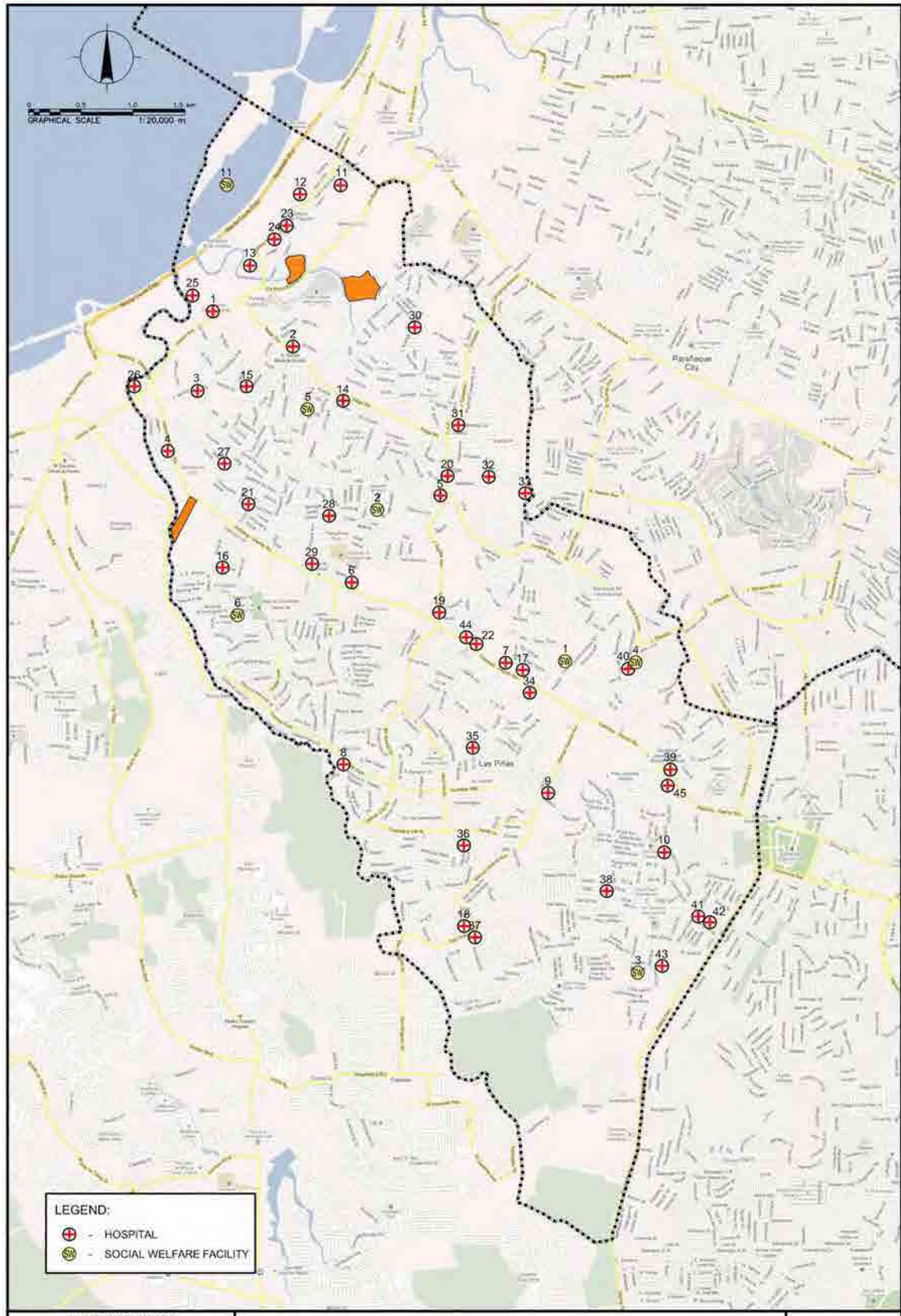


Figure 3-6 Las Piñas: Schools and Churches

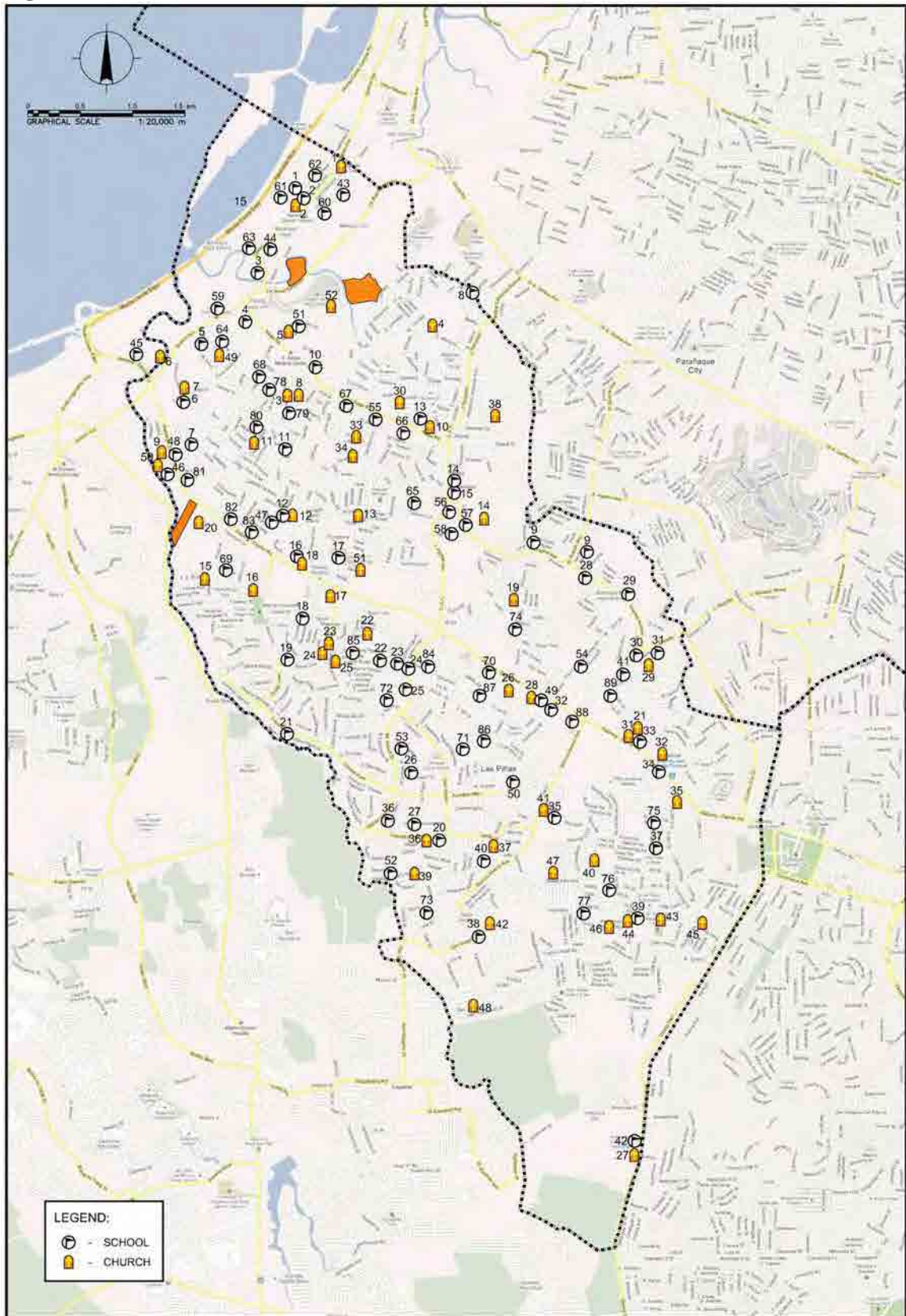
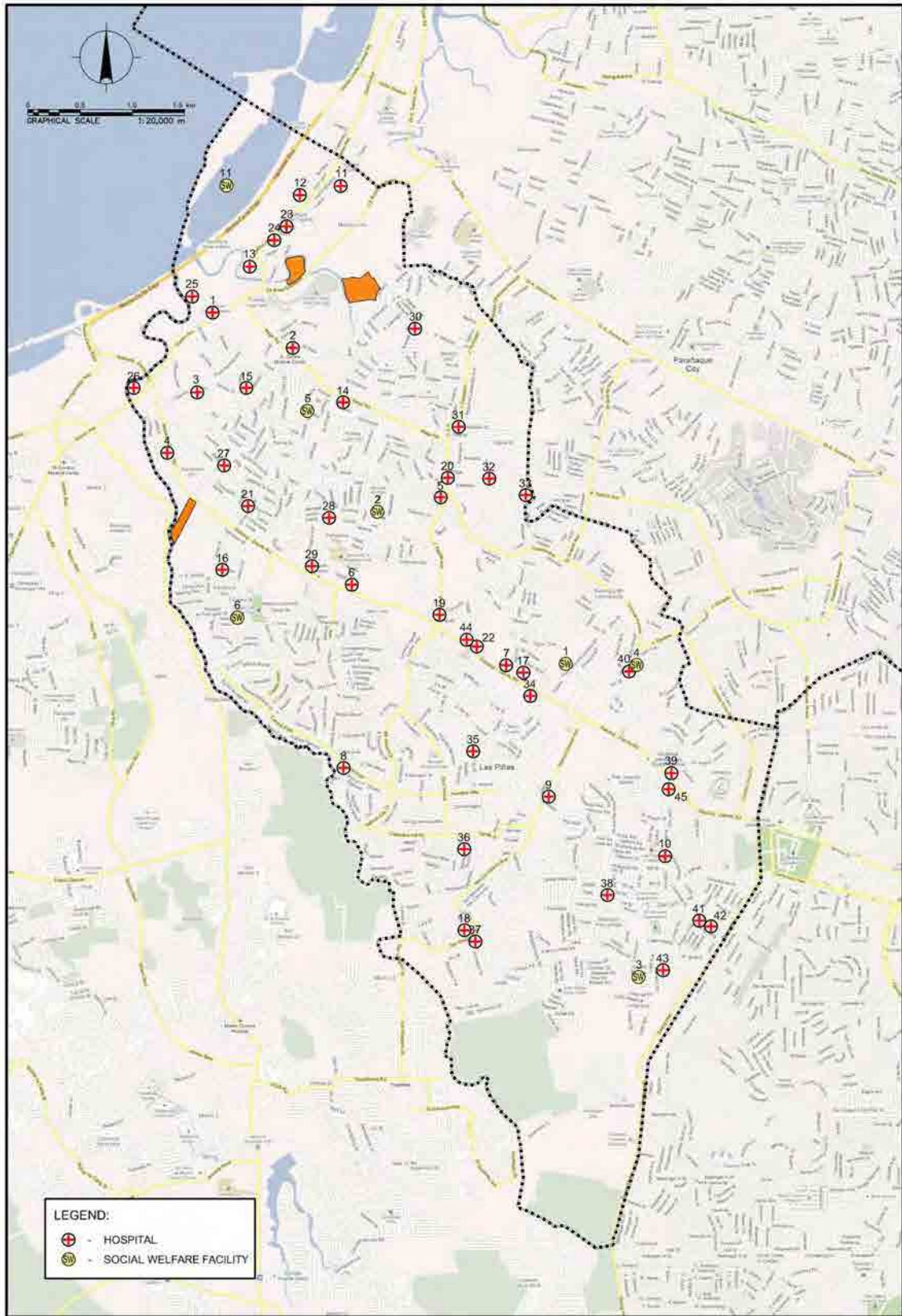


Figure 3-7 Las Piñas: Hospitals and Social Welfare Facilities



List of Designations in Figure 3-4 to 3-7

The facility names in the maps are shown hereunder with the identification numbers.

PARAÑAQUE

List of Churches

1. Martyrs' Memorial United Methodist Church
2. San Nicolas School
3. St. Joseph Parish Church
4. Sta. Monica Chapel
5. Iglesia ni Cristo
6. St. Andrew's Cathedral
7. San Dionisio Church
8. Church of Jesus Christ Savior King
9. San Antonio de Padua
10. Iglesia ni Cristo
11. Sto. Niño Chapel
12. Holy Infant Jesus Parish Church
13. Our Lady of Beautiful Love Parish
14. Parañaque Bible Christian Church
15. National Shrine of Our Mother of Perpetual Help
16. The Salvation Army Church
17. El Shaddai Shrine
18. Kingdom Hall
19. Our Lady of the Most Holy Rosary Parish
20. Marimar Village Church
21. San Agustin Church
22. Korean Union Church of Manila
23. The Living Word Foursquare Church
24. Jesus is Lord
25. Mary Immaculate Quasi-Parish
26. Franciscan Sister Adorers of the Cross
27. Our Lady of the Most Holy Rosary Parish Church
28. Our Lady of Peñafrancia Chapel
29. Church of Nazarene
30. The Church of Jesus Christ of Latter Day Saints
31. Shrine of Mary Help of Christians
32. Mary Mother of Good Counsel Parish Church
33. San Antonio de Padua
34. San Martin de Porres
35. Iglesia ni Cristo
36. Moonwalk Community Bible Church
37. Our Lady of Peace Parish Church (Fourth Estate Church)

38. Our Lady of Grace Parish
39. Parañaque Central United Methodist Church
40. Mary Queen of Apostles Parish Center
41. Iglesia ni Cristo
42. Holy Trinity Memorial Chapel
43. Berean Bible Baptist Church
44. Our Lady of Unity Parish
45. Presentation of the Child Jesus Parish Church
46. Ascension of Our Lord Parish Church
47. Parish of the Resurrection
48. Jesus The Divine Healer Parish Church
49. City Gate Christian Ministries
50. Baclaran Redemptorist Church
51. Sta. Rita de Cascia Parish Church
52. Annunciation Orthodox Church
53. Holy Eucharist Parish Church
54. Kiu Pat Hong Shiao Taoist Temple
55. Covered Court Chapel
56. Parañaque Center Seventh-Day Adventist Church

List of Hospitals

1. Parañaque Hospital
2. Florencio V. Bernabe, Sr. Memorial Hospital (Parañaque Community Hospital)
3. Our Lady of Peace Hospital
4. Parañaque Doctors Hospital
5. Commcare Out Patient Medical Center
6. Olivarez General Hospital
7. Philippine Association of Ayurvedic Practitioners
8. Parañaque Medical Center
9. Sta. Rita de Baclaran Hospital
10. South Superhighway Medical Center
11. Pasay-Parañaque Hospital
12. D. T. Protacio Medical Services, Inc.
13. Sacred Heart Medical and Surgical Clinic
14. Baclaran General Hospital
15. Barangay Tambo Health Center
16. Barangay Don Galo Health Center
17. Barangay Sto. Niño Health Center
18. Doña Maura S. Pascual Health Center
19. The Health Capital
20. Barangay San Isidro Health Center
21. Animal Bite Center
22. PCL Health Center

23. Sun Valley Health Center
24. DONICA Diagnostics and Imaging Service

List of Schools

1. Baclaran Elementary & High School
2. Our Lady of Carmel School
3. Tambo Elementary School Main
4. Camp Claudio Elementary School
5. R. Gatchalian Elementary School
6. Don Galo Elementary School
7. Sto. Niño Elementary School
8. St. Paul College
9. Parañaque Municipal High School Annex
10. St. Andrews School
11. La Huerta Elementary School
12. Escuela De San Dionisio
13. Parañaque Municipal High School
14. Parañaque Elementary School Central
15. Kalayaan National High School (Kalayaan Village)
16. Maria Montessori School
17. Le-Sil Montessori School
18. San Agustin Elementary School
19. Regina Maria Montessori
20. AMA Computer College
21. Olivarez College
22. Rogationist Seminary
23. Parañaque National High School
24. Uni-Cyber College
25. Universal College of Nursing
26. Informatics Computer Institute-Sucat Center
27. PATTS College of Aeronautics
28. St. Agustin School of Nursing
29. Lycee D' St. Cyr High School
30. Blessed Luisa School
31. Stars & Rainbow Academy
32. LH Montessori School
33. Madre Maria Pia Notari School
34. Manila Japanese School
35. Immaculate Heart of Mary College Parañaque
36. Don Bosco Center of Studies
37. Paolo Scholastic Chastity De Montessori Academy
38. Escuela De San Lorenzo Ruiz
39. St. Francis Academy

40. St. Anthony Elementary School
41. Masville Elementary School
42. Informatics
43. St. James School of Parañaque
44. St. Rita College
45. Felixberto Serrano Elementary School
46. Little Friends Academy
47. Neo Brightside Christian Academy
48. Parañaque Community High School
49. Tambo Elementary School Unit I
50. Rivera Village Elementary School
51. Arandia Academy
52. Mother of Divine Grace School of Parañaque
53. Datamex Institute of Computer Technology
54. Ann Arbor Montessori
55. Libho Day Care Center
56. Father Simpliciano Academy
57. Jesu Mariae School
58. Ramon Pascual Institute
59. St. Cyr Academy
60. World of Wonder Pre School
61. School of Tomorrow
62. Infant & Toddlers Development Center
63. Manresa School
64. Dr. Arcadio Santos National High School
65. Asian Institute of Computer Studies
66. Euro Campus
67. Ville Saint John Academy
68. International Christian School
69. Regis Marie College
70. Sacred Heart School
71. Little Archers Learning Center
72. Foundation for Children's Education, Inc. (Teacher-Mom)
73. The Learning Center
74. Sto. Rosario Learning Center
75. The Growing Place Pre-School
76. Fr. Manuel S. Guerrero School
77. STI College-Parañaque
78. Infotech College of Art
79. Mary Louis School
80. Kids' Concept Knowledge Center
81. Xavier Technological Training Center
82. Bricktown Kindergarten School

List of Social Welfare Facilities

1. Parañaque Anti-Drug Abuse Council Holding/Diagnostic Center
2. New Beginnings Treatment and Rehabilitation Center
3. New Beginnings Halfway House
4. New Beginnings Detoxification Center

LAS PIÑAS**List of Churches**

1. Iglesia ni Cristo
2. St. Joseph Parish Church (Las Piñas Church)
3. St. Michael's Chapel
4. Immaculate Conception Church
5. Divine Mercy Chapel
6. Iglesia ni Cristo
7. Holy Family Chapel
8. Our Lady of Fatima Chapel
9. Iglesia ni Cristo
10. Iglesia ni Cristo
11. Church of the Good Shepard
12. Berdant Church
13. Manuela 4B Chapel
14. San Antonio De Padua Chapel
15. St. Peter Chapel
16. Our Lady of Fatima Parish Church
17. Church of Jesus Christ of Latter-Day Saints
18. God's Light International Ministries
19. St. Joseph The Worker Parish
20. Grace Covenant Church of God
21. Church of God's Miracles
22. Iglesia ni Cristo
23. Sta. Cecilia Chapel
24. Community Baptist Church
25. Miraculous Sto Niño de Provencia Church
26. Spirit & Truth Ministries Christian Church
27. Greenhills Christian Fellowship
28. Parish of the Five Wounds of Our Lord Jesus Christ
29. Community of Faith Alliance Church
30. Holy Family Chapel
31. Church of Jesus Christ of Latter-Day Saints
32. San Isidro Labrador Parish Church
33. St. Joseph's Chapel
34. Sto Niño Chapel

35. San Isidro Labrador Parish Church
36. Mary Mother of the Church Parish
37. Immaculate Mary Parish Church
38. Sto Niño de CAA Chapel
39. Iglesia ni Cristo
40. Community Church of Las Piñas
41. Las Piñas Baptist Church
42. Iglesia ni Cristo
43. Holy Family Parish Church
44. Our Lady of Pilar Parish Church
45. Iglesia ni Cristo
46. Pilar Village Gospel Church
47. Delnor Chapel
48. St. Christ Parish Church (Sto. Cristo Parish)
49. Brgy. Pulang Lupa Uno Chapel
50. Christ the King Parish Church
51. Last Supper of Our Lord Parish Church
52. Risen Lord Chapel

List of Hospitals

1. Las Piñas District Hospital
2. A. Zarate Medical Center/General Hospital
3. Jasmin Emergency Hospital
4. Christ the King Maternity Hospital
5. Las Piñas Doctors Hospital
6. University of Perpetual Help Medical Center
7. Alabang Medical Hospital
8. BF Carnival Health Center
9. Las Piñas City Medical Center
10. Las Piñas Doctors Hospital
11. Manuyo 1 Health Center
12. D. Fajardo Health Center
13. Elias Aldana Health Center
14. Pulang Lupa II Health Center
15. Zapote Health Center
16. Pamplona II Health Center
17. Admiral Health Center
18. Cavinti Hospital
19. E. Zarate Medical Center
20. Las Piñas Lying-In Clinic
21. Timbol Lying-in Clinic
22. Alabang Medical Clinic
23. Aldana Health Center

24. Ilaya Health Center
25. Bernabe Health Center
26. Basa Health Center
27. Balagtas Health Center
28. Pamplona III Health Center
29. Las Piñas City Health Office
30. Gatchalian Health Office
31. CAA-A Health Center
32. CAA-B Health Center
33. CAA-C Health Center
34. Talon I Health Center
35. Talon IV Health Center
36. Moonwalk Health Center
37. Golden Acres Health Center
38. Pilar Village Health Center
39. STD Clinic
40. Urbanville Health Center
41. Women's Health Center
42. T.S. Cruz Health Center
43. Pugadlawin Health Center
44. Callejo Medical Clinic
45. Alabang Medical Clinic-Almanza

List of Schools

1. Las Piñas Municipal High School/Day care
2. St. Joseph Academy & Technical School
3. St. Rose of Lima (private Elem. & HS)
4. Pulang Lupa Elementary School
5. Bernardo College
6. Zapote Elementary School
7. Pamplona Unit I Elementary School
8. Copel School
9. Mind Builders Pre-school
10. Immaculate Mary Montessori School
11. Las Piñas North National High School
12. Las Piñas East Municipal High School
13. Young Achievers International School
14. Parañaque Municipal High School
15. Las Piñas CAA National High School
16. ABE International College of Business and Accountancy
17. University of Perpetual Help System – Dalta
18. Madre Guilia Salzano School
19. The Montessori Legacy School

20. Philippines-Japan Communication Center
21. Las Piñas Science High School
22. Blessed Mother Mary's Learning Center
23. Merry Treasure School
24. St. Ignatius South School
25. Elizabeth Seaton School
26. Bloomfield Academy
27. Fr. Angelico Lipani School
28. Gualandi Center for Hearing Impaired
29. Las Piñas Montessori Center
30. Montessori de Manila
31. Blessed Margaret Educational Center
32. Philippine Merchant Marine School
33. AMA Las Piñas Campus
34. Almanza Elementary School
35. Mikesell Elementary School
36. Silverdale Education and Health and Social Services Foundation
37. Las Piñas Colleges
38. Las Piñas Municipal High School
39. Blessed Pine School of Las Piñas
40. Mary Immaculate Parish Special School
41. Happy & Organized Persons Through Education for Children, Inc. (HOPE)
42. Greenhills Fellowship International School
43. Manuyo Elementary School
44. Brittany School of Las Piñas
45. Divine Grace Institute of Technology
46. Pamplona Central Elementary School
47. Doña Manuela Elementary School
48. St. Augustine School of Nursing
49. Talon Elementary School
50. Don Carlo Cavina School
51. Angelus Academy
52. Mayflower Academy of Las Piñas
53. Westfield Science School
54. DFCAM College
55. Holy Rosary Academy
56. Integrated School of Las Piñas
57. Southville International School & College
58. Operation Brotherhood Montessori Center
59. TESDA
60. Newman Learning Center (private Elementary & High School)
61. Daniel Fajardo Elementary School
62. Puericulture Learning Center

63. Las Piñas Central School
64. Infant Jesus School
65. Vergon Elementary, North High School
66. Bright Morning Start Pre-school/Elementary
67. Brgy. Pulang Lupa Dos Day Care
68. Zapote Day Care
69. Pamplona Dos Day Care
70. Electron School
71. PMMI, Private-Maritime School
72. STI
73. Moonwalk Elementary School
74. St. Francis of Assisi Elementary to College School
75. Almanza Uno 1 Day Care Center
76. Almanza Uno 2 Day Care Center
77. Blessed Trinity School
78. St. Michael's School, Inc.
79. Las Piñas Montessori School
80. Dr. Filemon C. Aguilar Information Technology Training Institute
81. Imus Computer College
82. Divine Light Academy
83. STI College - Las Piñas
84. Talon Dos Institute of Technology
85. Integrated Movement Learning Center
86. St. Anthony School Las Piñas
87. Camella Homes Montessori Child Development Center
88. Lozada Swimming School
89. Dr. Filemon C. Aguilar Memorial College
90. Shekinah Christian Training Center

List of Social Welfare Facilities

1. Center for Autism and Related Disorders (CARD)
2. The Playroom
3. The Special Care Development Center
4. Hope Development Center for Children, Inc.
5. Patubaes Foundation
6. Chosen Children, Inc.

3.1.6 Traffic Condition

Airport

The Ninoy Aquino International Airport or NAIA serves as the gateway or focal point of all travelers, foreign and local, flying to and from the Philippines, as well the hub for Philippine airlines. It is located along the border between Pasay City and Parañaque City and about seven kilometers south of Manila proper and southwest of Makati City. The airport is named for Benigno "Ninoy" Aquino, Jr., who was assassinated at the airport in 1983 and is managed by the Manila International Airport Authority (MIAA). In 2007, the airport handled 21,261,133 passengers. This was a 20.4% growth in passenger numbers compared to 2006, placing the airport 59th worldwide in terms of passenger traffic. 2008 passenger numbers were near 22 million. In 2009 the airport saw growth of 11.4% to 24.1 million passengers, making it the 48th busiest airport in the world in terms of passenger traffic.

There are 4 terminals inside NAIA:

- Terminal 1: NAIA Terminal - International flights, non-Philippine Airlines
- Terminal 2: Centennial Terminal - All Philippine Airlines flights only (North wing International, South wing Domestic)
- Terminal 3: NAIA International Terminal - International flights (Air Philippines, Cebu Pacific, PAL Express)
- Domestic Terminal - All domestic flights other than Philippine Airlines

Taxi service is available to and from NAIA from and to all points of Metro Manila. Also, jeepney and bus routes are available within the airport vicinity. Both forms of transportation facilities connect all three NAIA terminals as well. The airport is also accessible to the Manila Light Rail Transit System by a two-kilometer taxi ride to Baclaran station. In the future, with the extension of the existing Yellow Line, a new station, Manila International Airport station, is set to connect the airport, albeit still indirectly, to the LRT.

Parañaque City is located about 3 kilometers from Manila Domestic Airport and about 1.8km away from NAIA terminal 3 while Las Piñas is about 11.9 km away from Manila Domestic Airport and about 11.3 km away from NAIA terminal 3.

3.1.6.1 Volume of Passengers

Table 3-15 presents the breakdown of passenger movements in Manila based on data from Airport Council International (ACI).

Table 3-15 Passenger movements in Manila and relative ranking worldwide in terms of passenger number

Year	Passenger Movements	Ranking
2003	12,955,809	81 st
2004	15,186,521	75 th
2005	16,216,031	77 th
2006	17,660,697	73 rd
2007	20,467,627	64 th
2008	22,253,158	57 th
2009	24,108,825	48 th

Source: http://en.wikipedia.org/wiki/Ninoy_Aquino_International_Airport

Seaport

The main gateway to the Philippines is the Port of Manila. It is the largest seaport in the Philippines and is located in the vicinity of Manila Bay. The bay entrance is 19 km (12 mi) wide and expands to a width of 48 km (30 mi). Forty kilometers (40 km or 25 mi) to the north is the Bataan Peninsula and to the south is the province of Cavite.

The Port of Manila is divided by the following sectors, namely:

1. South Harbor (Baseport)
2. North Harbor (Baseport)
3. Manila International Container Terminal (MICT)
4. Harbour Centre Port Terminal Inc. (HCPTI)

In a 2005 study, the Port of Manila was listed as the world's 31st most active container port, moving 2,665 Twenty-foot equivalent units (TEU) worth of containers that year.

Table 3-17 to **Table 3-20** presents some statistics on shipping traffic, cargo traffic, passenger traffic and number of containers handled at the port in 2009. A detailed listing of other important statistics for the Port of Manila is presented in **Annex E**.

Table 3-16 Shipping Traffic, 2009

PDO/PMO	SHIPCALLS		
	Total	Domestic	Foreign
PDO MANILA/NORLUZ	22,341	17,368	4,973
<i>Manila - N. Harbor</i>	5,043	4,602	441
<i>Manila - S. Harbor</i>	7,650	5,822	1,828
<i>- M.I.C.T.</i>	2,042	105	1,937

Table 3-17 Cargo Traffic, 2009

PDO/ PMO	Grand Total	D O M E S T I C			F O R E I G N		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA/ NORLUZ	61,687,825	26,667,432	11,590,343	15,077,089	35,020,393	28,488,707	6,531,686
<i>Manila - N. Harbor</i>	17,406,085	14,183,402	6,088,018	8,095,384	3,222,683	3,112,315	110,368
<i>Manila - S. Harbor</i>	10,734,949	5,385,457	4,689,224	696,233	5,349,492	5,123,942	225,550
<i>- M.I.C.T.</i>	15,639,479	822,314	335,952	486,362	14,817,165	10,015,945	4,801,220

Table 3-18 Passenger Traffic, 2009

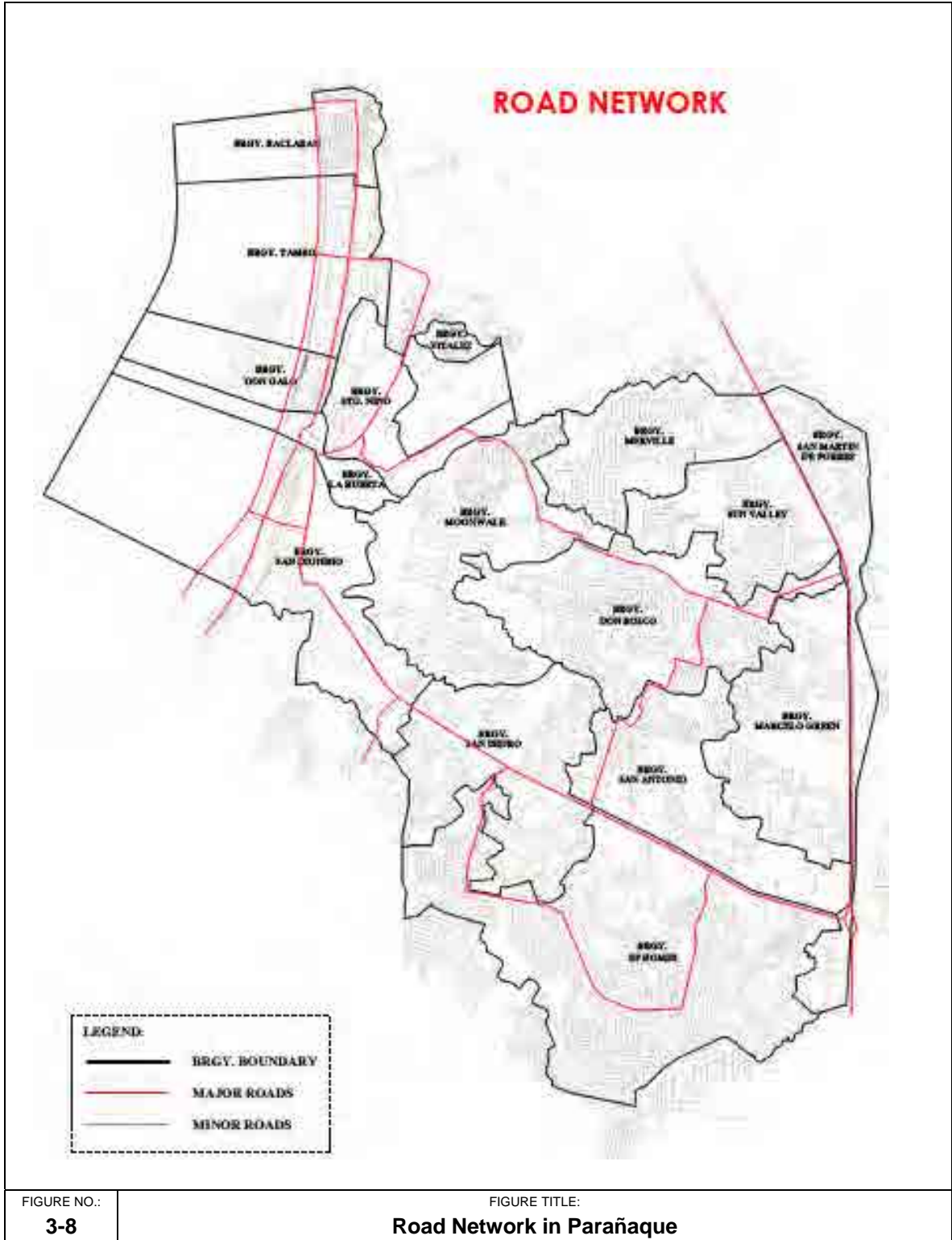
PDO/PMO	PASSENGER TRAFFIC		
	Total	Disembarked	Embarked
PDO MANILA/NORLUZ	1,938,251	1,003,890	934,361
<i>Manila - N. Harbor</i>	821,565	420,222	401,343
<i>Manila - S. Harbor</i>	1,116,662	583,644	533,018
<i>- M.I.C.T.</i>	0	0	0

Table 3-19 No. of Containers Handles in TEU

PDO/PMO	CONTAINER TRAFFIC (in TEU)						
	Grand Total	D O M E S T I C			F O R E I G N		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA/ NORLUZ	2,877,638	810,118	389,392	420,726	2,067,520	1,059,058	1,008,462
<i>Manila - N. Harbor</i>	638,263	638,263	317,530	320,733	0	0	0
<i>Manila - S. Harbor</i>	838,950	86,608	41,360	45,248	752,342	379,866	372,476
<i>- M.I.C.T.</i>	1,397,594	82,932	29,632	53,300	1,314,662	678,899	635,763

Vehicles

Parañaque has a 258 km total length of road network and 316 km total length of paved roads. **Figure 3-8** illustrates the road network in Parañaque. In addition, there are about 4469 registered utility tricycles and 3804 public utility jeepneys servicing the city.



The number of vehicles in Las Piñas continues to grow. **Table 3-20** shows the number of motor vehicles registered at the Land Transportation Office in Las Piñas City. The figures show a marked increase in all the number of vehicles registered between 2001 and 2006, particularly in the volume of motorcycles, which grew 4 times since 2001. It is estimated that 48 percent of vehicles in Las Piñas are public utility vehicles while the remaining 52 percent are privately owned.

Table 3-20 Vehicle registration in Las Piñas by type, 2001 and 2006

Type of vehicle	Number of Vehicles registered	
	2001	2006
Cars	23,124	24,667
Buses	-	854
Utility Vehicles	23,355	26,917
Sports Utility Vehicles	1,135	4,514
Trucks	-	2,037
Trailer vans	-	948
Tricycles	-	3,838
Motorcycles	4,647	17,067
Total	52,261	80,842

Source: Office of the City Engineer, Las Piñas

The increase in the volume of vehicles in Las Piñas and nearby communities, coupled with erring motorists, resulted in traffic problems especially along the Alabang-Zapote Road. To address this, the so-called Friendship Route was inaugurated with the collaborative efforts of the city government and homeowners associations. Through the scheme, strategic subdivision roads were opened up to decongest the main roads of traffic.

There are 4 national roads that pass through Las Piñas City: the Alabang-Zapote Road, CAA Road (2), and the Tramo Line (refer to **Table 3-21**). The longest of these roads is the Alabang-Zapote road, which serves as a major link between the Manila-Cavite coastal road and Muntinlupa City. Heavy vehicular traffic is common along this route, especially during peak hours. **Table 3- 22** tabulates the exiting city roads in Las Piñas. **Figure 3-7** illustrates the road network of Las Piñas City.

Table 3-21 National roads in Las Piñas City by surface type, 2006

National Roads	Length (km)	Form width	C-way width	Surface type	
				Asphalt	Concrete
Manuyo I (Tramo Rd.)	487.9	6.35	5.85	487.9	-
Ilaya (Tramo Rd.)	165.4	6.45	5.95	165.4	-
D. Fajardo+B43 (Tramo Rd.)	340.9	6.35	5.85	340.9	-
E. Aldana (Tramo Rd.)	364.3	6.45	5.95	364.3	-
Zapote (Tramo Rd.)	990	10.2	9.7	990	-
Pulanglupa I (Tramo Rd.)	693.8	11.9	11.4	-	693.8
CAA/BF International (CAA Road)	564.5	14.9	14	-	564.5
CAA (CAA Road)	523.7	6.7	5.8	-	523.7
Pamplona III (CAA Road)	929.7	14.9	14	-	929.7
Manuyo II (Tongkiao St.)	1,143.10	12.5	12	-	1,143.10
Total	6,203.30	96.65	90.5	2,348.50	3,854.80

Source: Office of the City Engineer, Las Piñas

Table 3- 22 Existing City roads in Las Piñas by surface type, 2006

Barangay	Length (kms.) by Type of Pavement/Surface				
	Concrete	Asphalt	Gravel	Earth	Total
Almanza Dos	1,358.30	1,688.25			3,046.55
Almanza Uno	3,493.38	1,173.80			4,667.18
CAA-BF	7,986.35				7,986.35
Daniel Fajardo		533.1			533.1
Elias Aldana		579.5		75.5	655
Ilaya		677.4			677.4
Manuyo Uno	305.7	1,194.00			1,499.70
Manuyo Dos	2,008.30	2,701.65			4,709.95
Pamplona Dos	1,045.00	1,650.90			2,695.90
Pamplona Tres	2,770.20	5,441.00			8,211.20
Pamplona Uno	1,552.30	534			2,086.30
Pilar	1,018.80	1,140.90			2,159.70
Pulanglupa Dos	3,542.00	938.2			4,480.20
Pulanglupa Uno	2,000.80				2,000.80
Talon 1	1,226.50	591.3			1,817.80
Talon 2	7,351.20	2,453.00			9,804.20
Talon 3	2,856.70	1,367.20			4,223.90
Talon 4	2,049.60	1,928.20			3,977.80
Talon 5	3,060.20	4,059.50			7,119.70
Zapote	1,706.70	79.8	12.2		1,798.70
Total	45,332.03	28,731.70	12.2	75.5	74,151.43

Source: Office of the City Engineer, Las Piñas

Las Piñas City



FIGURE NO.:
3-7

FIGURE TITLE:
Road Network in Las Piñas

3.1.7 Environmental Development

Sewerage Services

About 81.76% or 88, 850 households have toilet facilities and septic tanks and are connected to sewerage system. The total length of existing drainage system is 238 km. Maynilad Water Services Inc. (MWSI) renders free septic tank desludging services for its patrons in Parañaque City. The areas covered by the service are Barangays Sto. Niño, Tambo, Marcelo Green, BF Homes, San Isidro, San Martin de Porres, and San Dionisio. This is aimed at preventing the clogging of residential sewage systems and providing a clean and healthy environment for customers.

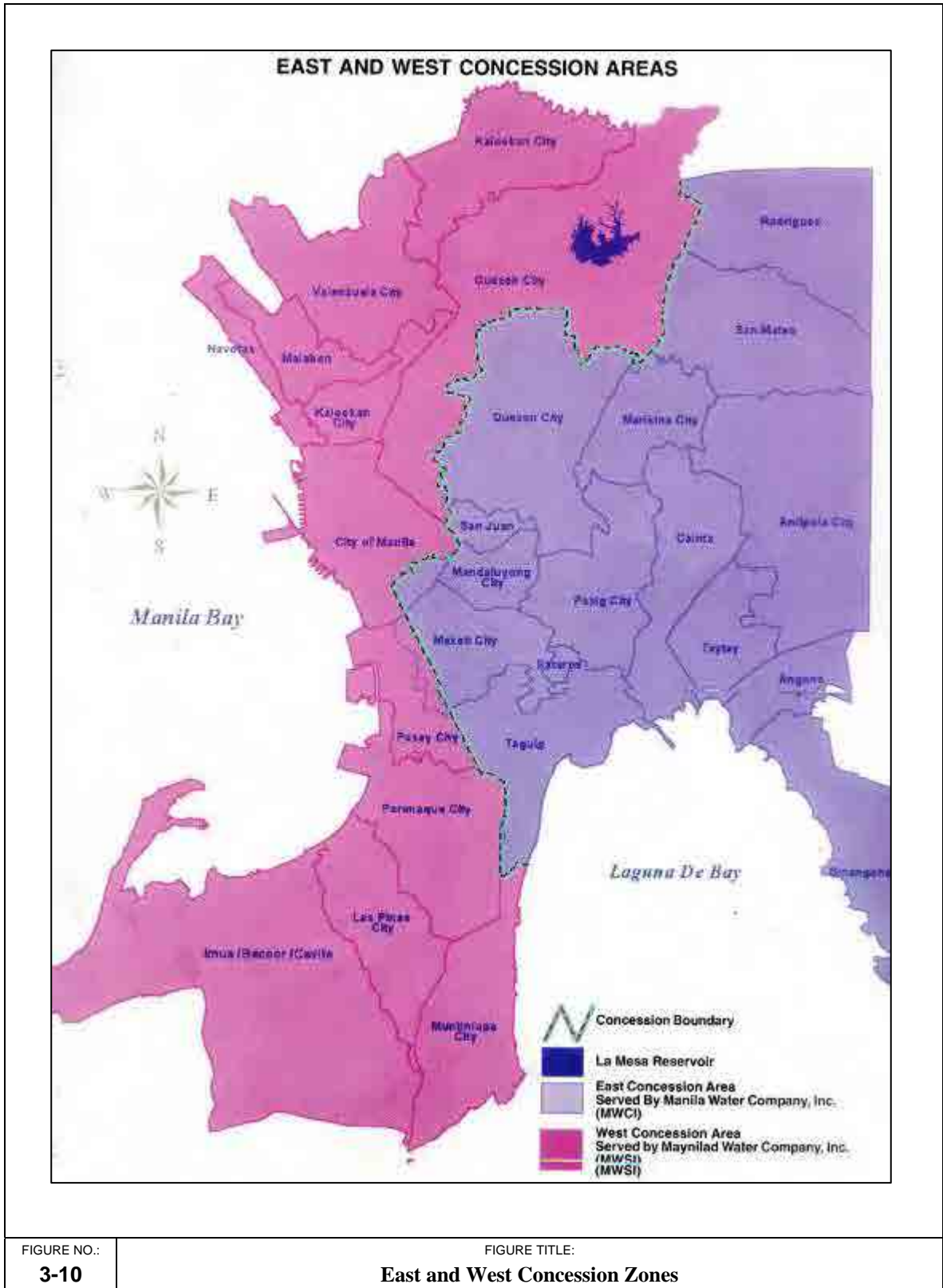
Las Piñas City is not covered by the areas serviced by the sewerage system of the Metropolitan Waterworks and Sewerage System (MWSS). As such, on-site disposal systems (septic tanks) are used in most residences and are generally suitable to collect wastewater. Domestic wastes are treated before being discharged into the Zapote River.

Water Supply

Both Las Piñas and Parañaque belong to the West Concession areas and are serviced by Maynilad Water Services Inc. (MWSI). MWSI is the water and wastewater services provider for the 17 cities and municipalities including Caloocan, Las Piñas, Malabon, Manila, Muntinlupa, Navotas, Pasay, Parañaque, Valenzuela, parts of Quezon City, a part of Makati, Cavite City, and the municipalities of Rosario, Imus, Noveleta, Bacoor, and Kawit in Cavite (refer to **Figure 3-10**). In 1997, the company was granted a 25-year exclusive concession by the Philippine Government, through the Metropolitan Waterworks and Sewerage System (MWSS), to operate, maintain and invest in the water and sewerage system in the West Zone. Maynilad used to supply 2,100 million liters of water a day to around six million people in the West Zone.

The Maynilad Water Services, Inc. provides the water supply in Las Piñas and Parañaque Cities. It is estimated that the water supply has increased by 7 to 8 million liters daily (MLD) since 2006 in Las Piñas City. Maynilad is now distributing 24-hour potable water supply to a majority of the population. A few barangays, however, have limited potable water supply being rationed only for 8 hours in the evening. Other sources of water are the deep wells put up by the homeowners, local government and the Department of Public Works and Highways (DPWH).

The city government of Parañaque has provided potable and adequate supply of water in the city. It has constructed sixty nine (69) pumps and artesian wells in the different blighted areas of the city. On the other hand, availability of water in District I and II are provided by the MWSS and some portion only comes from deep well. The main source of water at present comes far up North in Bulacan. Parañaque is approximately 27 kms from Balara Treatment Plant and 32 kilometers from La Mesa Treatment Plant. About 73, 862 households have access to piped water (Level 3) representing 67.97% of total households.



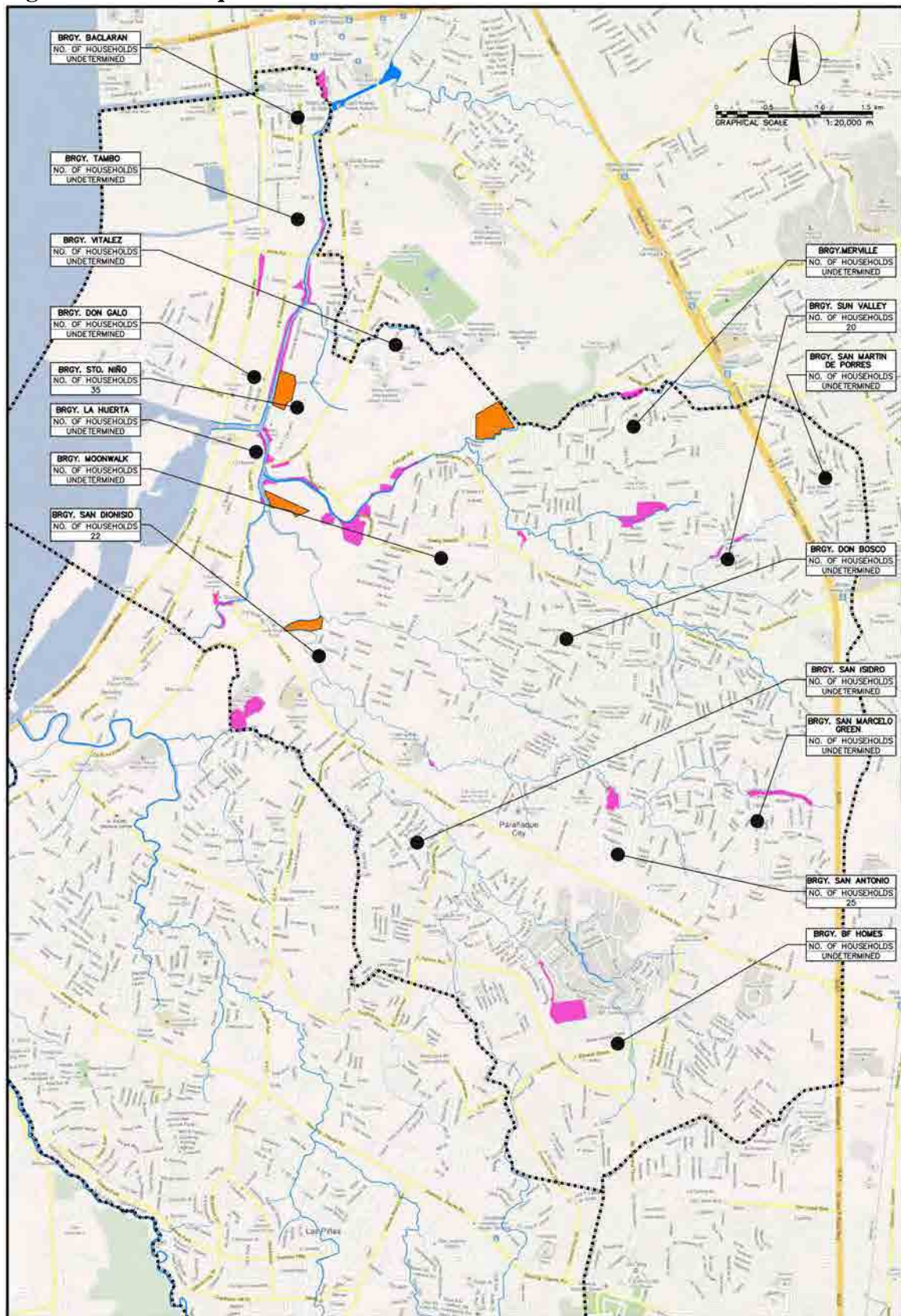
3.1.8 Informal Settlers

There are approximately two hundred twenty seven (227) areas occupying the City of Parañaque, which are considered Urban Mission Areas. Four (4) areas are considered Areas for Priority Development (APD) and fourteen (14) others are undergoing Community Mortgage Program (CMP). The city is home to 25,073 informal settler families, covering an estimated land area of 45.131 hectares. Majority of informal settler dwellings are made of light materials; only a few are made of concrete and semi-concrete materials. Monthly income of these informal settler families falls below the minimum wage. Barangay Sto. Niño has the most number of informal settlers, thirty five (35) followed by Barangay San Antonio with twenty five (25), Barangay San Dionisio with twenty two (22) and Barangay Sun Valley with twenty (20) clustered settlements. Household population in each settlement ranges from 50 to 1,700 families.

Of Las Piñas City's 472,780 urban population (NSO, 2000 Census), 36,710 families belonged to the so-called urban poor, who were squatters in the twenty barangays of Las Piñas City. The Las Piñas local government set out to build houses for 36,710 homeless families within a span of only 10 years and they are half way through the project which began in 1995. Out of the total 36,710 homeless families, 23,138 families now have security of land tenure. A total of 96.9 hectares have also been acquired for the housing project.

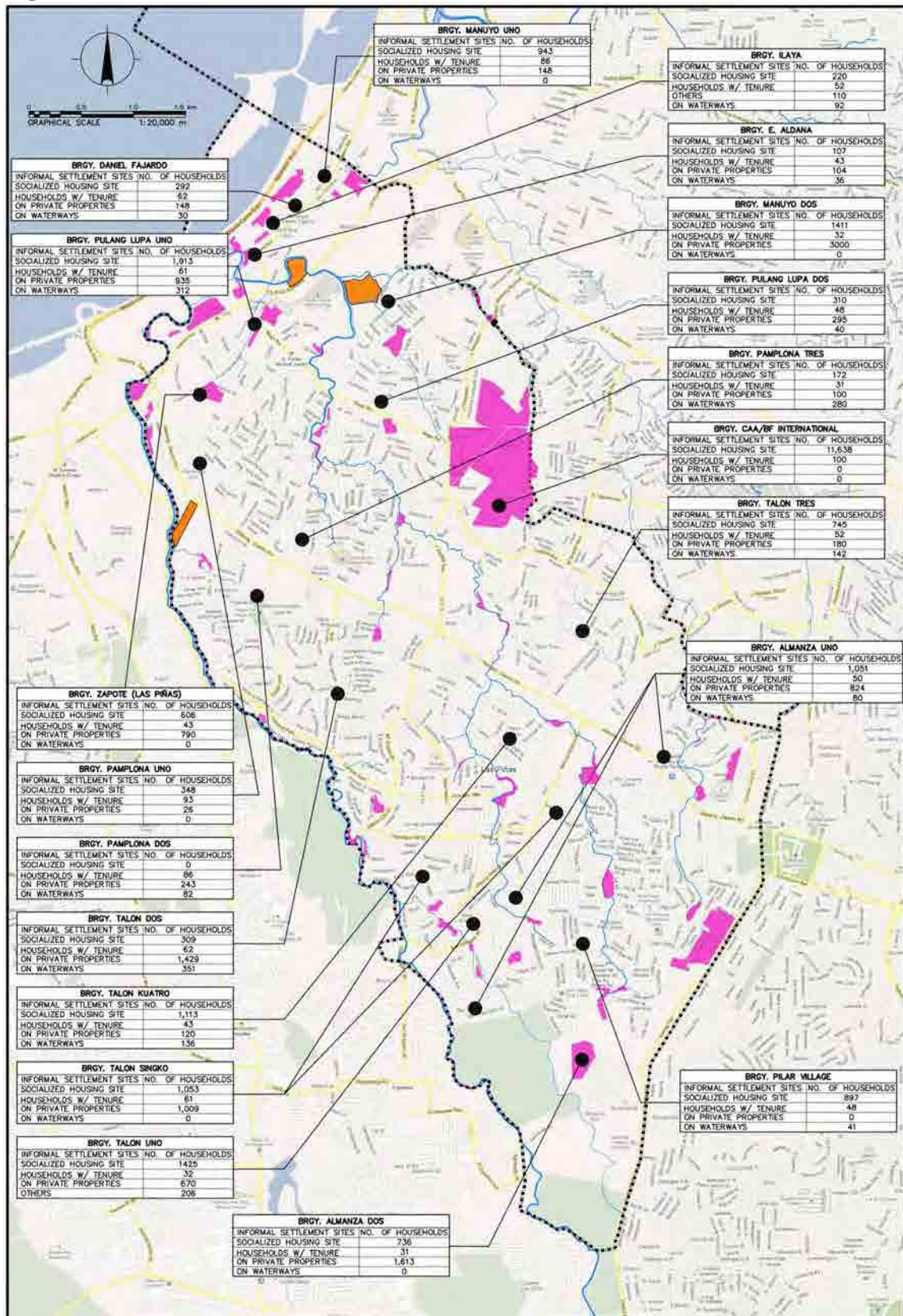
There are many informal settlers who are living on the rivers, creeks or the other water ways and narrow strips alongside of the waterways. They are discharging wastewater (grey or sanitary), garbage and the other solid wastes into the water. This situation is one of contamination of waterways; however, these problems shall be resolved by the several activities mentioned above. The lands occupied by them are basically of governmental ownership and each scale is small. Thus those areas are not applicable to sewage treatment plant or facilities installed even though many of the land are beside the waterways in the receiving body. **Figure 3-11** and **3-12** show current informal settlers' areas.

Figure 3-11 Paranaque: Informal Settlers



Local Development Plan, City Planning & Development Coordinator's Office, City of Paranaque, 2008. Interview, Urban Poor Office, City of Paranaque, 2010.

Figure 3-12 Las Piñas: Informal Settlers



Interview, City Planning & Development Office, City of Las Pinás, 2010. NSO, 2000.

3.1.9 Relative Laws, Acts, Regulations and Standards

Local Environmental Laws and Government Laws

Table 3-24 summarizes the local environmental rules and regulations which are relevant to the regulation of wastes from sanitation and sewerage projects.

Table 3-23 Summary Matrix of Rules and Regulations Pertinent to the Regulated Wastes from Sanitation and Sewerage Projects

REGULATED WASTES	RELEVANT LAWS, RULES AND REGULATIONS	REMARKS
Liquid Wastes		
Effluents of individual/household septic tank	PD 856 – Sanitation Code <ul style="list-style-type: none"> • 1995 IRR of Chapter XVII 	<ul style="list-style-type: none"> • Guidelines for design and maintenance of septic tanks • Whenever available, sewage disposal must be by means of municipal sewerage system
	RA 9275 – Clean Water Act	<ul style="list-style-type: none"> • Mandatory connection to existing sewerage system
Effluents of communal septic tanks, sewage treatment plants (STPs), septage treatment plants (SpTPs), and outfalls	PD 856 – Sanitation Code <ul style="list-style-type: none"> • 1995 IRR of Chapter XVII 	<ul style="list-style-type: none"> • Procedures for design approval, construction, operation and maintenance
	RA 9275 – Clean Water Act <ul style="list-style-type: none"> • Provisional DAO 35 series of 1990 	<ul style="list-style-type: none"> • Secure discharge permit after payment of wastewater discharge fee • Unauthorized dumping of untreated sewage is prohibited • Effluents must comply with provisional DAO 35 or the Philippine effluent standards
Domestic wastes from offshore sources	PD 979 – Marine Pollution Law	<ul style="list-style-type: none"> • Unauthorized dumping of untreated sewage is prohibited • Sea dumping is regulated by Philippine Coast Guard
Effluents for recycling/re-use	RA 9275 – Clean Water Act	Department of Agriculture shall set guideline for safe re-use of wastewater for

REGULATED WASTES	RELEVANT LAWS, RULES AND REGULATIONS	REMARKS
		irrigation and agricultural purposes.
Septage/ Bio-solids and other Solid Wastes		
Septage from individual household septic tank	PD 856 – Sanitation Code <ul style="list-style-type: none"> • 2004 IRR of Chapter XVII 	<ul style="list-style-type: none"> • Requirement of Environmental Sanitation Clearance for operators involved in collection, handling, treatment and disposal of septage • Mandatory processing and treatment of septage prior to disposal • Recommended treatment processes and disposal methods
Biosolids from STPs and SpTPs	PD 856 – Sanitation Code <ul style="list-style-type: none"> • 2004 IRR of Chapter XVII 	<ul style="list-style-type: none"> • Department of Agriculture thru the Bureau of Solid and Water Management shall establish allowable and acceptable limits for nutrients, heavy metals and pathogens.
	RA 9275 - Clean Water Act	
Preliminary treatment residues i.e., oil and grease, grits and screenings	RA 9003 – Ecological Solid Waste Management Act <ul style="list-style-type: none"> • DAO 2001-34 	<ul style="list-style-type: none"> • Compliance to disposal and transport to sanitary landfill
Air Pollutants		
Conventional air pollutants from stationary sources i.e., PM, CO, SO ₂ , NO _x from generator set	RA 8749 – Clean Air Act <ul style="list-style-type: none"> • DAO 2000-81 	<ul style="list-style-type: none"> • Secure permit to operate for air pollution source installation • Compliance to National Emission Standards for Source Specific Air Pollutants (NESSAP)
Odor (specific malodorous compounds such as methane)	RA 8749 – Clean Air Act <ul style="list-style-type: none"> • DAO 2000-81 	<ul style="list-style-type: none"> • Compliance to National Emission Standards for Source Specific Air Pollutants (NESSAP)
Noise	NPCC Rules	<ul style="list-style-type: none"> • Compliance to ambient noise standards

Environmental Permitting Requirements of Sewage / Sanitation Treatment Projects

The following permits presented in **Table 3-25** are required for projects related to sanitation, sewerage system, and sewage/septage treatment plants, grouped according to the implementation stage, i.e., pre-operating and operational stage of the project:

Table 3-24 Environmental Permitting Requirements of Sewage/Sanitation/Septage Treatment Projects

REGULATORY PERMIT	ISSUING AGENCY	REMARKS
PRE-OPERATING STAGE		
Environmental Permits		
Environmental Compliance Certificate (ECC) supported by Initial Environmental Examination (IEE) Report or Environmental Impact Statement	Regional/Field Office DENR-EMB	In accordance with the procedural requirements of the EIS systems. For projects located in Environmentally Critical Areas.
Permit to Import Hazardous Chemicals	DENR-EMB and Bureau of Customs	Allows importation of hazardous chemicals
Permit to Cut Trees	DENR Regional/Field Office	For projects that will cut trees
Water Permit	National Water Resources Board (NWRB)	Regulates the use of ground and surface waters by the project
LLDA Clearance	Laguna Lake Development Authority (LLDA)	For development plan / program / project in the Laguna de Bay Region. Requires an ECC.
Other Related Permits		
Certificate of Registration	Securities and Exchange Commission (SEC) or Bureau of Domestic Trade (BDT)	Proof of business registration of corporation with SEC and single proprietorship with BDT
Certificate of Land Title	Registry of Deeds	Proof of land ownership

REGULATORY PERMIT	ISSUING AGENCY	REMARKS
Certificate of Lease Agreement	DENR Regional/Field Office	Proof of transfer of right to use for an agreed period of time and amount of rent
Foreshore Lease Agreement		For contract leasing of foreshore lands covering different sizes: below six hectares, more than 50 hectares
Special Land Use Permit	DENR Regional/Field Office	For land use of areas of different sizes: areas up to 50 hectares but less than 100 hectares; areas of 100 to 500 hectares; areas more than 500 hectares
Land Conversion		
Clearance for Land Conversion	Department of Agriculture (DA)	Land is not economically viable and sound for agricultural use; conforms to zoning plan of municipality or city; no tenant-lessee problems. Required for project site located in an agricultural land. A requisite for securing DAR Land Use Conversion
Land Use Conversion Certificate	Department of Agrarian Reform (DAR)	For Comprehensive Agrarian Reform Program (CARP) land conversion
Certificate of Zoning Compliance	DAR	Proposed land in accordance with the zoning plan. Issued by DAR to the HLURB to enable project to get an ECC
Locational Clearance	Metro Manila Development Authority (MMDA) or Housing and Land Use Regulatory Board (HLURB) or Local Government Unit (LGU) with Deputized Zoning Administrator	For projects with an ECC. A requisite to get building permit from LGU.
Building and Construction Permits		
Building Permit	LGU	Ensures plans and specifications of project conform with the requirements of the Building Code

REGULATORY PERMIT	ISSUING AGENCY	REMARKS
Clearing/Fencing/ Excavation Permits		Permit to start construction activities
Authority for Electrical/Mechanical Installations		Allows installation of electrical and mechanical works consistent with the Building Code
Sanitary Permit		Attests building / structure conforms with good engineering and sanitation practices
Certificate of Occupancy		Attests compliance of finished structure/building with the Building Code
Mayor's Permit and Locational Endorsement		Business Permits of the project
OPERATIONAL STAGE		
Environmental Permits		
Environmental Monitoring Fund (EMF)	MOA between DENR and Client	For the operational expenses of the Multi- partite Monitoring Team (MMT) and analysis of samples. The revolving fund is replenished by the Client and managed by the MMT Executive Committee.
Environmental Guarantee Fund (EGF)	MOA between DENR and Client	For the immediate rehabilitation and contingency clean-up activities of the project. Can be used for the implementation of environmental information and education campaigns to the community.
Permit to Operate (P/O) for Air Source Emission / Air Pollution Control Facilities	DENR Regional/Field Office	For the operation of air source emission and air pollution control facilities such as generator sets
Discharge Permit	DENR- EMB/LLDA	For discharge of effluent into a body of water, i.e., Pasig River, Laguna Lake, Manila Bay, etc.
Interim Permit for Handling, Transport and Disposal (TSD) of Toxic and Hazardous Wastes	DENR - EMB	For generation, disposal, and transport of hazardous wastes from the plant site

REGULATORY PERMIT	ISSUING AGENCY	REMARKS
Other Related Permits		
Sanitation	Department of Health (DOH)	For the maintenance of sanitary conditions in the facility
Fire Protection Permit	LGU	For the maintenance of fire-protection devices and implementation of safety measures in plant site
Solid Waste Disposal		For the collection and disposal of solid wastes generated by the plant.
Occupational Safety and Health	Department of Labor and Employment (DOLE)	For the protection and promotion of safety and health of the employees in facility

3.2 Environmental Conditions

3.2.1 Atmospheric Environment

Meteorological Conditions

Both Parañaque and Las Piñas falls under Type I category of the Philippine Climate Corona Classification that has two (2) pronounced seasons, i.e., wet and dry season. The months of May to October are considered rainy season period while relatively dry and cool weather pattern begins from November to April. Maximum rain period is observed between the months of June to September during prevalence of southwest monsoon. Every so often, dry season last only for three months but sometimes extends up to seven months.

The Climate Station nearest to the two project areas is the Port Station in Manila. Records show that the highest rainfall values usually occur during the months of July and August. The monthly average rainfall is presented in **Table 3-26**. Values for climatological normal and extremes are shown in **Table 3-27** and **Table 3-28**, respectively.

Parañaque has two distinct seasons: wet season from July to September and dry season for the rest of the year with March to May as hot summer months. The temperature dips following intermittent rains and occasional gustiness from June to October. Cool and fair weather prevails from November to February. The city experiences an annual rainfall of 1.82 mm. per minute while its temperature ranges from 23 to 33 degrees Celsius. It has a relative humidity of 76%, enjoys average daylight duration of 12 hours and a three (3) mile/sec. speed of southeast wind.

Table 3- 25 Monthly Total and Annual Climatic Data Rainfall amount (mm)

Station: Port Area (MCO), Manila							Latitude: 14 ⁰ 35' N						
CMO: Alejandro Villota							Longitude: 120 ⁰ 59' E						
Period: 1990-2004							E l e v a t i o n : 16.0 M						
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1990	5.6	-1.0	5.6	3.2	152.1	1. 366.6	561.4	501.3	520.0	140.9	151.9	76.8	2485.4
1991	22.5	6.6	12.7	12.8	29.6	203.3	366.5	713.9	305.4	70.6	76.6	5.2	1834.7
1992	4.6	-1.0	-1.0	-1.0	104.6	160.6	319.0	562.7	324.1	231.0	126.9	3.6	1837.1
1993	-1.0	0.2	0.5	0.5	7.0	219.2	217.3	437.6	284.2	249.4	206.2	146.0	1768.6
1994	41.2	1.6	22.4	22.4	168.7	241.8	761.7	367.8	276.4	60.7	44.7	96.3	2115.3
1995	3.4	23.0	4.0	4.0	110.8	225.8	342.1	538.2	493.6	335.5	264.7	142.7	2490.6
1996	6.6	-1.0	30.6	30.6	172.7	156.2	413.7	257.5	463.8	54.0	150.1	12.0	1742.1
1997	10.4	24.0	20.4	20.4	520.9	240.0	438.7	679.8	184.7	121.4	24.4	32.9	2287.6
1998	5.4	.0	2.8	2.8	126.7	120.6	167.2	195.7	704.9	356.9	84.1	315.9	2095.6
1999	18.0	11.0	125.9	125.0	98.5	327.9	569.8	654.8	383.6	303.3	106.7	132.4	2832.8
2000	25.5	48.4	49.6	49.6	513.8	213.0	893.1	340.3	443.2	499.8	242.0	155.8	3448.1
2001	34.0	54.5	39.0	39.0	174.2	182.1	386.6	465.4	121.4	183.4	74.6	88.7	1832.2
2002	7.5	11.3	15.4	15.4	71.2	37.4	1468.8	363.3	277.7	212.4	140.1	29.3	2642.2
2003	8.5	5.3	18.4	18.4	408.1	232.1	334.1	425.5	366.7	97.9	120.6	11.4	2041.8
2004	1.2	40.5	-1.0	-1.0	225.3	259.6	150.6	426.3	172.9	75.6	152.6	41.3	1545.9
TOTAL	195.4	228.4	162.2	345.0	2884.2	3186.2	7382.6	6930.1	5342.6	3026.9	1975.2	1340.3	33010.1
MEAN	13.0	15.3	10.8	23.0	192.3	212.4	492.8	462.0	356.2	201.8	131.7	39.4	2200.7
STDEV	12.5	16.7	12.8	32.2	161.4	78.0	339.0	150.0	153.8	129.3	66.1	87.1	506.8

Source: PAGASA

Table 3- 26 Climatological Normal

NORMAL VALUES																
Station Name : NAIA (MIA), PASAY CITY										Latitude : 14°31'00" N Elevation:21.0 m						
Period : 1971 - 2000										Longitude : 121°01'00" E						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
Month	Rainfall		Temperature						Vapor Pressure (MBS)	Rel. Hum. %	MSLP (MBS)	Wind		Cloud Amount (okta)	No. Days w/	
	Amount	No. Of RD	Max (°C)	Min (°C)	Mean (°C)	Dry Bulb (°C)	Wet Bulb (°C)	Dew Pt. (°C)				DIR (16pt)	SPD (mps)		TSTM	LTNG
Jan	6.6	2	30.3	21.5	25.9	25.7	22.3	20.9	24.6	74	1013.3	E	3	5	0	0
Feb	2.6	1	31.1	21.9	26.5	26.4	22.4	20.8	24.3	71	1013.3	E	3	4	0	0
Mar	8.6	2	32.5	22.9	27.7	27.5	23.1	21.4	25.2	69	1012.5	E	4	3	0	1
Apr	13.8	2	34.1	24.5	29.3	29.1	24.3	22.5	27.1	67	1010.9	E	4	4	1	4
May	108.2	7	33.9	25.1	29.5	29.2	25.0	23.5	28.8	71	1009.4	E	3	5	6	14
Jun	213.7	13	32.4	24.7	28.6	28.3	25.0	23.9	29.4	76	1008.7	W	3	6	8	15
Jul	354.3	17	31.2	24.3	27.8	27.5	24.8	23.8	29.4	80	1008.2	W	3	6	10	16
Aug	401.1	19	30.7	24.2	27.5	27.2	24.7	23.8	29.4	81	1008.1	W	3	7	7	10
Sep	249.2	15	31.0	24.2	27.6	27.3	24.8	23.9	29.6	82	1008.9	W	2	7	9	14
Oct	235.3	13	31.1	23.9	27.5	27.3	24.5	23.5	28.8	79	1009.5	E	2	6	5	9
Nov	118.4	9	31.1	23.3	27.2	26.9	23.9	22.8	27.6	78	1010.8	E	2	5	1	3
Dec	48.0	6	30.2	22.2	26.2	26.0	23.0	21.8	26.0	77	1012.5	E	3	5	0	0
Annual	1759.9	106	31.6	23.6	27.6	27.4	24.0	22.7	27.5	75	1010.5	E	3	5	47	86

Source: PAGASA

Table 3-27 Climatological Extremes

STATION: NAIA AIRPORT PASAY CITY													
Year: As of 2003													
MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (mm)		HIGHEST WIND (mps)			SEA LEVEL PRESSURES (mbs)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	35.8	01-07-89	14.8	01-18-61	55.3	01-03-70	20	ENE	01-12-86	1022.3	01-27-87	1004.4	01-01-50
FEB	35.1	02-21-98	14.6	02-01-62	16.5	02-27-50	20	E	02-28-88	1021.4	02-01-98	1003.8	02-21-01
MAR	36.5	03-30-78	16.0	03-03-63	35.5	03-12-71	26	E	03-29-92	1021.1	03-02-87	1002.4	03-06-99
APR	37.8	04-23-48	18.7	04-01-94	63.0	04-04-92	20	E	04-06-86	1019.9	04-23-87	1002.8	04-21-01
MAY	38.1	05-18-69	19.1	05-11-50	229.1	05-27-60	31	SW	05-22-76	1015.9	05-09-57	992.2	05-17-89
JUN	38.0	06-02-91	20.0	06-22-54	353.8	06-01-58	36	S	06-29-64	1016.0	06-07-97	974.6	06-29-84
JUL	36.0	07-06-91	18.3	07-28-48	472.4	07-20-72	36	W	07-08-86	1014.9	07-07-53	990.3	07-04-01
AUG	35.2	08-29-89	17.4	08-09-49	401.8	08-10-47	30	WSW	08-16-84	1015.2	08-12-58	992.8	08-24-78
SEP	34.9	09-09-79	19.1	09-15-50	228.9	09-08-63	26	NW	09-27-78	1015.3	09-28-97	988.9	09-30-95
OCT	36.0	10-24-76	18.0	10-23-81	274.5	10-09-78	27	W	10-18-85	1017.0	10-25-86	977.9	10-14-70
NOV	35.8	11-17-72	17.2	11-26-49	121.7	11-14-77	56	W	11-19-70	1019.4	11-03-89	899.4	11-03-95
DEC	34.2	12-29-78	16.3	12-18-55	110.5	12-30-50	25	NW	12-30-50	1020.9	12-08-60	996.2	12-15-62
ANNUAL	38.1	05-18-69	14.6	02-01-62	472.4	07-20-72	56	W	11-19-70	1022.3	01-27-87	899.4	11-03-95
Period of Record	1947-2003				1949-2003		1950-2003			1950-2003			

Source: PAGAS

Air Quality and Noise Quality

Similar to most urban areas, air pollution is a major concern in Las Piñas City. This is mainly caused by transport emissions especially during heavy traffic. Because of polluted air, respiratory diseases like asthma are common among residents.

The average total suspended particulates (TSP) in Las Piñas City from 2000 to 2003 is 65.5 ug/scm which is below the annual average of 90 ug/Ncm (refer to **Table 3-28**). The city has one air quality monitoring station located in Barangay Pamplona.

There has been no significant change in the TSP concentration in the city since the closing of major industrial businesses in the area. According to the DENR, the highest concentration of TSP is only along major thoroughfares like the Alabang- Zapote Road. The TSP level in residential areas is low.

Table 3-28 Average concentration of Total Suspended Particulates (TSP) in microgram per normal cubic meter (ug/Name) in geometric mean in the atmosphere in Las Piñas City, 2000-2003

Year	Total Suspended Solids
2000	80
2001	67
2002	78
2003	37

Source: DENR-Environmental Management Bureau (NCR), 2007

Note: Annual/long term ug/Ncm average is 90 ug/Ncm

The main contributors of noise in the project areas are the public and private vehicles plying along the main avenues and city streets. This noise is at its maximum level during peak hours. Additional noise is incurred by the occasional landing and take-off of various aircrafts from the NAIA.

3.2.2 Water Environment

Water Condition

Rivers and Creeks in the project areas are shown in **Figure 3-13**.

Water Quality of Rivers and Creeks

Las Piñas City has a coastline (Manila Bay) of about 190 kilometers. In addition to the pollution of the Manila Bay, the Department of Environment and Natural Resources (DENR) reported the degradation of the rivers in Metro Manila, which are characterized by insufficient dissolved oxygen (DO) content and high biological oxygen demand (BOD). At present, there are 7 sampling stations along the Parañaque-Zapote River System. The DENR is closely monitoring the water quality of the 5 major river systems in Metro Manila (Marikina River, Navotas-Malabon-Tullahan-Tenejeros

(NMTT) River, San Juan River, Pasig River, and Parañaque River) for color, temperature, turbidity, potential of hydrogen (pH), DO, BOD, and suspended solids.

Based on the DENR’s assessment for 2006, the Parañaque-Zapote River has the lowest DO, the highest BOD and the lowest pH. Among the monitored river systems, it also has the lowest change on suspended solids and the least stable temperature change.

The average DO is between 1.9 and 2.14 mg/liter; the average BOD is from 14.4 to 41.02 mg/liter and the average change on suspended solids ranges from 2.75 to 12.62 mg/liter. On the other hand, the average pH is between 7.89 and 8.75, and the average temperature change is from 0.42°C to 0.9 °C.

Results of the monitoring indicate the degradation and poor water quality of the Parañaque-Zapote River (refer to **Table 3-29**).

Table 3-29 Water quality of the Parañaque-Zapote River System, 2006

Parameters	Value	DENR Standard	Assessment	Rating
DO,mg/L	1.19	5	Failed	Poor
BOD,mg/L	41.02	10	Failed	Poor
Suspended Solids change, mg/L	41.02	30	Failed	Poor
pH	7.89	6-5-8-5	Failed	Poor
Temperature Change °C	0.92	3	Passed	Good

Source: DENR-Environmental Management Bureau (NCR) as cited in Las Piñas City Profile

Industrial establishments cause water pollution in Las Piñas City primarily by households and secondarily. To address this, the local government launched the “Cleaning of Esteros, Creeks, Rivers and Waterway” (Clearway) project under the Clean and Green Program.

Continuous Monitoring Stations in Paranaque and Las Pinãs

There are several monitoring stations to record air, water and rainfall conditions in Paranaque and Las Pinãs Cities. Those locations are shown in **Figure 3-14**. OEC conducted analysis of river and creek water quality in the project areas on 29th and 30th of July, 2010 (Upstream of Paranaque River in Pasay City on May 26, 2010). The results are shown in **Figure 3-15** together with the monitoring positions. Drainage water quality analysis will be done January or February of next year, because such season is dry and cursive season for wastewater qualities.

Figure 3-13 Paranaque and Las Pinas: Major Rivers and Creeks

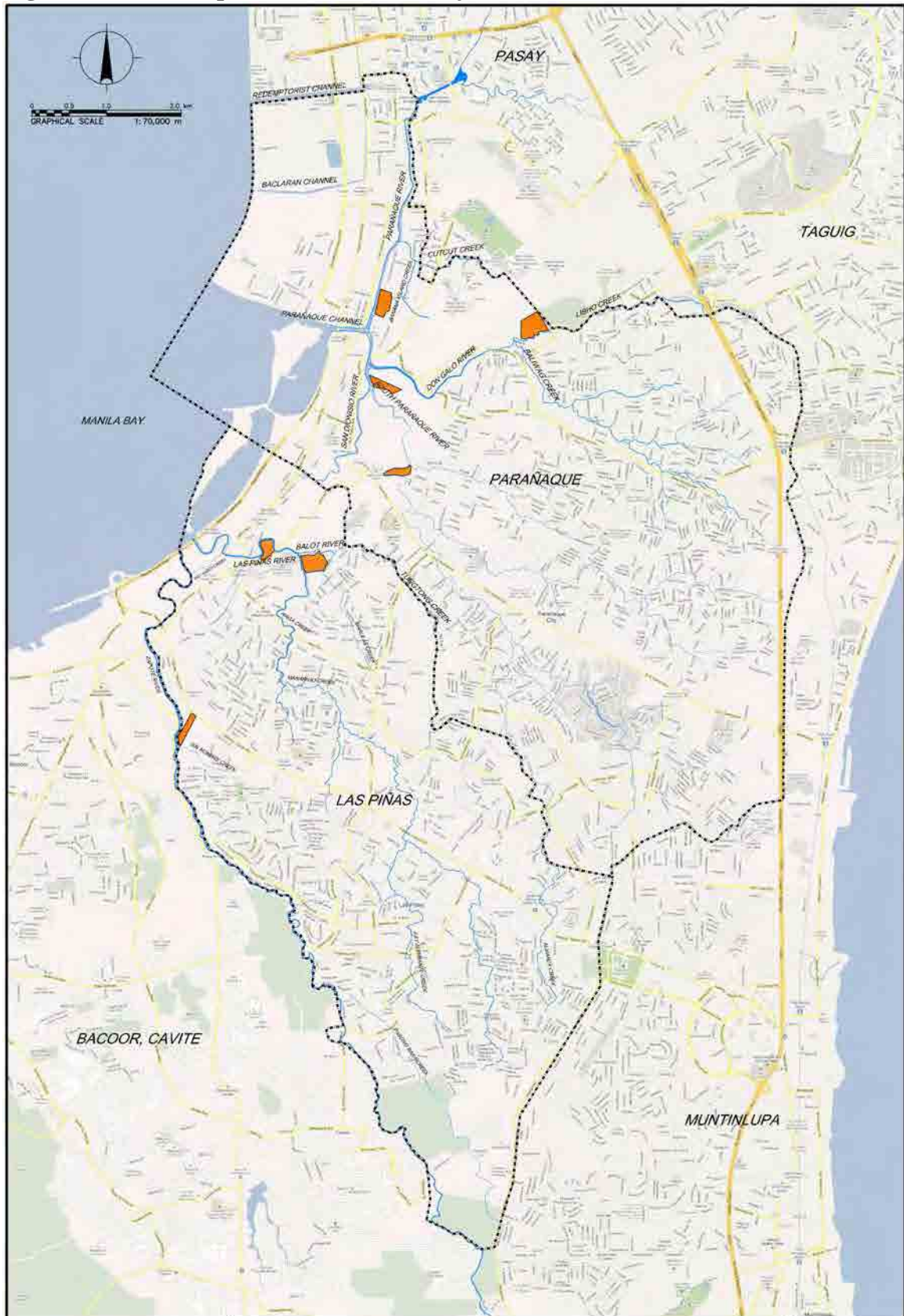


Figure 3-14 Parañaque and Las Piñas Monitoring Stations (Air, Rainfall, Water)

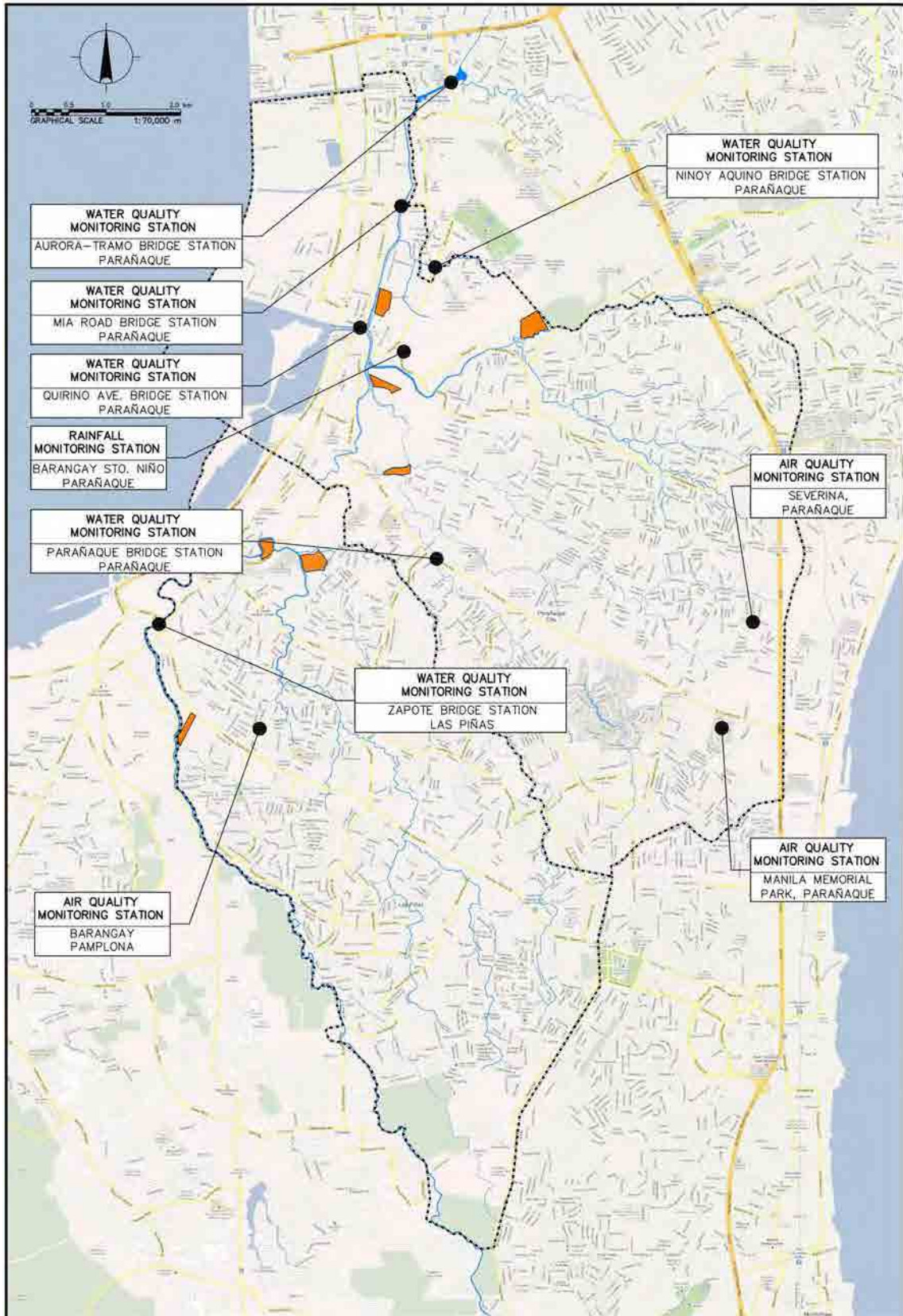
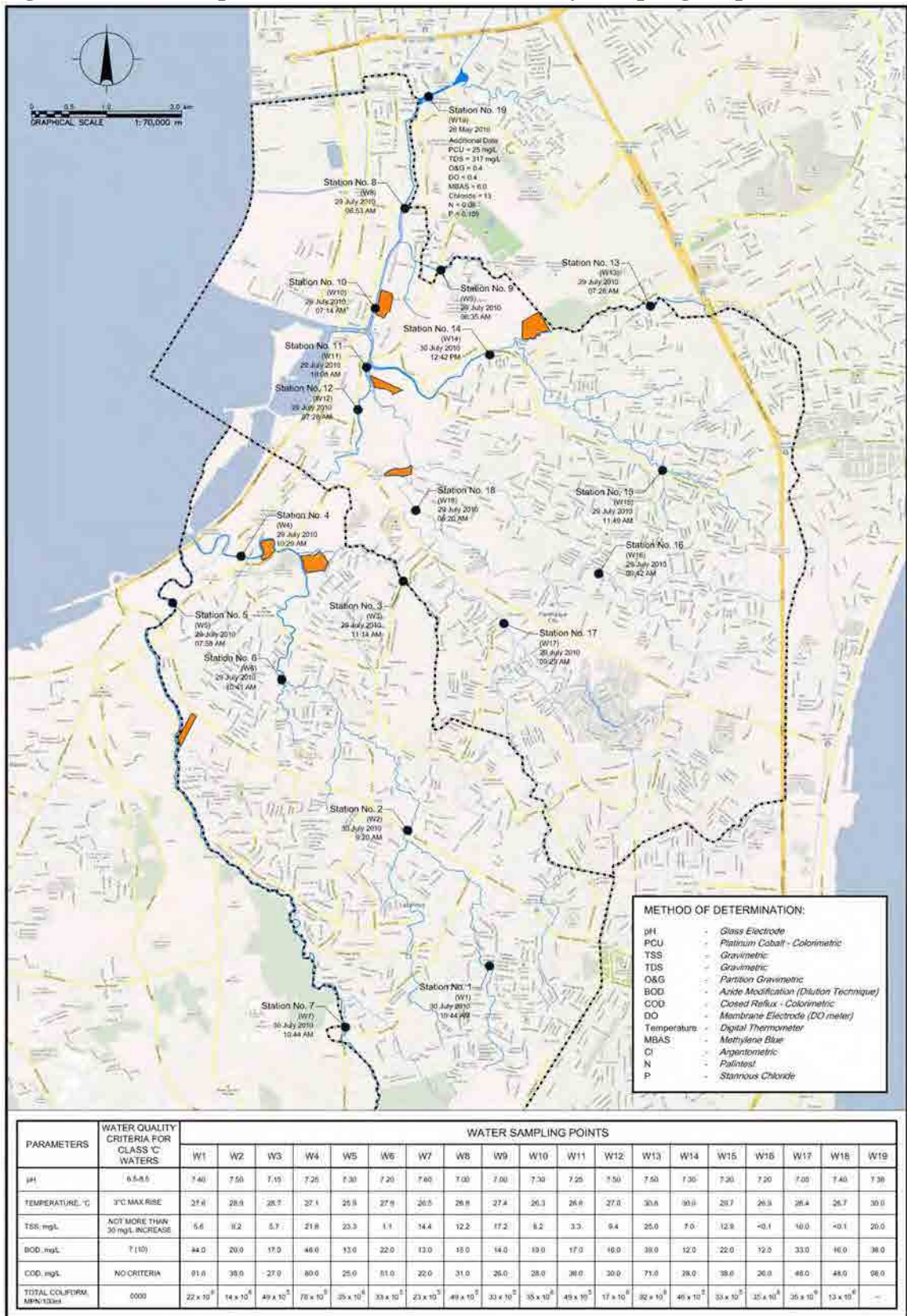


Figure 3-15 Paranaque and Las Pinãs: Water Quality Sampling Map



Water Quality Conditions of Manila Bay

Manila Bay is a semi-enclosed estuary located southwest section of Luzon facing the South China Sea. The 60 kilometer long bay has a coastline of approximately 190 km and a surface area of about 1,800 km². Its width varies from 22 km to 60 km. It is bounded within the coordinates 120°28' to 121°15' east longitude, and between 14°16' to 15° north latitude. Its 18-km access channel, where Corregidor Island is situated, is about 15 km from the 200-meter contour of the continental shelf. It consists of a gently sloping basin with the depth increasing at a rate of 1 meter per kilometer from the interior to the access channel and has an average depth of 17 meters (PRRP, 1999).

The bay is bordered by coastal cities and municipalities of the National Capital Region or NCR (Manila, Pasay, Parañaque, Las Piñas, and Navotas), and the coastal provinces of Bataan, Pampanga, Bulacan in Region 3, and Cavite in Region 4. As shown in Figure 1, the Manila Bay watershed area includes the non-coastal cities and municipalities of the NCR (Quezon City, Caloocan City, Makati, Pasig, Marikina, Mandaluyong, Muntinlupa, Valenzuela, Malabon, San Juan, Pateros, and Taguig), provinces of Nueva Ecija and Tarlac in Region 3, and Rizal and Laguna in Region 4. The entire watershed is approximated at 17,000 km² consisting of 23 catchment areas.

Domestic effluent is the main contributor in organic pollution in the Bay. A mere 18% of the domestic wastewater is treated in localized sewerage systems. The rest of the generated domestic wastewater in areas around the bay is directly discharged into it.

Agricultural wastewater is accounted to be the second largest polluter of Manila Bay. The sources include agricultural runoff and wastewater discharges from poultry and piggeries particularly from the provinces of Tarlac, Pampanga and Bulacan. Major sources of agricultural runoffs include: organic wastes such as decayed plants, livestock manure, and dead animals; soil loss in the form of suspended solids; and pesticides and fertilizer residues. The absence of facilities to intercept surface runoffs from agricultural farms affects the water quality of surface and coastal water, especially in the downstream urban areas.

Industrial wastewater is mostly generated by water intensive industries such as food and dairy manufacturing; pulp and paper products; textile products, and others. Other types of waste include thermal waste, created by cooling processes used by industry and thermal power stations. Both treated and partially treated effluents are often discharged to river systems which eventually received by the bay.

3.2.3 Ground and Soil Condition

The regional geology of Metro Manila includes:

- Quaternary Alluvium - recent deposits of unconsolidated sediments of sandstone, siltstone, claystone and conglomerates;
- Guadalupe Formation - composed of two sub-units, the pumiceous pyroclastic flow unit and the extensive volcanic tuffaceous deposits;

- Alat Conglomerate - represented by a thin conglomerate sedimentary unit underlying the Guadalupe Formation;
- Binangonan Limestone - composed of extensive coralline and massive limestone deposits
- Angat Formation - consisting of Gabbro and Pillow Basalts representing the upper section of the Ophiolite sequence and serves as the basement for Metro Manila.

Three major geologic structures affect the general vicinity of Metro Manila, most important of which is the Valley Fault System (VFS) which traverses the Eastern Metro Manila area in a north-south trend. The north-south trending active Philippine Fault Zone (PFZ) is located east of the Metro Manila area towards the Sierra Madre Range. To the west is the Manila Trench which is actively subducting the South China Sea Plate beneath the Luzon segment of the Philippine Mobile Belt (PMB). The Philippine Institute of Volcanology and Seismology (PHIVOLCS) found no faultiness to cross the areas of Las Piñas and Parañaque. The nearest fault is the creeping fault segment of the West Marikina Fault in the Muntinlupa-San Pedro-Biñan area.

Table 3-31 summarizes the general soil characteristics in Metro Manila. The soil in Parañaque is classified under Guadalupe soil. It is volcanic eject that produces a loam to clay loam texture that can hold more water. The soil contains more clay than silt. Its permeability is low with high swelling capacity. Furthermore, alluvial plain in Las Piñas is composed of sand and clay with shell fragments (JICA Study on Metro Manila Groundwater Development). The alluvium is observed to extend to depths of about 10 to 20 meters. The hilly portion is composed of sandstone, conglomerate, mudstone and stuff, and reaches a thickness of 2,000 meters.

Table 3-30 General Soil Characteristics in Metro Manila

Parameter	Physiographic Zones				
	Coastal Margin	Reclamation	Guadalupe Plateau	Marikina Valley	Laguna Lowlands
Slope	Less than 1%	Less than 1%	0-12%	Less than 1%	Less than 1%
Flooding Frequency	High	Low	None to Very High	High to Very High	High to Very High
Soil Drainage	Poor	Moderate	Good	Very Poor	Poor
Depth to Water Table	Very Shallow	Shallow	Deep	Extremely Shallow	Very Shallow
Depth to Bedrock	Very Deep	Very Deep	Shallow	Very Deep	Very Deep
Soil Stability	Low	Very Low	Moderate to High	Very Low	Low
Soil Corrosivity	High	High	Very Low	High	High
Earthquake Damage Risk	High	Very High	Low	Very High	High

Source: Malabon City Medium Term Development Plan

3.2.4 Flora

Both Las Piñas and Parañaque are built-up and densely populated urban metropolis. Vegetation within idle lands is usually covered with cogon grass. Several unoccupied areas are usually planted with wild bamboos, banana trees, coconut trees, fire trees and other similar wild trees that relatively thrive in Luzon. There are some areas that were planted by the city government with trees, shrubs and ornamental plants such as palm trees, pine trees and bushes as part of urban landscaping.

Table 3-32 presents the typical plant conservation status in Luzon Area. There is not any valuable vegetation of trees in the project areas.

Table 3-31 Typical Plant Conservation Status in Luzon

	ABUNDANT	COMMON	DEPLETED	VULNERABLE	RARE	ENDANGERED	INDETERMINATE
1	ABACA	AGLAONEMA	AKLE	ANTIPOLO	ALAHAN	ILANG-ILANG	ALAGASI
2	ALAGAU	AGOOY	AMUGIS	BALOBO	BALITANTAN	NARRA	ANULING
3	ALIBANGBANG	AMAMALI	ANONANG	HAMINDANG	BAMBAN	PALASAN	BINUANG
4	ANUBING	BIKAL	APANANG	ISIS	BUKAUI	WHITE LAUAN	KALUBKUB
5	AURI	BINAYUYU	BALINGHASAI	MAGABUYO	BOLON	MAHOGANY	KAMOT
6	BASTON DE SAN JOSE	BOGUS	BANGKAL	DUGUAN	MAMUKO		LAGO
7	BAYABAS	BUHO	BANSIU	TAGPO			MABUNOT
8	BINUNGA	BUNGA	BATINONG LIITAN				MAMALIS
9	COGON	CAIMITO	BAYOK-BAYOKAN				TULIBAS MABOLO
10	DUHAT	KUDZU	BUTLI				TULIBAS TILOS
11	GABI	CENTROSEMA	KULATINGAN				
12	GMELINA	CLERODENDRUM	LIGAS				
13	GUMAMELA	NEPHROLEPIS	MALAPAPAYA				
14	NARROW LEAF HELICONIA	GOVERNOR'S PLUM	MALATIBIG				
15	IPIL-IPIL	CYPERUS SP.	PAGSAHINGIN				
16	SWEET POTATO	HAGONOY	PAKILING				
17	CASSAVA	HAULI	RUBUS SP.				
18	LUMBANG	BULAK MANOK	SALINGGOGON				
19	MAIS	PACHYSTACHYS	SUBIANG				
20	MALUNGGAI	KANDI-KANDILAAN	TALISAI GUBAT				
21	MANGGA	KAONG	TAMAYUAN				
22	MANILA PALM	KAPOK	TARA-TARA				
23	LANGKA	KATAGPO					
24	NIOG	KOLLO-KOLLOT					
25	RAINTREE	MELON-MELONAN					
26	SAGING	LANTANA					
27	TALAHIB	MAKAHIYA					
28		MALATUNGAW					

ABUNDANT	COMMON	DEPLETED	VULNERABLE	RARE	ENDANGERED	INDETER-MINATE
	NIOG-NIOGAN					
	NITONG HAPON					
	NITONG PUTI					
	PAKO					
	PAKPAK LAWIN					
	PALM GRASS					
	PAYANG-PAYANG					
	RIMAS					
	SAN FRANCISCO					
	TAGBAK					
	TANGISANG BAYAWAK					
	TIBIG					
	UOKO					
	MALUBAGO					
	DONA AURORA					
	MUTHA					

3.2.5 Fauna

There are 191 mammal species in the Philippines, of which 8 are critically endangered, 13 are endangered, 30 are vulnerable, and 1 is near-threatened. Some notable mammalian species in Luzon include macaque (*Macaca fascicularis*), civets (*Paradoxus hermaphrodites* and *Viverra zangalunga*), pig (*Sus philippinensis*), deer (*Cervus mariannus*), golden crowned flying fox (*Acerodon jubatus*) and mottled-winged flying fox (*Pteropus leucopterus*) and Tamaraw. There are not any valuable mammals found in the project areas.

There are 612 species of birds found in the Philippines, of which 194 are endemic, 3 have been introduced by humans, and 52 are rare or accidental. 67 species are globally threatened. This includes the Rufous Hornbill (*Buceros hydrocorax*) and the critically endangered and national bird of the Philippines, Philippine Eagle. Other popular types of birds include ducks, geese, swans, hawks, eagles, falcons, partridges, pigeons, doves, owls, kingfishers, cockatoos and pipits. There are not any valuable birds found in the project areas. Some species of mammals and birds endemic in Luzon are tabulated in **Table 3-33**.

There are also 332 species of reptiles and amphibians were discovered in the archipelago, 215 of them is endemic. Some of them are the endemic freshwater crocodile *Crocodylus mindorensis*, Gray's monitor and the Philippine Pond Turtle. There are not any valuable amphibians and reptiles found in the project areas.

The Philippines has more than 280 inland fish, including nine endemic genera and more than 65 endemic species, many of which are confined to single lakes. An example is *Sardinella tawilis*, a freshwater sardine found only in Taal Lake. There are not any valuable species of fishes found in the project areas.

Nearly 21,000 recorded insect species are found in the country. In addition about one-third of the 915 butterflies found here are endemic to the country, and over 110 of the more than 130 species of tiger beetle are found nowhere else. There are not any valuable insects found in the project areas.

Table 3-32 Some Mammals and Bird species found in Luzon

Mammals			Birds
Critically Endangered:	Endangered:	Vulnerable:	Endemic Species
Ilin Island Cloud Rat (<i>Crateromys paulus</i>)	Calamian Deer (<i>Axis calamianensis</i>).	Dugong (<i>Dugong dugon</i>)	Luzon buttonquail (<i>Turnix worcesteri</i>)
Mt. Isarog Striped Rat (<i>Chrotomys gonzalesi</i>)	Dinagat Bushy-tailed Cloud Rat (<i>Crateromys australis</i>)	Fischer's Pygmy Fruit Bat (<i>Haplonycteris fischeri</i>)	Brown-banded rail (<i>Lewina mirificus</i>)
Northern Luzon Shrew Rat (<i>Crunomys fallax</i>)	Dinagat Moonrat (<i>Podogymnura aureospinula</i>)	Flying Lemur (<i>Cynocephalus volans</i>)	Luzon bleeding-heart (<i>Gallicolumba luzonica</i>)
Philippines Tube-nosed Fruit Bat (<i>Nyctimene rabori</i>).	Golden-capped Fruit Bat (<i>Acerodon jubatus</i>)	Giant Bushy-tailed Cloud Rat (<i>Crateromys schadenbergi</i>)	Flame-breasted fruit-dove (<i>Ptilinopus marchei</i>)
Negros Shrew (<i>Crocidura negrina</i>)	Mindanao Gymnure (<i>Podogymnura truei</i>)	Large Mindoro Forest Mouse (<i>Apomys gracillirostris</i>)	Luzon racquet-tail (<i>Prioniturus montanus</i>)
Tamaraw (<i>Bubalus mindorensis</i>)	Mindoro Shrew (<i>Crocidura mindorus</i>)	Lesser Raneer Mouse (<i>Haeromys pusillus</i>).	Scale-feathered malkoha (<i>Phaenicophaeus cumingi</i>)
Visayan Warty Pig (<i>Sus cebifrons</i>)	Mt. Isarog Shrew-mouse (<i>Archboldomys luzonensis</i>)	Little Golden-mantled Flying Fox (<i>Pteropus pumilus</i>).	Luzon scops-owl <i>Otus longicornis</i>)
	Mt. Malindang Shrew (<i>Crocidura grandis</i>)	Long-nosed Luzon Forest Mouse (<i>Apomys sacobianus</i>)	Whitehead's swiftlet (<i>Aerodramus whiteheadi</i>)
	Northern Palawan Tree Squirrel (<i>Sundasciurus juvenicus</i>)	Luzon Fruit Bat (<i>Otopteropus cartilagonodus</i>)	Whiskered pitta (<i>Pitta kochi</i>)
	Palawan Soft-furred Mountain Rat (<i>Palawanomys fuvus</i>)	Luzon Shrew (<i>Crocidura grayi</i>)	Grey-capped shrike (<i>Lanius validirostris</i>)
	Panay bushy-tailed cloud rat (Panay cloud runner) (<i>Crateromys heaneyi</i>)	Luzon Striped Rat (<i>Chrotomys whiteheadi</i>)	Ashy thrush (<i>Zoothera cinerea</i>)
	Visayan Spotted Deer (<i>Cervus alfredi</i>)	Mearns' Luzon Rat (<i>Tryphomys adustus</i>)	Luzon redstart (<i>Rhyacornis bicolour</i>)
	White-winged Flying Fox (<i>Pteropus leucopterus</i>)	Mindanao Pygmy Fruit Bat (<i>Allonycteris paucidentata</i>)	Golden-crowned babbler (<i>Stachyris dennistouni</i>)
		Mindanao Shrew (<i>Crocidura beatus</i>)	Chestnut-faced babbler (<i>Stachyris whiteheadi</i>)
		Mindoro Black Rat (<i>Rattus mindorensis</i>)	Philippine bush-warbler (<i>Cettia seebohmi</i>)
		Mindoro Climbing Rat (<i>Anonymomys mindorensis</i>)	Long-tailed bush-warbler (<i>Bradypterus caudatus</i>)
		Mt. Isarog Shrew-rat (<i>Rhynchomys isarogensis</i>)	Rusty-flanked jungle-flycatcher (<i>Rhynomyias insignis</i>)
		Palawan Fruit Bat (<i>Acerodon leucotis</i>)	Ash-breasted flycatcher (<i>Muscicapa randi</i>)

		Palawan Montane Squirrel (<i>Sundasciurus rabori</i>)	Green-backed whistler (<i>Pachycephala albiventris</i>)
		Palawan Shrew (<i>Crocidura palawanensis</i>)	Long-billed rhabdornis (<i>Rhabdornis grandis</i>)
		Palawan Stink Badger (<i>Mydaus marchei</i>)	Flame-crowned flowerpecker (<i>Dicaeum anthonyi</i>)
		Palawan Tree Shrew (<i>Tupaia palawanensis</i>)	White-cheeked bullfinch (<i>Pyrrhula leucogenis</i>)
		Philippine Gray Flying Fox (<i>Pteropus speciosus</i>)	White-lored oriole (<i>Oriolus albiloris</i>)
		Philippine Tree Shrew (<i>Urogale everetti</i>)	
		Philippine Warty Pig (<i>Sus philippensis</i>)	
		Samar Squirrel (<i>Sundasciurus samarensis</i>)	
		Small Rufous Horseshoe Bat (<i>Rhinolophus subrufus</i>)	
		Southern Giant Slender-tailed Cloud Rat (<i>Phloeomys cumingi</i>)	
		Spiny Long-footed Rat (<i>Tarsomys echinatus</i>)	
		Tawitawi Island Rat (<i>Rattus tawitawiensis</i>)	

3.2.6 Nature and Human Contact Zones

Landscape

The City of Parañaque sits on a plain with parts lying along the coastline of scenic Manila Bay. Within the next decade, expansions are well-planned in large-scale, and fast-track development upon an approximately 1,200 hectare stretch that will contain mixed land uses for residential, commercial, institutional, hotel, residential-commercial, residential-office, greens and open spaces, among other purposes.

It is relatively flat and situated along the coastline areas of six (6) barangays namely, Baclaran, Tambo, Don Galo, Sto. Nino, la Huerta and San Dionisio. The other barangay such as Moonwalk, Vitalez, San Isidro, BF, Don Bosco, Marcelo Green, Merville, Sun Valley, San Antonio, San Martin de Porres have an elevation ranging from 10 to 35 above mean sea level.

3.2.7 Historical Heritage

Several historical sites located in Parañaque and Las Piñas are listed below:

- Saint Andrews Church

The evangelization of Parañaque started 400 years ago with the arrival of the Augustinian missionaries. The founding religious order chose La Huerta as the site of their mission house. It is now the shrine of the Nuestra Señora. Del Buen Suceso.

- Redemptorist Church.

The Shrine of Our Lady of Perpetual Help in Baclaran continues to be the most attended church in Asia. It has a seating capacity of 3,000 and 9,000 for standing devotees.

- Dampa

Seafood lovers from all over Metropolitan Manila troop to the various markets of Parañaque City. There are dozens of places to shop for the freshest crustaceans, mollusks, shellfish and other marine and freshwater catch. Courteous Parañaqueño vendors often offer to clean or debone the fish purchase, free of charge, to the delight of consumers.

- Casino Filipino

There is never a dull day in Parañaque. Facilities and their distinctive attractions and features allow you to unwind and relax. Splendid shows and tax-free winnings at the country's premiere casino.

- Bamboo Organ

Las Piñas City is world famous for its nineteenth-century old Bamboo Organ. It is housed inside the St. Joseph Church, and was built in the year 1824 by Fr. Diego Cera de la Virgen del Carmen, a priest under the Augustinian Recolletos.



The Las Piñas Bamboo Organ is a church organ made almost entirely from bamboo with only the trumpet stops made from metal. It is known as the only pipe organ in the world whose 902 out of the 1,031 pipes are made of bamboo and the remaining pipes are made of metal. This famous organ is praised for its unique, rare, and melodious sound that draws in the second week of February for an Organ Festival. On November 24, 2003, the National Museum of the Philippines officially declared the Las Piñas Bamboo Organ a ‘National Cultural Treasure.

- Sarao Jeepney Factory

Another attraction at Las Piñas is the Sarao Jeepney Factory owned by Leonardo Sarao on Padre Diego Cerra Avenue, Pulanglupa, Las Piñas, which is about 3km south of San Jose Church. Sarao was one of the first companies to take leftover World War II American jeeps and transform them into the ubiquitous “King of the Road”. Visitors can watch the famous Manila jeepneys being assembled and handcrafted according to clients’ request. Jeepneys are built, piece by piece in painstaking individual production.

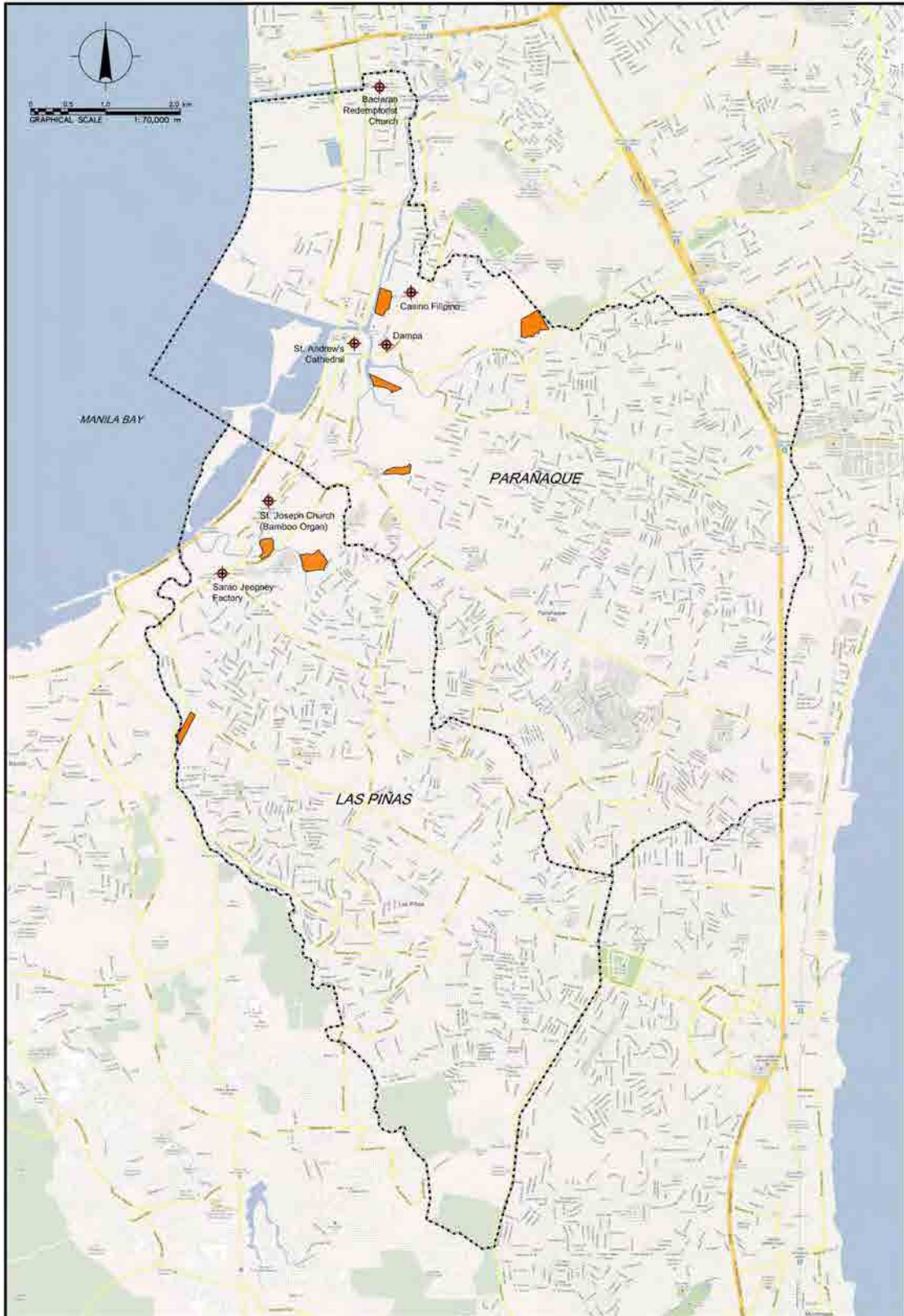


- Salt center of Metro Manila

Las Piñas City is known also for its salt beds where salt is produced the old-fashioned way. Las Piñas used to hold the distinction “**Salt Center of Metro Manila**” until the construction of the Coastal Road and land reclamation project in Manila Bay severely affected the industry. However, through the initiatives of local government leaders, the salt beds of Las Piñas were restored giving visitors the chance to see the traditional method of **salt-making** and harvesting the way the people in this historic place have been doing it for the past two centuries.



Figure 3-16 Paranaque and Las Pinas: Historical Heritage Map



3.2.8 Environmental Standards

3.2.8.1 Atmospheric Standards

Table 3-34 and Table 3-35 presents the Ambient Air Quality Guideline Values and Standards as mandated by the Philippine Clean Air Act of 1999 (RA 8749).

Table 3-33 Guidelines for Criteria Pollutants for National Ambient Air Quality

Pollutants	Short Term			Long term		
	$\mu\text{g}/\text{m}^3$	ppm	Averaging time	$\mu\text{g}/\text{m}^3$	ppm	Averaging time
Suspended Particulate Matter						
TSP	230		24 hours	90		1 year
PM-10	150		24 hours	60		1 year
Sulfur Dioxide	180	0.07	24 hours	80	0.03	1 year
Nitrogen Dioxide	150	0.08	24 hours			
Photochemical Oxidants as Ozone	140 60	0.07 0.03	1 hour 8 hours			
Carbon Monoxide	35 mg/NCM 10 mg/NCM	30 9	1 hour 8 hrs			
Lead	1.5		3 months	1		1 year

Table 3-34 National Ambient Air Quality Standards for Source Specific Air Pollutants from Industrial Sources/Operations

Pollutants	Concentration		Averaging time (min)	Method of Analysis/ Measurement
	$\mu\text{g}/\text{m}^3$	ppm		
1. Ammonia	200	0.28	30	Nesslerization/ Indo Phenol
2. Carbon dioxide	30	0.01	30	Tischer Method
3. Chlorine and Chlorine compounds expressed as Cl ₂	100	0.03	5	Methyl Orange
4. Formaldehyde	50	0.04	30	Chromotropic acid Method or MBTH Colorimetric Method
5. Hydrogen Chloride	200	0.13	30	Volhard Titration with Iodine Solution
6. Hydrogen Sulfide	100	0.07	30	Methylene Blue
7. Lead	20		30	AAS
8. Nitrogen Dioxide	375 260	0.20 0.14	30 60	Greiss-Saltzman
9. Phenol	100	0.03	30	4-Aminoantipyrine
10. Sulfur Dioxide	470 340	0.18 0.13	30 60	Colorimetric-Parasoaniline
11. Suspended Particulate Matter - TSP - PM10	300 200		60 60	Gravimetric

3.2.8.2 Water Quality Regulations

Water usage and Classification (DAO 34)

The quality of Philippine waters shall be maintained in a safe and satisfactory condition according to their best usages. For this purpose, all waters shall be classified according to the beneficial usages enumerated in **Table 3-36**.

Table 3-35 Water Usage and Classification

Classification	Beneficial Use
Class AA	Public Water Supply Class I. This class is intended primarily for waters having watersheds, which are uninhabited and otherwise, protected and which require only approved disinfection in order to meet the National Standards for Drinking Water (NSDW) of the Philippines.
Class A	Public Water Supply Class II. For sources of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the NSDW.
Class B	Recreational Water Class I. For primary contact recreation such as bathing, swimming, skin diving, etc. (particularly those designated for tourism purposes).
Class C	1) Fishery Water for the propagation and growth of fish and other aquatic resources; 2) Recreational Water Class II (Boatings, etc.) 3) Industrial Water Supply Class I (For manufacturing processes after treatment).
Class D	1) For agriculture, irrigation, livestock watering, etc. 2) Industrial Water Supply Class II (e.g. cooling, etc.) 3) Other inland waters, by their quality, belong to this classification.

Water Quality Criteria

Table 3-367 and **Table 3-378** shows the parameters and limits or specifications for conventional and other pollutants; and toxic and deleterious substances, respectively, according to classification and use of the receiving body of water. This has been taken from DENR Administrative Order No. 34, Series of 1990.

DENR Administrative Order No. 35 imposes effluent standards for conventional and other pollutants; and toxic and deleterious substances. These are presented in **Table 3-39** and **Table 3-40**.

Table 3-36 Water Quality Criteria for Conventional and Other Pollutants Contributing to Aesthetics and Oxygen Demand for Fresh Waters

PARAMETERS	UNITS	CLASS AA	CLASS A	CLASS B	CLASS C	CLASS D
Color	PCU	15	50	-	-	-
Temperature (max. rise in deg. Celsius)	°C	-	3	3	3	3
pH (range)	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5 -8.5	6.0-9.0
Dissolved Oxygen ^(E) %	70	70	70	70	70	70
5-Day 20° C BOD	mg/L	1	5	5	7	7
Total Suspended Solids	mg/L	25	50	-	-	-
Total Dissolved Solids	mg/L	500	1000	-	-	1000
Surfactants (MBAS)	mg/L	nil	0.2	0.3	0.5	-
Oil/Grease(Petroleum Ether Extract)	mg/L	nil	1	1	2	5
Nitrate as Nitrogen	mg/L	1	1	NR	10	-
Phosphate as Phosphorus	mg/L	nil	0.1	0.2	0.1	-
Phenolic Substances as Phenols	mg/L	nil	0.002	0.005	0.02	-
Total Coliforms	MPN/100mL	50	1000	1000	5000	-
Fecal Coliforms	MPN/100mL	20	100	200	-	-
Chloride as Cl	mg/L	250	250	-	350	-
Copper	mg/L	1	1	-	0.05	-

Table 3-37 Water Quality Criteria for Toxic and Other Deleterious Substances for Fresh Waters (For the Protection of Public Health)

PARAMETERS	UNITS	CLASS AA	CLASS A	CLASS B	CLASS C	CLASS D
Arsenic	mg/L	0.05	0.05	0.05	0.05	0.1
Cadium	mg/L	0.01	0.01	0.01	0.01	
Chromium (hexavalent)	mg/L	0.05	0.05	0.05	0.05	0.1
Cyanide	mg/L	0.05	0.05	0.05	0.05	-
Lead	mg/L	0.05	0.05	0.05	0.05	0.05
Total Mercury	mg/L	0.002	0.002	0.002	0.002	0.002
Organophosphate	mg/L	nil	nil	nil	nil	nil
Aldrin	mg/L	0.001	0.001	-	-	-
DDT	mg/L	0.05	0.05	-	-	-
Dieldrin	mg/L	0.001	0.001	-	-	-
Heptachlor	mg/L	nil	nil	-	-	-
Lindane	mg/L	0.004	0.004	-	-	-
Toxaphane	mg/L	0.005	0.005	-	-	-
Methoxychlor	mg/L	0.1	0.1	-	-	-
Chlordane	mg/L	0.003	0.003	-	-	-
Endrin	mg/L	nil	nil	-	-	-
PCB	mg/L	0.001	0.001	-	-	-

Table 3-38 Effluent Standards for Conventional and Other Pollutants

PARAMETERS	CLASS A and B and SB	CLASS C	CLASS D	CLASS SC	Coastal Waters
Color	100	150	-	-	-
Temperature (max. rise in deg. Celsius)	3	3	3	3	3
pH (range)	6.0-9.0	6.5 - 9.0	6.0-9.0	6 -9	5 - 9
COD	60	100	200	200	200
5-Day 20° C BOD	30	50	120	100	120
Total Suspended Solids	50	70	150	150	-
Total Dissolved Solids	1000	-	1500	-	-
Settleable solids	0.3	0.5	-		
Surfactants (MBAS)	2	5	-	10	-
Oil/Grease(Petroleum Ether Extract)	5	5	-	10	15
Phenolic Substances as Phenols	0.05	0.1	-	0.5	1.0
Total Coliforms	3000	10000			

Table 3-39 Effluent Standards: Toxic and Other Deleterious Substance (Maximum Limits for the Protection of Public Health)

PARAMETERS	CLASS A and B	CLASS C	CLASS SC	CLASS SD
	Protected Waters	Inland Waters	Marine Waters	
Arsenic	0.1	0.2	0.5	0.5
Cadmium	0.02	0.05	0.1	0.2
Chromium (hexavalent)	0.05	0.1	0.2	0.5
Cyanide	0.1	0.2	0.2	-
Lead	0.1	0.3	0.5	-
Total Mercury	0.005	0.005	0.005	0.01
PCB	0.003	0.003	0.003	-
Formaldehyde	1	1	1	-

Table 3-41 provides the list of methods that are currently approved by DENR for the analysis of water quality.

Table 3- 40 Approved Method of Analysis According to DAO 34

PARAMETER	METHOD OF ANALYSIS
ARSENIC	Silver Diethyldithiocarbamate Method (Colorimetric)
BOD5	Azide Modification (Dilution Technique)
BORON	Carmine Method (Colorimetric Method)
CADMIUM	Atomic Absorption Spectrophotometry (Wet ashing with concentrated HNO ₃ , + HCl)
CHLORINATED HYDROCARBONS	Gas Chromatography (ECD)
CHROMIUM (HEXA VALENT)	Diphenyl Carbazide Colorimetric Method
COLOR	Visual Comparison Method (Platinum Cobalt Scale)
CYANIDE	Specific Ion Electrode Method
DISSOLVED OXYGEN	Azide Modification (Winkler Method), Membrane Electrode (DO meter)
FECAL COLIFORMS	Multiple-Tube Fermentation Technique or Membrane Filter
LEAD	Atomic Absorption Spectrophotometry
NITRATE AS NITROGEN	Brucine Method for Saline Waters, specific Ion Electrode Meter for Fresh Water
OIL AND GREASE	Gravimetric Method (Petroleum Ether Extraction)
ORGANO PHOSPHORUS COMPOUNDS	Gas Chromatography (FPD)
POLYCHLORINATED BIPHENYL (PCB)	Gas Chromatography (ECD)
pH	Glass Electrode Method
PHENOLIC SUBSTANCES	Chloroform Extraction Method
PHOSPHATE AS PHOSPHORUS	Stannous Chloride Method
SETTLABLE SOLIDS	Imhoff Cone Method
SURFACTANTS (MBAS)	Methylene Blue Method (Colorimetric)
TEMPERATURE	Use of Mercury-Filled Thermometer
TOTAL COLIFORMS	Multiple-Tube Fermentation Technique or Membrane Filter
TOTAL MERCURY	Cold Vapor Technique (Mercury Analyzer, AAS)
TOTAL SUSPENDED SOLIDS	Gravimetric Method

4. Assessment Methodologies and Items related to the Project and its Implementation

The assessment methodologies are based on the DENR-EMB guidelines for Environmental and Social Impact Assessment. Based on these assessment guidelines, environmental factors and elements must be considered for every component of the proposed project. Once the key factors and elements relevant to the project are identified, the environmental impact assessment may be conducted using sound environmental management and study tools recommended by DENR-EMB. The Impacts Management Plan (IMP) shall present the mitigation and enhancement principles, practices, and technologies aimed at minimizing and/or eliminating the potential impacts of the proposed Project to its surrounding environment.

4.1. Selection of Environmental Factors and Elements

Environmental impact factors pertaining to Project implementation were extracted upon examining the contents of expected project activities in the implementation of works (during works) and existence and provision of land and work pieces (during provision). The results are indicated in **Table 4-1**.

Table 4-1 Extraction of Environmental Impact Factors

Environmental Impact Factor		Anticipated Project Activities	
Works implementation	Temporary impacts of site preparation, etc.	The project implementation site has already been prepared, so there is no new site preparation work. When constructing work pieces, foundation excavation is anticipated and construction byproducts will be generated.	
	Operation of construction machinery	Since preparation works and work piece construction works will be implemented, various construction machines will operate.	
	Transport in and out of works materials, etc.	When transporting works materials and equipment in and out, there will be running of works vehicles, etc.	
Existence and provision of land or work pieces	Topographical alteration and existence of facilities	Since the site is already prepared, there will be no topographical alteration; however, new work pieces will appear.	
	Facilities operation	Exhaust gas	Exhaust gases will be generated by operation of facilities, albeit inside plants.
		Wastewater	Wastewater generated during operation of facilities will be recycled internally following treatment; therefore no wastewater will be generated externally.
		Machinery, etc. operation	Sewage treatment plant will operate.
	Generation of waste products	Treatment residue and solid wastes will arise in line with the generation of facilities.	

Presented in **Annex A** is the scoping matrix for key environmental factors and elements that must be considered prior to the conduct of an environmental impact assessment. The selection matrix is applicable for projects which are considered environmentally critical projects (ECPs) and those projects that will be constructed within environmentally critical areas (ECAs). Criteria for ECA consideration are presented in Proclamation 2146 (1981). ECAs may include protected areas, historical spots, areas with critical slope, those near mangrove areas, and areas which are frequently hit by typhoon and other calamities.

Annex A has two major columns: key environmental factors and elements to be considered, and the description of the existing environment (primary or secondary data) based on one or more environmental parameters identified.

There is no one-to-one correspondence between the potential issue columns to the left and the baseline information to the right. These columns are provided to ensure the environmental impact assessment (EIA) to be conducted focuses on the most relevant environmental issues. Each parameter is evaluated and assessed as: **LS = likely significant, LI = likely insignificant, or NR = not relevant**. LS requires in depth quantitative analysis depending on the availability of mathematical methods. LI requires qualitative analysis. NR column is provided since there are listed impacts that may not be after all existent due to the nature of the project and location. During the EIA study, some project aspects may be discovered as significant and may be the basis of additional information in the review (as adopted from DENR-EMB AO 30-03).

Table 4-2 presents the minimum content of the environmental impact assessment report which will be developed out of the scoping exercise on key environmental factors and parameters. This is the latest procedural guideline on EIA documentation recommended by DENR-EMB.

Table 4-2: Revised Environmental Impact Assessment (EIA) Report Annotated Outline Based on MC 2010-14 for New and Proposed Projects

Basic Requirement in the Environmental Impact Assessment Report	Details and Description
Executive Summary	
Project Fact Sheet	
Process Documentation on the conduct of the EIA	
<ul style="list-style-type: none"> EIA Team 	Tabulate data on EIA Team: list of team members, field of expertise, module assigned to both proponent and preparer team
<ul style="list-style-type: none"> EIA Study Schedule 	Inclusive periods of study/field surveys , state climate/season
<ul style="list-style-type: none"> EIA Study Area 	Present area from project site up to extent of coverage of study: Show study area in NAMRIA topographic map of 1:50,000 scale
<ul style="list-style-type: none"> EIA Methodology 	Tabulate generic EIA approach and data sources
<ul style="list-style-type: none"> Public Participation 	Tabulate chronologically the following: EIA stage, dates, sectors involved, issues raised committed actions by the Proponent where relevant; and explain or shed light on succeeding public's response/ reactions/participation or explain prevailing perceptions/ actions by the public. On sectors and issue, differentiate the list into supportive and opposing sectors as well as issues considered valid and invalid.
Summary of Baseline Characterization for Key Environmental Impact and Management & Monitoring Plan including EMF and EGF Commitments	
1. PROJECT DESCRIPTION	
1.1 Project Location & Area	<ul style="list-style-type: none"> Presented in legible maps (use clearly scanned or original NAMRIA topographic map of 1:50,000 or appropriate scale) showing both project site up to regional location with Philippine map as inset; Regional and provincial vicinity map (showing major landmarks, existing industries, settlements, etc) Show title, legend, scale, project location and political boundaries (from sitio/barangay to region); delineation of areas of primary and secondary impact areas, geographic coordinates

Basic Requirement in the Environmental Impact Assessment Report	Details and Description
	<ul style="list-style-type: none"> • Rationale for selection of primary and secondary impact areas
<p>1.2 Project Rationale</p>	<ul style="list-style-type: none"> • Present need for project based on national & local environmental protection goals and in terms of contribution to sustainable development agenda; • Briefly justify/describe existence of expected commercial quantities of resources to meet local/national development or sectoral objectives
<p>1.3 Project Alternatives</p>	<ul style="list-style-type: none"> • Present criteria used in determining preliminary options for facility siting; development design; process/technology selection; resource utilization • Reason for selecting the preferred options delineated in terms of technical, commercial, social and natural environmental aspects • Present summary of the comparative environmental impacts of each alternative
<p>1.4 Project Components</p>	<ul style="list-style-type: none"> • Attach tentative/options of Physical Plan/Site Development Map being considered at the FS stage (e.g., development plan for sewerage connection or construction phases of the STP); • In matrix form, tabulate project phases, activities/environmental aspects, associated wastes*, other key environmental and social issues; and built-in pollution control measures <p>*Under the column on Waste Generation: subheadings are as follows: types of wastes, estimated waste generation rate, estimated volume for the duration of the project phase)</p>
<p>1.5 Process/ Technology Options</p>	<ul style="list-style-type: none"> • In matrix form, discuss sewerage development options as well as the sewage treatment processes/technologies being considered; tabulate project components and estimated dimensions/specifications (facilities / infrastructures, other single projects supporting the main project) and locate in map at a level of detail feasible at FS Stage • Power generation and water supply system • Waste management systems

Basic Requirement in the Environmental Impact Assessment Report	Details and Description
1.6 Project Size	In matrix form, describe the existing, proposed expansion and resulting total capacity/project scope in terms of total project area and annual production rates and operations
1.7 Development Plan, Description of Project Phases and Corresponding Time Frames	<ul style="list-style-type: none"> • Phases to be described in terms of identifying specific activities with attention on those with significant impacts • This will include pre-construction, construction, operation and abandonment phases.
1.8 Manpower	Present manpower requirements per project phase; specify expertise needed; nature & estimated number of jobs available for men; nature and number of jobs available for women; specify strategy and tentative scheme for sourcing locally from host and neighboring LGUs and those from outside
1.9 Indicative Project Investment Cost	Estimate total cost of STP, pump stations and sewer lines
2. ANALYSIS OF KEY ENVIRONMENTAL IMPACTS	
2.1 Land	<ul style="list-style-type: none"> • Discuss Land Use/classification; • Discuss only relevant aspects of geology which will explain the geohazards; • Discuss Geomorphology (i.e. land forms/topography/slope/ terrain) which explain the limitations or nature of the land use and distribution of population and nature of and vegetation/wildlife forms; • Discuss Petrology (main soil type and quality) which rationalize/explain and lend support to the land use, population and biota profile • Discuss Terrestrial Biology in terms of vegetation removal and loss of habitat, threat to existence of important local species; etc
2.2 Water	<ul style="list-style-type: none"> • Discuss relevant modules: Hydrology and Hydrogeology, Oceanography, Water Quality, Freshwater and Marine Biology <p>Note #1: Identify which surface and groundwater systems will be affected/improved by the project; present water quality status with highlight on the most relevant parameters, critical uses and the</p>

Basic Requirement in the Environmental Impact Assessment Report	Details and Description
	<p>users of these water bodies; present the most important species likely to be affected by the project; present conclusions of modeling (where relevant) of extent of physical and chemical dispersion/trajectory of most relevant parameter and resulting concentrations with increasing distance and depth from the source as basis for deriving a mixing or buffer zone and delineating the direct impact zone (DIA) from the indirect impact zone (IIA); map out the economically and ecologically critical areas/resources and superimpose on the biophysical data;</p> <p>Note #2: Present key findings and conclusions of analysis of surface and groundwater quality; Identify key potential impacts of the project across project phases and propose corresponding measures</p>
2.3 Air	<ul style="list-style-type: none"> • Meteorology/Climatology (Note: The relevant parameters are only the climate types, seasons, rainfall profile, wind roses and climatological extremes as the latter pose environmental hazards; the rest of the climatological data can be attached as an Annex); • Air Quality & Noise : Present highlight of air quality status with highlight on the most relevant parameters; present conclusions of modeling (where required) on extent of physical and chemical dispersion/trajectory of most relevant parameter and resulting ground level concentrations with increasing distance from the source as basis for deriving a buffer zone and delineating the DIA from the IIA; superimpose on the economically and ecologically critical areas/resources and population/significant socio-cultural features <p>Note: Present key findings and conclusions of analysis of air quality; Identify key potential impacts of the project across project phases and propose corresponding measures</p>
2.4 People	<ul style="list-style-type: none"> • Present highlights of primary and secondary data on the DIA and IIA, including highlights of perception survey; Present key findings and conclusions of analysis of the Socio-Cultural Environment; Identify key potential impacts of the project considering biophysical findings

Basic Requirement in the Environmental Impact Assessment Report	Details and Description
	<p>across project phases and propose corresponding measures</p> <ul style="list-style-type: none"> • Discuss issues on displacement of settlers, in-migration patterns, IPs and culture/lifestyle, threat to public health and local benefits expected from project implementation, delivery of basic services, traffic, accountability and relocation/devaluation.
3. ENVIRONMENTAL RISK ASSESSMENT (WHEN APPLICABLE)	Present only key findings and conclusions of the Environmental Impact Assessment (ERA) with respect to chronic risks and acute risk/worst case scenarios
4. IMPACTS MANAGEMENT PLAN (IMP)	Limit to most significant impacts per project phase and per environmental component arising from key environmental aspects
5. SOCIAL DEVELOPMENT PLAN (SDP) AND IEC IMPLEMENTATION	<p>Discuss the social development component of the project as a response to the issues and concerns brought up during project scoping and consultations.</p> <p>Discuss the strategies that will be adopted for information, education and communication campaign for the project.</p>
6. ENVIRONMENTAL COMPLIANCE MONITORING	
6.1 Self-Monitoring Plan	ECC Compliance Monitoring of the Proponent; Present a statement on the existence of a PATHWAY, criticality of the RECEPTOR, status of perception of ENVIRONMENTAL PERFORMANCE from supportive or opposing groups.
6.2 Multi-sectoral Monitoring Framework	For projects with MMT requirement, tabulate the following: list of stakeholder community sectors or representatives who are proposed to be likely members of the MMT as validated by EIA process, basis of priority selection, proposed MMT role, and scope of MMT responsibilities/activities; strategy or approach in establishing and monitoring Environmental Quality Performance Levels (EQPLs) in coordination with the MMT's program of identifying pseudo/quasi-indicators of environmental damage.

Basic Requirement in the Environmental Impact Assessment Report	Details and Description
6.3 Environmental Guarantee and Monitoring Fund Considerations (when necessary)	Present a proposed amount of EMF (based on a draft AWWP); Present a committed amount of EGF and the basis for the estimate.
7. EMERGENCY RESPONSE POLICY AND GENERIC GUIDELINE	The policy and generic guidelines are to be consistent with the relevant agencies' requirements that are to be complied with after the ECC is issued.
8. ABANDONMENT/ DECOMMISSIONING/ REHABILITATION POLICIES AND GENERIC GUIDELINE	Statement on Proponent's policies and generic procedures; Detailed Abandonment/Decommissioning Plan to be submitted post-ECC, within a timeframe specified in the ECC
9. INSTITUTIONAL PLAN FOR EMPL IMPLEMENTATION	Discuss the Table of Organization of the Proponent where the reporting line and manpower complement/positions of the Environmental Unit or equivalent section to higher management and relationships with operating departments are shown
BIBLIOGRAPHY/REFERENCES	

4.2. Selection of Environmental Impact Assessment Items

4.2.1 Project Impacts to the Surrounding Environment

Construction Nuisances

During construction, there are unavoidable environmental impacts on water, land and air. However, these are temporary and localized in the vicinity of the construction sites. The following environmental impacts are expected:

- Increased particulate matters, SO₂ and NO_x from excavation, pipe laying and moving heavy equipments;
- Increased noise level, particularly excavation works as concrete breaking normally used pneumatic equipment;
- Increased suspended solids in waterways in the vicinity of the construction sites from working areas; and
- Increased in traffic nuisance which may include re-routing and temporary road closure during pipe laying and pipe jacking.

Potential spill and leakage of fuel, petroleum products, lubricants, solvents, and other pollutants related to vehicle and equipment fuelling, maintenance, and cleaning may also cause serious water pollution during the construction phase.

Noise and vibration will be generated during construction by heavy equipment, including excavators, concrete cutters, jack hammers, concrete mixers, and transportation vehicles. Noise levels may be severe for the adjacent school and communities. It is estimated that noise intensity from these activities will be in the range of 57-73 dB(A). In such case, they will not meet the standards of 45-55 dB(A) for school sites and residential areas located 240 meters away from the construction site.

Such impacts may be easily mitigated using appropriate pollution prevention and control methods as presented in the Environmental Management Plan.

Impacts during Operation

Odor emanating from the treatment process and waste sludges is a challenge in the design and operation of most sewage treatment plants. During power failure or in cases when there are upsets in the plant operation, septic condition due to anaerobic decomposition emits malodorous gases such as hydrogen sulfide, ammonia and other organic sulfur compounds. Also, excess sludge from the aeration tank may also emit these gases during decomposition.

Odor control is one aspect of the proposed treatment that should be evaluated in the engineering phase to lessen this impact. There are various options which may be implemented such as tower spray and dry scrubber or even providing 'green areas' or buffer zones around the STP.

Another concern during the operation is the management of fat, oil and grease (FOG) trap in preliminary treatment units. FOG forms scums usually accumulating at the water surface of tanks. These may cause foul odor as well when left uncollected.

4.2.2 Environmental Management Plan

An Environment Management Plan (EMP) is aimed at addressing the technical, environmental and regulatory issues arising from the project. It also assessed the various socio-economic impacts on the different stakeholders and activities that may be affected or attributed to the project.

The EMP presents the measures aimed at avoiding or reducing adverse impact to the environment at acceptable levels. When impact is unavoidable, these measures are intended to minimize such effects, or are designed to compensate for them. In addition, activities that may be undertaken in order to maximize benefit to stakeholders are identified.

4.2.2.1 Mitigating and Monitoring Measures during Construction

Considerable excavation works will be involved in the project. Erosion of excavation materials may affect the turbidity of water bodies nearby especially during rains. Hence, eroded materials must not reach natural waterways. During construction, regular inspection of the stockpile of material will be made to determine if considerable erosion has taken place and the river is affected.

Safety of workers and people at the vicinity of the construction site should be ensured. All safety provisions should be instituted and implemented every time of the day. Hence, it is paramount to monitor daily the safety condition of the site and observance of workers to the safety procedures imposed by the project.

The following mitigation measures for reducing risks associated with heavy equipment and vehicles are proposed:

- All vehicles and equipment that regularly enter and leave the construction sites (i.e., STP site) will be fuelled off-site;
- Vehicle and equipment wash areas will be properly identified by signs and located away from drainage facilities and watercourses. These will be paved with concrete or asphalt to contain runoff. All vehicles and equipment that regularly enter and leave the construction sites will be cleaned off-site; and
- Storage of construction materials will be away from the river and retention areas will be provided in order to contain accidental spills of such toxic, hazardous, and harmful construction materials as acidic substances, oil and petroleum products, and asphalt materials.

For noise mitigating measures the following are recommended:

- No night construction using heavy equipment near residential areas. This is to avoid nuisance in the nearby communities. If there are construction activities that must be continued during the day and night, the construction unit will come to an agreement with residents nearby (i.e., permit to work during nighttime)
- Good maintenance and proper operation of construction machinery to minimize noise generation, and
- Selection of transport routes for large vehicles to avoid residential areas.

The Contractor will ensure proper collection, storage, and disposal of wastes, and multi-compartment collection bins will be provided to facilitate the reuse, recycling and composting of solid waste. Wastes will be stored away from water bodies and will be regularly hauled to a designated dumping site. Appropriate waste storage containers will be provided by the contractors.

4.2.2.2 Mitigating and Monitoring Measures during Operation

During operation, the BOD, TSS and coliform must be regularly monitored at the inlet and outlet of the STP to assess the overall treatment efficiency. This will be part of the normal operating procedure. Likewise, monitoring of water quality may be carried out along the major receiving bodies of water (upstream and downstream outfalls of STPs), to determine pollution reduction. Indirectly, this monitoring activity will indicate the effectiveness of the project and whether the project meets its objectives. At least, two sampling events per year, representing dry and wet seasons, are proposed.

The minimum water quality parameters that need to be monitored during the operational phase are as follows:

- BOD
- Dissolved Oxygen
- Total Coliform, Fecal Coliform
- pH
- TSS

Odor emanating from the operation would be a nuisance to the households nearby. Monitoring of odor will be made qualitatively.

The Project will inevitably create various impacts, both positive and negative, on the surrounding land, air, water, biological environment, and the local population throughout the Pre-operations, Operations, and Abandonment phases. An analysis of the impact identified is shown in **Table 4-3**.

Table4-3: Matrix of Impact Identification, Prediction and Assessment

Activity	Environmental Aspects	Potential Environmental Impacts	Parameter Most Likely to be Affected	Significance of Impact			
				+/- (positive/negative)	D/In (direct/indirect)	L/S (long-/short-term)	R/I (reversible/irreversible)
A. Construction Phase							
A1. Construction of Sewage Treatment Plant & Pump Stations	Earth-movement and civil/structural works	Disturbance and/or displacement of flora and fauna	Flora and fauna	-	D	L	I
		Increased erosion	Land	-	D	S	R
		Generation of construction spoils and debris	Land	-	D	S	R
		Restriction or alteration of drainage flow	Water	-	D	S	R
		Siltation and increased turbidity on the affected water body	Water	-	D	S	R
		Generation of dust	Air	-	D	S	R
	Influx of construction equipment	Ground vibration	Land	-	D	S	R
		Generation of air emissions	Air	-	D	S	R
	Influx of construction personnel	Generation of solid wastes	Land/Water	-	D	S	R
		Generation of domestic wastewater	Water	-	D	S	R
		Increased occupational safety & health risks	People	-	D	S	R
		Disturbance on peace and order	People	-	In	S	R

Activity	Environmental Aspects	Potential Environmental Impacts	Parameter Most Likely to be Affected	Significance of Impact			
				+/- (positive/negative)	D/In (direct/indirect)	L/S (long-/short-term)	R/I (reversible/irreversible)
A2. Pipe Laying Activities / Laying of Primary & Trunk Sewers	Traffic and Accessibility	Increase in traffic	People	-	In	S	R
	Air & Noise Quality	Increased in dust due to excavation works; increased level of noise generation	People, Air	-	D	S	R
	Water Quality	Drainage siltation due to spoils	Water	-	D	S	R
B. Operations Phase							
B1. Operation and maintenance of STP and Pump Stations	General Environment	Generation of hazardous wastes (i.e. chemical containers)	Land, Water	-	D	L	R
		Increase in air emission and noise levels	Air	-	D	S	R
		Increased risks to occupational safety	People	-	D	S	R
		Possible contamination of nearby water bodies and groundwater	Water	-	D	S	R
	Solid wastes	Generation of sludges and biosolids	Land	-	D	L	R
C. Abandonment Phase							
C1. Decommissioning	Rehabilitation of the abandoned project site	Restoration of the area	Land, Water	+	D	L	R

4.3 Methodology of Examination, Prediction and Assessment of Environmental Impact on Project Implementation Plan

Table 4-4 details the matrix summary of the mitigating and enhancement measures, corresponding to each of the proposed Project's identified environmental aspects and impacts, during Pre-construction/Construction, Operations, and Abandonment phases. This matrix summary also includes the responsible parties, estimated costs, and guarantees involved.

The Environmental Monitoring Plan (EMoP) presented in **Table 4-5** is set of critical environmental parameters that has to be checked regularly to ensure environmental compliance and sustainability of operations. The EMoP will monitor, verify, and perform the necessary corrective measures towards the mitigation of the identified environmental impacts. The information that will be obtained during the EMoP implementation will provide significant information on examining the short and long-term effects of the Project's various environmental aspects, from which future strategies on environmental enhancement measures can be formulated.

Table 4-4: Matrix of Impacts and the Mitigating and Enhancement Measures

Activity	Environmental Aspects	Potential Environmental Impacts	Mitigation and Enhancement Measures	Responsibility	Cost	Guarantees
A. Construction Phase						
A1. Construction of Sewage Treatment Plant and Pump Stations	Earth-movement and civil/ structural works	Disturbance and/or displacement of flora and fauna	<ul style="list-style-type: none"> • Perform earth-balling for applicable tree species • Avoidance of unnecessary vegetation clearing 	Contractor	Part of construction costs	MOA / EMP
		Increased erosion	<ul style="list-style-type: none"> • Avoid long exposure of open soil to wind and flowing water 	Contractor	Part of construction costs	MOA / EMP
		Generation of construction spoils and debris	<ul style="list-style-type: none"> • Use of excavated soil as backfill material • Segregation of solid wastes according to re-usable, recyclable, and disposal items 	Contractor	Part of construction costs	MOA / EMP
		Restriction or alteration of drainage flow	<ul style="list-style-type: none"> • Provide a temporary diversionary channel to allow continuous water flow of drainage channels 	Contractor	Part of construction costs	MOA / EMP
		Siltation and increased turbidity on the affected water body	<ul style="list-style-type: none"> • Avoidance of disposing excavated items, washing of concrete-mixing equipment in drainage 	Contractor	Part of construction costs	MOA / EMP
		Generation of dust	<ul style="list-style-type: none"> • Minimize/prevent unnecessary earth-movement • Regular watering of construction 	Contractor	Part of construction costs	MOA / EMP

Activity	Environmental Aspects	Potential Environmental Impacts	Mitigation and Enhancement Measures	Responsibility	Cost	Guarantees
			<p>areas that have high dust generation potential</p> <ul style="list-style-type: none"> Establish construction containment barriers/buffer zones 			
	Influx of construction equipment	Ground vibration	<ul style="list-style-type: none"> Apply non-vibrating methods (i.e. bored piling) for areas that are near concrete structures Monitor possible ground instability within the vicinity of the proposed Project 	Contractor	Part of construction costs	MOA / EMP
		Generation of air emissions	<ul style="list-style-type: none"> Proper and regular maintenance of heavy equipment 	Contractor	Part of construction costs	MOA / EMP
	Influx of construction workers	Generation of solid wastes	<ul style="list-style-type: none"> Segregation of solid wastes according to re-usable, recyclable, and disposal items Hauling of waste residuals by licensed waste service provider Proper housekeeping at construction areas 	Contractor	Part of construction costs	MOA / EMP
		Generation of domestic wastewater	<ul style="list-style-type: none"> Establish a designated work area with sanitation facilities (i.e. portable toilets) 	Contractor	Part of construction costs	MOA / EMP
		Increased occupational safety and health risks	<ul style="list-style-type: none"> Provide construction personnel with adequate personal protective equipment Supervision of civil and structural 	Contractor	Part of construction costs	MOA / EMP

Activity	Environmental Aspects	Potential Environmental Impacts	Mitigation and Enhancement Measures	Responsibility	Cost	Guarantees
			works <ul style="list-style-type: none"> • Provision of first-aid stations, safety equipment, and warning signages on working areas • Implementation of Emergency Response Plan 			
		Disturbance on peace and order	<ul style="list-style-type: none"> • Establish a drug-free, anti-alcohol drinking, gambling, etc. system for construction personnel • Coordination with local police and peace and order councils 	Contractor	Part of construction costs	MOA / EMP
A2. Laying of Sewer Lines	Traffic	Increase in traffic	<ul style="list-style-type: none"> • Coordinate traffic procedures with the local barangay and city ordinances • All vehicles shall stay at the designated parking areas within the construction premises • Security personnel/traffic marshals will assist in directing traffic near the construction areas 	Contractor	Part of construction costs	MOA / EMP
	Air Quality & Noise	Increase in noise and dust emission	<ul style="list-style-type: none"> • Excavate by segment and rehabilitate areas as soon as possible • 			
	Water Quality	Siltation of drainage	<ul style="list-style-type: none"> • Collection and proper disposal of spoils • Store excavated materials properly 			

Activity	Environmental Aspects	Potential Environmental Impacts	Mitigation and Enhancement Measures	Responsibility	Cost	Guarantees
B. Operations Phase						
B1. Operation and maintenance of STP and Pump Stations	General Environment	Generation of hazardous wastes (i.e. containers)	<ul style="list-style-type: none"> Segregation of hazardous wastes from regular wastes Storage of hazardous items on sealed, sturdy, and properly-marked containers 	Eng'g. Maintenance Dept.	Part of Maynilad	MOA / EMP
		Increase in air emission and noise levels	<ul style="list-style-type: none"> Establishment of air pollution controls fro genset Proper maintenance of equipment to minimize noise and vibration Capture of methane gas 	Eng'g. Maintenance Dept.	Part of Maynilad	MOA / EMP
		Increased risks to occupational safety	<ul style="list-style-type: none"> Provide personnel with PPE (i.e. goggles and masks) Extensive training for selected personnel in handling and operating chemicals 	Eng'g. Maintenance Dept.	Part of Maynilad	MOA / EMP
		Possible contamination of nearby water bodies and groundwater	<ul style="list-style-type: none"> Proper operation of the STP to ensure discharge shall meet standards Provision of containment barriers and spill response procedures in case of chemical spills 	Eng'g. Maintenance Dept.	Part of Maynilad	MOA / EMP
	Solid Wastes	Generation excess sludges and biosolids	<ul style="list-style-type: none"> Stabilize sludge prior to disposal through certified sludge treaters Provide good sludge drying procedure 	Eng'g. Maintenance Dept.	Part of Maynilad	MOA / EMP

Activity	Environmental Aspects	Potential Environmental Impacts	Mitigation and Enhancement Measures	Responsibility	Cost	Guarantees
C. Abandonment Phase						
C1. Decommissioning	Rehabilitation of the abandoned project site	Restoration of the area	<ul style="list-style-type: none"> • Dismantling and transfer of equipment • Disposal of scraps and waste materials 	Contractor	Part of construction costs	MOA / EMP

Table 4-5: Matrix of the Environmental Monitoring Plan

Concern	Parameter to be Monitored	Sampling Measurement Plan			Responsibility	Estimated Cost
		Method	Frequency	Location		
A. Construction						
A1. Soil erosion	Amount of silts accumulating in drainage	Inspection	Daily	Construction areas	Contractor	Part of construction costs
A2. Solid waste generation	Weight or volume of wastes generated	Weighing/log-book recording	Daily	Construction areas	Contractor	Minimal
A3. Siltation of nearby drainage systems and bodies of water	Silt and suspended solids	Grab sampling and laboratory analysis	As needed	Receiving body of water	Contractor	P5,000 per month
A4. Air quality	Dust and noise emissions	Air Sampling	As needed	Project sites	Contractor	P10,000 per event per station
A5. Employment	No. of locally-employed personnel	Log-book/ database registration	Daily	Administration office of the project site	Contractor	Minimal
A6. Occupational health and safety	No. of work-related illnesses/injuries No. of safety man-hours	Log-book/ database registration	Daily	Administration office of the project site	Contractor	Minimal
A7. Public perception/ acceptability	No. of valid complaints	Consultations with local officials and residents	Upon official request/summon of the local barangay office	Host barangay	Community Relations Dept.	Minimal
B. Operation						
B1. Solid waste generation	Weight or volume of wastes generated	Weighing/log-book recording	Daily/weekly	Solid waste storage facility	Eng'g. Maintenance Dept.	Minimal

Concern	Parameter to be Monitored	Sampling Measurement Plan			Responsibility	Estimated Cost
		Method	Frequency	Location		
B2. Hazardous waste generation	liters (liquid) kgs./no. of items (solids)	Weighing/log-book recording	Weekly	HW waste storage facility	Eng'g. Maintenance Dept.	Part of operations
B3. Sludge generation	Volume (m ³ /day) of sludge generated	Weighing/log-book recording	Daily	STP	Eng'g. Maintenance Dept.	Part of operations costs
B4. Surface water quality	BOD, TSS, total and fecal coliforms, pH, heavy metals, oil and grease, pesticides	Grab sampling and laboratory analysis	Monthly	Effluent, Upstream and downstream of effluent discharge	Eng'g. Maintenance Dept.	P10,000 per month per station
B5. Noise emissions	Decibel levels on selected equipment	Digital sound level meter	Variable	WTP and pumping stations	Contractor	P2,000 per station
B6. Air emissions	NO _x , SO _x , TSP	Air sampler	Annually	Stack of standby generator set	Contractor	P10,000 per station per event
B7. Occupational health and safety	No. of work-related illnesses/injuries No. of safety man-hours	Log-book/ database registration	Daily	Administration office of the project site	Human Resource Dept.	Minimal
B8. Public perception/acceptability	No. of valid complaints	Consultations with local officials and residents	Variable	Host barangay	Community Relations Dept.	Minimal
C. Abandonment						
C1. Demolition spoils and solid wastes	kgs./no. of items	Weighing/log-book recording	Daily/weekly	Project site	Contractor	To be determined
C4. Loss of employment	No. of affected employees	Database registration	Once	MWCI data base	Management	To be determined

4.4 Scoping Summary confined in the Sewerage Treatment System Plan

The environmental factors targeted for environmental impact assessment extracted based on the local characteristics described in the preceding chapter are as indicated in Table 4.2. Moreover, a summary of the local characteristics is given below with a view to aiding understanding of this extraction.

(Summary of local characteristics)

- Concerning air environment in the area deemed to be within the scope of environmental impact of the Project works, based on existing data from the target area and environs, environmental standards are not attained for some items.
- The Project target area and environs are coastal or salt pan reclaimed land and are thus already prepared. Accordingly, there is no need for new site preparation.
- Concerning land use in the Project target area and environs, there are no manufacturing plants nearby. There are some private houses; however, they are enough distance away as the crow flies.
- Any historical heritages in the Project target area and environs are far distance so that any impact may not be made on them.
- Public roads will be used in order to gain access to the Project target area.
- The Project target area is designated as a city planning area and housing and commercial dedicated area.

Table 4-6 Extracted Environmental Factors

Division	Environmental Factor
Environmental factors that should be surveyed, projected and assessed with a view to keeping natural environmental factors in good condition	Air quality, noise, vibration, odor, water turbidity
Environmental factors that should be surveyed, projected and assessed with a view to securing biodiversity and conserving natural environmental systems	Land creatures and ecosystems
Environmental factors that should be surveyed, projected and assessed with a view to securing rich contact between people and nature	Landscape, areas where people can come into contact with nature
Environmental factors that should be surveyed, projected and assessed according to the level of environmental load	Solid waste, greenhouse gases, etc.

Concerning environmental impact assessment items, **Table 4-7** shows categorized assessment items confined in the sewerage treatment systems to be applied in this project from the aforementioned environmental factors and standards specified in the DENR environmental impact assessment guidelines.

Moreover, **Table 4-8** indicates the reasons for selection or non-selection of environmental items targeted in environmental impact assessment upon considering the project characteristics and local area characteristics.

Selection reasons of methodology of examination, prediction and assessment of environmental impacts are shown in **Table 4-9 –Table 4-17**.

Table 4-8 Reasons of Selecting or Waiving the Assessment Items

Environmental Elements	Impact Elements	Implementation of STP Construction			Introduction of STP			The reasons to select or not select the environmental elements	
		Temporal Impact by Constructing	Operation of Construction Machines	Delivery of Construction Materials	Establishing STP	Running STP	Generation of Wastes		
Assessment Items to keep environmental conditions good to circumstances	Atmospheric Environment	Air Quality	SO ₂						SO ₂ generation by gasoline or diesel oil used by construction vehicles and machines are negligible.
			SPM	○	○	○	○		Exhaust gas generated by construction vehicles, machines and Plant equipment operation contain SPM that has impact possibility to the air.
			Dust						The STP site is reclaimed land therefore dust generation during construction is negligible.
		NO ₂		○	○	○		Exhaust gas generated by construction vehicles, machines and Plant equipment operation contain CO ₂ that has impact possibility to the air.	
		Toxic Gas						There is no toxic gas emission during both construction and STP operation.	
		Others	Noise		○	○	○		Noise generation by construction machines and plant equipment are made.
			Vibration		○	○	○		Vibration generated by construction vehicles, machines and Plant equipment operation that has impact possibility to the circumstances.
	Odor						○	Sewage water process and solid waste caught at screen would emit offensive odor.	
	Water	Water	Turbidity	○					Water turbidity caused by construction excavation shall be selected to check tie impact to the vicinity waterways with turbidity, suspended solid, and transparency..
			Contamination				○		General wastewater generated in the plant site shall be treated by the plant treatment process. However there is possibility for rainwater to mix the wastewater. Rainwater shall directly be discharged into the outside drainage system. Effluent of treated water shall be monitored in order to keep effluent water quality level defined by DENR effluent water standards.
Others		Solid Contamination						Sewage treatment plant discharges the treated water into waterways. No reason to cause solid contamination is found.	
		Terrain						The plant site is selected in the existing vacant lands, therefore any change of land shape wont be happened.	
Ecosystem	Land/Water	Fauna						Effluent water quality level shall be kept under the defined quality level by DENR effluent water standards. Therefore any impact to the current ecosystem will be made.	
		Flora							
		Localized Ecosystem							
Nature Contact	Nature Contact	Landscape				○		After completion of the plant construction, the permanent work piece is emerged in the vacant land. Thus landscape, scenery ,and aspect shall be assessed.	
		Parks Fishing place						There is not natural zone where people and nature contact.	
Emission Volume	Emission Volume	Wastes					○	Excess sewage sludge is generated in the treatment process, therefore the sludge treatment system and treated sludge are investigated if any environmental impact is predicted.	
		Arising	○					Arising generated during construction will be assumed.	
		Greenhouse gas					○	The sewage sludge generate methane gas in the process of degradation.	

Figure 4-1 Paranaque and Las Pinãs: STP Monitoring Positions

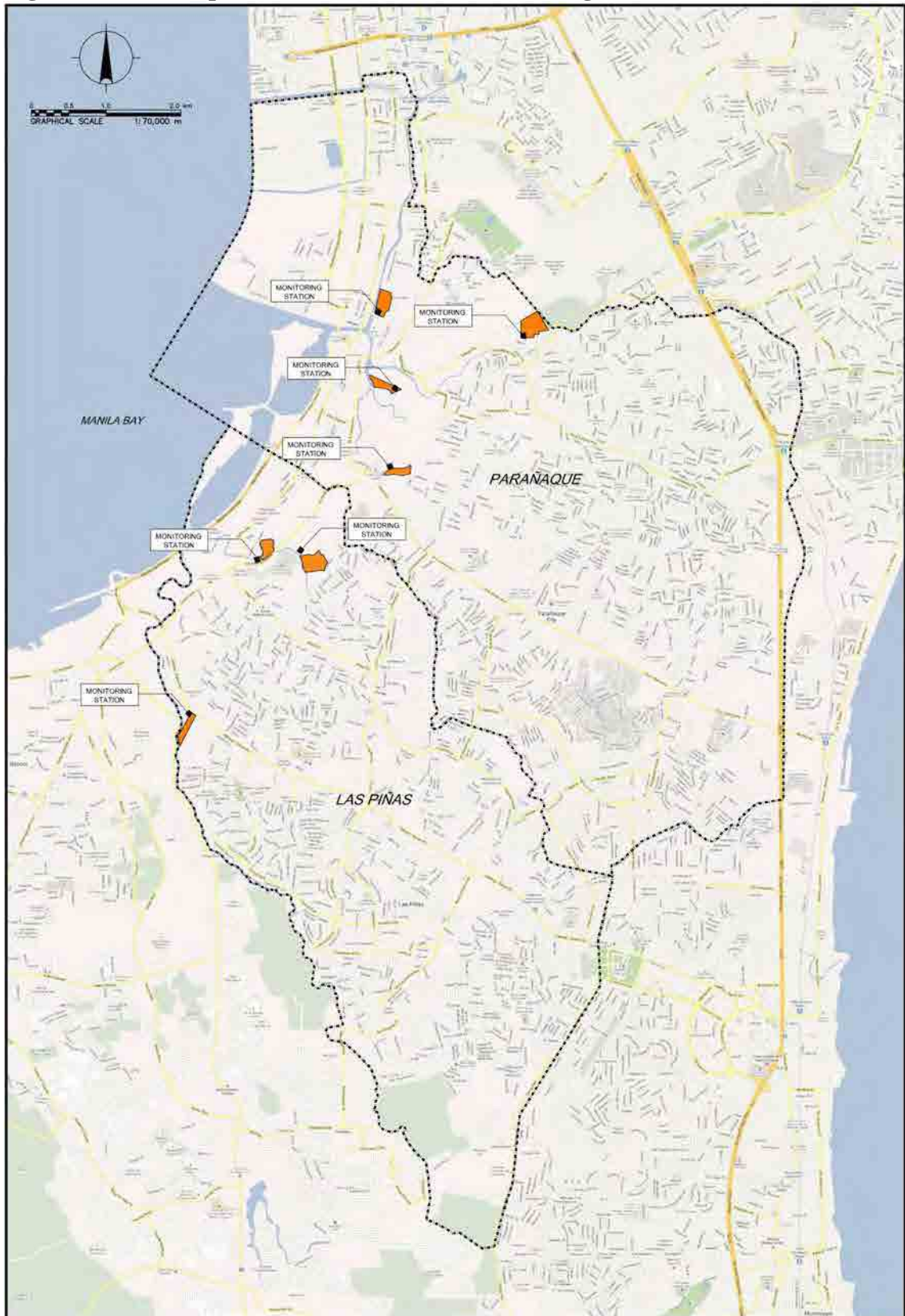


Table 4-9 Air Quality

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items Air Quality	NOx SPM	Construction machine running Construction vehicle transportation	<p>1. Information of Examination</p> <p>(1) Status of NO2</p> <p>(2) Concentration of SPM</p> <p>(3) Weather Condition Wind velocity, Air temperature, Humidity, Amount of Isolation, Net radiation</p> <p>2. Methodology Situation of weather condition and air pollution concentration shall be compiled from existing existing data. Site examination shall be conducted according to formal guidelines stipulated by DENR.</p> <p>3. Monitoring Area Vicinity areas to STPs.</p> <p>4. Monitoring Positions Shown in Figure 4-1</p> <p>5 Monitoring Duration During construction period. Air pollution: 7 days for rainy and dry seasons Weather: 5 days for rainy and dry seasons.</p>	<p>1. Basic Prediction Method Pollutive concentration of year average and 1 hour shall be calculated with effective exhaust coefficient settled and diffusion expression (Plume and Puff formula). Background concentration shall be set by existing second data and field examination data.</p> <p>2. Areas Predicted Areas within 100 meters from STP site border.</p> <p>3. Predicted Monitoring Time One year including the peak period of construction works assumed from the construction implementation schedule.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact In the project implementation plan, appropriate technology and effective construction plan to realize minimum transportation vehicle operation will be applied, therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations by DENR regarding air quality conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination Existing second data of air quality was monitored at far positions from the project sites, therefore independent field examination shall be conducted with comparison of the existing data. And traffic study of construction vehicles is also required, thus traffic study in the vicinity area to the STP site shall be done.</p> <p>2. Methodology of Prediction This method has been prevailed.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-10 Noise (1/3)

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items	Noise	Noise	<p>STP put in operation</p> <p>1. Information of Examination (1) Environmental noise situation (2) Factories, commercial facilities in the vicinity (3) Terrain and ground condition</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Environmental Noise: follow relevant acts (2) Plant noise: subject to factory noise regulations. (3) Ground condition: by field survey</p> <p>3. Monitoring Area Vicinity areas to STPs.</p> <p>4. Monitoring Positions STP site border lines. Figure 4-1</p> <p>5 Monitoring Duration Weekdays and holidays (24 hours) One day for each.</p>	<p>1. Basic Prediction Method Residential areas are apart from STP 100 meters and more. Therefore noise regulation at the site border line shall be based to calculate the noise with distance noise damping factor to predict the noise impact to the vicinity areas.</p> <p>2. Areas Predicted Nearest households located to the STP.</p> <p>3. Predicted Monitoring Time Appropriate soonest after the plant has reached to normal operation.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact At the plant designing stage, appropriate technology and effective measures shall be applied to minimize the noise impact caused by the plant operation. Therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations by DENR and the other relative regulations regarding noise stipulation conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination Examination shall be done mainly noise check in the plant vicinity area.</p> <p>2. Methodology of Prediction This method has been prevailed.</p> <p>2. Methodology of Prediction Residential areas are apart from STP 100 meters and more. Therefore noise regulation at the site border line shall be based to calculate the noise with distance noise damping factor to predict the noise impact to the vicinity areas. Prediction shall be made by the calculation results.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-10 (2/3) Noise

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items	Noise	Noise	<p>Construction Vehicles</p> <p>1. Information of Examination (1) Traffic noise situation (2) Construction vehicle route condition the roads situation (3) Traffic density (including car speed)</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Traffic Noise: follow equivalent noise level (2) Road condition: subject to field survey (3) Traffic density (and car speed) Apply any current prevailing method, and the vehicle speed shall be measured by stopwatch</p> <p>3. Monitoring Area Road route planned to be taken by the vehicles.</p> <p>4. Monitoring Positions Refer to Figure 4-1</p> <p>5 Monitoring Duration Weekdays 6am to 22pm, one day.</p>	<p>1. Basic Prediction Method Use the calculation model based on energy base. ASJ RTN-Model 2003 by Japan Acoustic Agency would be preferable.</p> <p>2. Areas Predicted Road route planned to be taken by the vehicles.</p> <p>3. Predicted Monitoring Position Noise sensor shall be set in the ambiance facing roads. Height of the position is 1.5m above ground.</p> <p>3. Predicted Monitoring Time One year including the period when the construction becomes the busiest predicted in the plant implementation schedule.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact In the project implementation plan, efficient vehicle operation plan in the construction schedule to realize minimum transportation vehicle operation will be applied, therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations and the other relative regulations regarding noise stipulation conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination Because of insufficient noise data in the construction vehicle routs, field survey shall be done.</p> <p>2. Methodology of Prediction Use the calculation model based on energy base. ASJ RTN-Model 2003 by Japan Acoustic Agency would be preferable.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-10 (3/3) Noise

Environmental Impact Items	Environmental Items	Methodology			Reason of Selection of methodology		
		Elements	Parameters	Examination		Prediction	Assessment
Assessment Items	Noise	Noise	Construction Machine Operation	<p>1. Information of Examination (1) Environmental noise situation (2) Terrain and ground condition</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Environmental Noise: follow relevant acts equivalent noise level. (2) Ground condition: by field survey</p> <p>3. Monitoring Area Vicinity areas to STPs.</p> <p>4. Monitoring Positions STP site border lines. Figure 4-1</p> <p>5 Monitoring Duration Weekdays and holidays (24 hours) One day for each.</p>	<p>1. Basic Prediction Method The equivalent noise level shall be calculated at the predicted points by predicted expression based on sound propagation theory assuming the noise source by the machine units considering construction work units. And the results shall be converted to equivalent parameter of L_{A5}</p> <p>2. Areas Predicted Area affected by the noise from the STP site.</p> <p>3. Predicted Measuring Points 1.2m height on the STP site borderline</p> <p>4. Predicted Monitoring Time In the period when the construction becomes the busiest predicted in the plant implementation schedule.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact In the construction implementation plan, adoption construction machines soft to environment and efficient construction plan to minimize the noise impact caused by the construction machines. Therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations and other noise regulations conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination Examination shall be done mainly field check in the plant vicinity area.</p> <p>2. Methodology of Prediction Prediction shall be done by the prediction expression based on sound propagation theory</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-11 Vibration (1/3)

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items	Vibration	Vibration	<p>STP put in operation</p> <p>1. Information of Examination (1) Environmental vibration situation (2) Terrain and ground condition</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Environmental Vibration: follow relevant acts (2) Ground condition: Refer soil investigation data conducted for the other items</p> <p>3. Monitoring Area Vicinity areas to STPs.</p> <p>4. Monitoring Positions STP site border lines. Figure 4-1</p> <p>5 Monitoring Duration Weekdays and holidays (24 hours) One day for each.</p>	<p>1. Basic Prediction Method Residential areas are apart from STP 100 meters and more. Therefore Vibration regulation at the site border line shall be based to calculate the level of the vibration with distance vibration damping factor to predict the impact level to the vicinity areas.</p> <p>2. Areas Predicted Nearest households located to the STP.</p> <p>3. Predicted Points STP site.</p> <p>3. Predicted Monitoring Time Appropriate soonest after the plant has reached to normal operation.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact At the plant designing stage, appropriate technology and effective measures shall be applied to minimize the vibration impact caused by the plant operation. Therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied 55dB is assumed the minimum level that personnel could be aware of, therefore assessment shall be made to identify that the figures got by prediction or field examination conform with the reference level.</p>	<p>1. Methodology of Examination Examination of vibration shall be done mainly in the plant site.</p> <p>2. Methodology of Prediction This method has been prevailed.</p> <p>2. Methodology of Prediction Residential areas are apart from STP 100 meters and more. Therefore Vibration regulation at the site border line shall be based to calculate the level of the vibration with distance vibration damping factor to predict the impact level to the vicinity areas.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-11 Vibration (2/3)

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items	Vibration	Vibration	<p>Construction Vehicles</p> <p>1. Information of Examination (1) Traffic noise situation (2) Vibration Dominant Frequency (3) Construction vehicle route condition the roads situation (4) Traffic density (including car speed)</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Traffic vibration (80% at upper level) (2) Ground dominant frequency: Big truck by 1/3 (3) Road structures and situation: field survey (4) Traffic density, speed: Apply any current prevailing method, and the vehicle speed shall be measured by stopwatch</p> <p>3. Monitoring Area Road route planned to be taken by the vehicles.</p> <p>4. Monitoring Positions Refer to Figure 4-1.</p> <p>5 Monitoring Duration 6am to 22pm on one weekday.</p>	<p>1. Basic Prediction Method Use the expression to predict the top value at 80% range</p> <p>2. Areas Predicted Road route planned to be taken by the vehicles.</p> <p>3. Predicted Monitoring Position Road section border line.</p> <p>3. Predicted Monitoring Time One year including the period when the construction becomes the busiest predicted in the plant implementation schedule.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact In the project implementation plan, efficient vehicle operation plan in the construction schedule to realize minimum transportation vehicle operation will be applied, therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations and the other relative regulations regarding vibration stipulation conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination Field survey shall be main activity to check the vibration level. survey shall be done.</p> <p>2. Methodology of Prediction Use the expression to predict the top value at 80% range</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-11 Vibration (3/3)

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items Vibration	Vibration	<p>Construction Machine Operation</p> <p>1. Information of Examination (1) Environmental vibration situation (2) Terrain and ground condition</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Environmental vibration: follow relevant acts stipulating factory vibration. (2) Ground condition: by field survey</p> <p>3. Monitoring Area Vicinity areas to STPs.</p> <p>4. Monitoring Positions STP site border lines. Figure 4-1</p> <p>5 Monitoring Duration Weekdays and holidays (24 hours) One day for each.</p>	<p>1. Basic Prediction Method Predict by distance damping formula.</p> <p>2. Areas Predicted Area affected by the vibration from the STP site.</p> <p>3. Predicted Measuring Points at the border of the nearest house to STP</p> <p>4. Predicted Monitoring Time In the period when the construction becomes the busiest predicted in the plant implementation schedule.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact In the construction implementation plan, adoption construction machines soft to environment and efficient construction plan to minimize the vibration impact caused by the construction machines. Therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations and other vibration regulations conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination Examination shall be done mainly field check in the plant vicinity area.</p> <p>2. Methodology of Prediction Predict by distance damping formula.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>	

Table 4-12 Offensive Odors

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items Offensive Odor Offensive Odor	STP put in operation		<p>1. Information of Examination (1) Foul concentration, odor parameter (2) Weather condition (3) Offensive odor emission source</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Foul concentration, odor parameter Based on Foul Smell Control Law. (2) Weather condition:Aerovane, Thermo hygrometer (3) Odor emission source: site identification</p> <p>3. Monitoring Area In the site and vicinity areas to STPs.</p> <p>4. Monitoring Positions STP site border lines. Figure 4-1</p> <p>5 Monitoring Duration One weekday each at half, one and two years passed since putting in practical operation.</p>	<p>1. Basic Prediction Method Use air diffusion formula. The results of the calculation shall be evaluated of the converted value to human perception time. Prediction of offensive odor emission shall be done to evaluate the existing STP foul smell emission state.</p> <p>2. Areas Predicted In the site and the border of the nearest residential house to STP. shall</p> <p>3. Predicted Monitoring Time Appropriate soonest after the plant has reached to normal operation.</p> <p>4. Predicted Position At the site border in lee side.</p> <p>5. predicted Time The timing when the environmental impact will become maximum under such operational condition. Prediction and assessment for average odor condition shall be done the time when the plant is running stabilized.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact At the plant designing stage, appropriate technology and effective measures shall be applied to minimize the noise impact caused by the plant operation. Therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations by DENR and the other relative regulations regarding noise stipulation conform with the figures resulted by prediction or field examination.</p> <p>3. Actual odor examination shall be done by olfactometru. The check period shall be doneat each year after commencement of fthe plantoperation, however, the first half year passed after actual retreatment process operation,an initial check shall be done.</p>	<p>1. Methodology of Examination Examination shall be done mainly field check in the plant and vicinity area.</p> <p>2. Methodology of Prediction Air diffusion formula is prevailed expression and the prediction shall be done with reference site.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p> <p>4. DENR has nonstandard for the offensive odor, and the plant facilities and process design shall take consideration offensive odor control or any measures shall be required to the contractor. mitigation. Periodical odor check will be managed by STP operator Odor will be monitored by 3 points comparison bag method, even though contractor shall be requested to follow Japanese standards.</p>

Table 4-13 Water Turbidity

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Water Quality	Water Turbidity	Construction Stage	<p>1. Information of Examination (1) Water turbidity, SS, Transparency condition of public water. (2) Soil condition in the project site area.</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey: (1) Water turbidity, SS, Transparency : Method based on water turbidity standards. (2) Solid Condition in the Site; Site survey and Static sedimentation method.</p> <p>3. Monitoring Area River, creek or public drainage receiving the site construction wastewater.</p> <p>4. Monitoring Positions Refer to Figure 4-1</p> <p>5 Monitoring Duration One time on a rainy day and fine day in rainy season and dry season, respectively.</p>	<p>1. Basic Prediction Method Prediction shall be made by Joseph-Sender formula with the parameters of the water turbidity prevention work in the construction plan</p> <p>2. Areas Predicted Same as monitoring area.</p> <p>3. Predicted Monitoring Position The position where water turbidity caused by construction is surely found.</p> <p>3. Predicted Monitoring Time At the term when the water turbidity become maximum during the project construction period.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact In the project implementation plan, the prevention measures are studied to apply during the construction period, therefore, assessment shall be done in of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations and the other relative regulations regarding water turbidity conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination Site survey in the project area is mainly conducted.</p> <p>2. Methodology of Prediction Use the Joseph-Sandler formula which has been prevailed and popular.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-14 Influent/Effluent Water

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Assessment Items Water Quality	Influent/Effluent Water	STP put in operation	<p>1. Information of Examination</p> <p>(1) Wastewater quality in the project area</p> <p>(2) River, creek and drainage situation in the project area</p> <p>(3) Sea water quality in the vicinity of the river mouths in the project area.</p> <p>(4) Terrain and ground condition</p> <p>2. Methodology</p> <p>Collection, review and analysis of information collected from existing data, referring field survey results. Methodology of field survey:</p> <p>(1) Water classification : follow DENR order No.34</p> <p>(2) Effluent water quality: Order No.35</p> <p>(3) Waterway situation: by field survey</p> <p>(3) Water quality analysis and items; Subject to DENR Order No.35</p> <p>3. Monitoring Area</p> <p>Main waterways in the project area.</p> <p>4. Monitoring Positions</p> <p>STP site border lines. Figure 4-1.</p> <p>5 Monitoring Duration</p> <p>Raining and fine days both in rainy and dry season once a month for influent. Treated water quality shall be monitored every month according to DENR regulation.</p>	<p>1. Basic Prediction Method</p> <p>Basing on the water quality analysis of the rivers, creeks in the project area, treated effluent water quality from STP shall be calculated by the design criteria for applied treatment process.</p> <p>2. Areas Predicted</p> <p>At the positions of incoming and outgoing piping areas.</p> <p>3. Predicted Monitoring Time</p> <p>Effluent water quality: once a week for first three months after STP put in service. After that, once a month.</p> <p>Influent Water Quality;</p> <p>Every hour in weekday and Sunday both during dry and rainy season.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact</p> <p>At the plant designing stage, appropriate technology and effective measures shall be applied to clear DENR discharging water quality standards, therefore assessment shall be done in aspect of emergent or unusual wastewater conditions to mitigate or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied</p> <p>Assessment shall be done to identify that environmental regulations by DENR and the other relative regulations regarding effluent water quality conform with the figures resulted by prediction or field examination.</p>	<p>1. Methodology of Examination</p> <p>Examination shall be done mainly by site survey in the project area.</p> <p>2. Methodology of Prediction</p> <p>The water quality analysis method is defined by DENR order No.35.</p> <p>2. Methodology of Prediction</p> <p>The wastewater treatment process which shall be used is well developed and prevailing with long term operation record.</p> <p>Therefore prediction regarding the water process function is made by using field experience record, and the process inherent expressions.</p> <p>3. Methodology of Assessment</p> <p>The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with environmental standards.</p>

Table 4-15 Scenery Source/Main Aspect, Vista

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Landscape Landscape	Scenery source/Main Aspect, Vista	Presence of STP	<p>1. Information of Examination (1) Main Vista point situation (2) Landscape source status</p> <p>2. Methodology Collection, review and analysis of information collected from existing data, photos, and hearing and field survey</p> <p>3. Monitoring Area The area where STP is viewed in the project area</p> <p>4. Monitoring Positions See Figure 4-1</p> <p>5 Monitoring Duration Any fine days after completion of the project. with balangay leaders neighbouring areas.</p>	<p>1. Basic Prediction Method Predict the change of landscape by using photomontage technology.</p> <p>2. Areas Predicted Same as monitoring area.</p> <p>3. Positions Predicted Same as monitoring positions</p> <p>3. Predicted Monitoring Time After completion of the facility.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact At the plant designing stage, appropriate mitigation measures to reduce optical harm to the landscape are taken, therefore assessment shall be done in aspect of any difference or discrepancy of the view from the initial prediction, if the impact is reduced or improved.</p>	<p>1. Methodology of Examination Examination shall be done mainly by site survey in the project area.</p> <p>2. Methodology of Prediction Because of easy visual understanding and perception to the scenery, photomontage technology is used for prediction.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact and compared with perception by photomontage.</p>

Table 4-16 Wastes

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Wastes Wastes	Wastes Generated during the Construction Works	Civil, structure building works	<p>1. Information of Examination (1) Wastes produced at service commencement (2) Wastes generated during construction</p> <p>2. Methodology Collection, review and analysis of information collected from existing data or similar plant, waste volume and disposal condition shall be studied.</p> <p>3. Monitoring Area Project site and vicinity area.</p> <p>4 Monitoring Duration Not specified, because examination will be done by information collected.</p>	<p>1. Basic Prediction Method Waste production volume shall be predicted for each waste kind by the project plan and similar project cases, and disposal or recycle condition is studied.</p> <p>2. Areas Predicted Same as monitoring area.</p> <p>3. Predicted Monitoring Time At the busiest period of the construction, and after service commencement, when the volume of wastes generated become stable.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact In the design and construction implementation plan, efficient construction adopted to minimize environmental impact. Therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p>	<p>1. Methodology of Examination Examination shall be conducted by existing information, plant implementation plan, etc.</p> <p>2. Methodology of Prediction Waste production volume shall be predicted for each waste kind by the project plan and similar project cases, and disposal or recycle condition is studied.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of environmental impact.</p>

Table 4-17 Greenhouse Gas

Environmental Impact Items	Environmental Items		Methodology			Reason of Selection of methodology
	Elements	Parameters	Examination	Prediction	Assessment	
Greenhouse Gas Greenhouse Gas Greenhouse Gas	STP put in operation		<p>1. Information of Examination (1) Greenhouse gas situation</p> <p>2. Methodology Collection, review and analysis of information collected from existing data.</p> <p>3. Monitoring Area Vicinity areas to the treatment process.</p> <p>5 Monitoring Duration Not specified. In case that sludge digesting process is installed, everyday record of gas volume generated together with raw sludge volume and influent water rate should be done. Gas composition should be monitored once a month.</p>	<p>1. Basic Prediction Method Predict the total excess sludge volume, and calculate total methane gas generation by the past field record and empirical equation.</p> <p>2. Areas Predicted Excess sludge thickening tank. STP.</p> <p>3. Predicted Monitoring Time From three month after STP put in service to one year operation.</p>	<p>1. Assessment on mitigation measures or adoption of environmental impact At the plant designing stage, appropriate technology and effective measures shall be applied to minimize greenhouse gas caused by the excess sludge degradation Therefore, assessment shall be done in aspect of effectiveness or level of mitigation or avoidance against environmental impact.</p> <p>2. Assessment on Compliance with Standards or Objectives Applied Assessment shall be done to identify that environmental regulations by DENR and the other relative regulations regarding exhaust gas stipulation conform with the figures resulted by prediction or field monitoring</p>	<p>1. Methodology of Examination Examination shall be done mainly by the field operation record of sewerage sludge production in the treatment process.</p> <p>2. Methodology of Prediction This method has been prevailed and there are many field records available in the similar STP.</p> <p>3. Methodology of Assessment The results of prediction shall be assessed in aspect of reduction level of methane gas volume by firing or fuel batteries.</p>

**ANNEX A: Scoping Checklist on Key Factors and Elements on EIA as Adopted from Procedural Manual for DENR AO 03-30
Applicable to the Proposed Metro Manila Sewerage & Sanitation Improvement Phase 2**

	List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
		LS	LI	NR			Y	N	
1.0	THE LAND					THE LAND			
1.1	Land Use and Classification					Land Use and Classification			
1.1.1.	Change/Inconsistency in land use	√			Issue on compatibility of land use	Description of existing land use/zoning/ classification	√		Review of CLUP
1.1.2.	Encroachment in Protected Area under NIPAS			√		Land Use Map (<i>include location of any ECAs and special land features</i>)	√		Review of CLUP
1.1.3.	Encroachment in other ECAs			√					
1.2	Geology/ Geomorphology					Geology/Geomorphology			
1.2.1.	Change in surface landform /topography/terrain/ slope		√		Any change in land form will depend on the type of structure to be constructed.	Slope and Elevation Map	√		MGB secondary data; topographic survey for the STP site
1.2.2.	Change in sub-surface/ underground geomorphology			√		Regional/General Geological Map	√		MGB Secondary Data
1.2.3.	Inducement of			√		Geological Cross-Sections	√		MGB Secondary

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
subsidence								Data
1.2.4. Inducement of landslides or other natural hazards			√		Sequence Stratigraphic Column of Rock Units		√	
1.2.5. ...					Geomorphological Map		√	
1.2.6. ...					g factor Contour Map for Rocks	√		MGB Secondary Data
1.2.7. ...					Seismicity Map	√		PHILVOLCS
1.2.8. ...					Differential Settling Hazard Map	√		PHILVOLCS or MGB data
1.2.9. ...					Bathymetric and Morphostructural Map		√	
1.2.10. ...					Results of Petrographic and Mineragraphic Analyses		√	
1.2.11. ...					Results of Geochemical Analyses of Rock Samples		√	
1.3 Pedology					Pedology			
1.3.1. Soil Erosion	√			Susceptibility to erosion and increase run-off brought about by excavation works	Summary of Soil Investigation Report on soil type and quality	√		Primary data or secondary data from BSWM
1.3.2. Change in soil quality (e.g. in irrigation)			√		Laboratory Results of Soil Sample Analysis	√		Primary data or secondary data

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
areas)								from BSWM
					Erodibility Potential	√		BSWM or MGB
1.4 Terrestrial Biology					Terrestrial Biology			
1.4.1. Vegetation removal and loss of habitat		√		Ocular; STP site investigation	Flora and Fauna Species Inventory or Survey	√		Primary data if applicable
1.4.2. Threat to existence of important local species		√		Ocular; for verification during STP site scoping	Summary of Endemicity /Conservation Status	√		Primary data if applicable
1.4.3. Threat to abundance, frequency and distribution			√		Summary of Abundance, Frequency and Distribution	√		Primary data if applicable
1.4.4. Hindrance to wildlife access			√		Site Observation/ Transect Walk Map	√		Primary data if applicable
2.0 THE WATER					THE WATER			
2.1 Hydrology/ Hydrogeology					Hydrology/Hydrogeology			
2.1.1. Change in drainage morphology			√		Topographic Map showing Drainage System	√		DPWH or LGU data
2.1.2. Change in stream, lake water depth			√		Regional Hydro-geologic Map	√		MGB or LGU data
2.1.3. Reduction in stream volumetric flow			√		Stream flow Measurements/ Mean Monthly Flow Data	√		Secondary data only (optional)

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
2.1.4. Inducement of flooding		√		Drainage inspection				
2.1.5. Water resource competition			√		Flood Peaks, Volumes, frequency rating curves and storm water flow estimates	√		Secondary data only (optional)
2.1.6. Reduction/Depletion of groundwater flow			√		Spring and Well Inventory and location map		√	
					Flow measurement location map		√	
2.2 Oceanography					Oceanography			
2.2.1. Change in circulation pattern			√		Predicted Tides		√	
2.2.2. Change in bathymetry			√		24-Hour Tidal Cycles		√	
2.2.3.					Surface Current System		√	
2.3 Water Quality					Water Quality			
2.3.1. Groundwater pollution		√		When spoils & wastes are not handled properly especially used oils	Physico-Chemical Characteristics of Wells and Springs		√	
2.3.2. Stream water pollution		√		When spoils & wastes are not handled properly	Physico-Chemical Characteristics of Inland Surface Waters	√		Primary data correlated with EMB data
2.3.3. Lake water pollution			√		Physico-Chemical Characteristics of Coastal	√		Primary data correlated with

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
2.3.4. Marine water pollution		√		Ocular, when spoils & wastes are not handled properly especially used oils	Waters			EMB data
					Bacteriological Characteristics of Wells and Springs		√	
					Bacteriological Characteristics of Inland Surface Waters	√		Primary data correlated with EMB data
					Bacteriological Characteristics of Coastal Waters	√		Primary data correlated with EMB data
					Sampling Site Map	√		Primary and secondary data
2.4 Freshwater Ecology					Freshwater Ecology			
2.4.1. Threat to abundance, frequency and distribution of species			√		Abundance of ecologically and economically important species	√		Secondary data only
2.4.2. Loss of important species			√		Presence of Pollution indicator Species	√		Secondary data only
2.4.3. Loss of habitat			√		Sampling Site Map	√		Secondary data
2.5 Marine Ecology					Marine Ecology			
2.5.1. Threat to abundance,			√		Abundance of ecologically	√		Secondary data

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
frequency and distribution					and economically important species			only
2.5.2. Loss of important species			√		Presence of Pollution indicator Species	√		Secondary data only
2.5.3. Loss of habitat			√		Marine Resource Map	√		Secondary data
2.5.4.					Abundance/Densities/ Distribution of mangroves, coral reefs, fishes, sea grasses, algae, seaweeds, plankton, etc	√		Secondary data only
2.5.5.					Sampling Site Map	√		Secondary data
3.0 THE AIR					THE AIR			
3.1 Meteorology/ Climatology					Meteorology/Climatology			
3.1.1. Change in the local climate, e.g. local temperature			√		Monthly Average Rainfall of the Area	√		PAGASA secondary data
3.1.2. Contribution to global greenhouse gas		√		Carbon emission calculation; methane gas estimates during STP operation;	Climatological Normals / Extremes	√		PAGASA secondary data
					Wind Rose Diagrams	√		PAGASA secondary data

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
					Frequency of Tropical Cyclones	√		PAGASA secondary data
3.2 Air Quality (& Noise)					Air Quality (& Noise)			
3.2.1. Air pollution		√		Ambient monitoring during construction ; temporary and localized along construction area & pipe laying routes	Ambient concentrations of TSP, SO _x , NO _x , PM10, etc., 1-hour, 24-Hour Sampling	√		Primary data to be correlated with EMB data
3.2.2. Increase in noise		√		Ambient monitoring; temporary during construction; may also be observed during STP operation	Noise Levels	√		Primary data to be correlated with EMB data
3.2.3. Odor	√			Ambient monitoring during STP operation especially during start-up and commissioning	Sampling Station Map (air and noise)	√		Primary data to be correlated with EMB data
4.0 THE PEOPLE					THE PEOPLE			
4.1.1. Displacement of settler		√		Survey; For verification during pre-engineering	Demography	√		Secondary data review; city and

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
				studies for the STP and pipe alignment				barangay data
4.1.2. Change in land ownership		√		Survey; For verification during pre-engineering studies for the STP and pipe alignment	Settlement Map and Population Distribution Map	√		Secondary data review; city and barangay data
4.1.3. Displacement of property		√		Survey; For verification during pre-engineering studies for the STP and pipe alignment	Population Growth Rate	√		Secondary data review; city and barangay data
4.1.4. Right-of-way conflict		√		Survey; For verification during pre-engineering studies for the STP and pipe alignment	Number of Households and Household Size by Barangay	√		Secondary data review; city and barangay data
					Summary of Demographic data per Barangay to be directly affected: Land Area, Population, Population Density, Main Sources of Income, Gender and Age Composition, Literacy, Highest	√		Secondary data review; city and barangay data

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
					Educational Attainment, Employment Status			
4.1.5. In-migration		√		Interviews, FGDs and KII; Comparison of barangay socio-economic profiles	Household Profile based on results of the Socio-Economic/Perception Survey	√		Secondary data review; city and barangay data
4.1.6. Presence of Indigenous People			√		Indigenous Peoples		√	
4.1.7. Cultural Change		√		FGDs & KII; Social acceptability of the construction of the STP in their area	Health	√		Secondary data review; city and barangay data (DOH, CHO)
4.1.8. Threat to public health		√		Interviews; Monitoring during STP operation; especially on discharges	Morbidity and Mortality Rates (Infants and Adults) from Direct Impact Areas	√		City and barangay data (DOH, CHO)
4.1.9. Local benefits from the project	√			Ambient monitoring of water quality of receiving bodies of water within catchment	5-Year Trend in Morbidity and Mortality	√		City and barangay data (DOH, CHO)
					Notifiable Diseases in the Area including Endemic Diseases	√		City and barangay data (DOH, CHO)

List of Key Environmental Factors & Elements	Relevance based on Project Description and Project Location (See Notes below)			a) Basis of Assessment of Relevance; b) Proposed Method of Impact Assessment; c) Other Instructions per Project Phase?	Description of Environment	Required?		Proposed Methodology of Securing and Presenting Information; Other Considerations in EIA Study
	LS	LI	NR			Y	N	
					Local Health Resources (Government and Private)	√		City and barangay data (DOH, CHO)
					Environmental Health and Sanitation Profile: water supply, human excreta mgt, waste mgt and disposal systems and food hygiene	√		City and barangay data (DOH, CHO)
4.1.10. Threat to delivery of basic services			√		Water Supply and Demand	√		MWSI secondary data & projections
					Power Supply and Demand	√		MERALCO
4.1.11. Traffic congestion	√			Ocular / monitoring during construction especially during the pipe laying	Transportation/Traffic situation	√		MMDA data or City data

LS = Likely Significant; LI = Likely Insignificant; NR= Not Relevant

ANNEX B: Listing of Private and Public Schools in Paranaque City

List of Day Care Centers City of Paranaque Year 2008		
Barangay	Number of Day Care Centers	Name of School
Baclaran	2	Baclaran Day care Center Baclaran Learning Center
Tambo	2	Seaside Day Care Center I Seaside Day Care Center II
Don Galo	1	Don Galo Day Care Center
Sto. Niño	6	Gena Day Care Center Libjo Day Care Center Scarha Day Care Center Sitio Libis Halik Alon Day Care Center Santos Compound Day Care Center
La Huerta	3	La Huerta Day Care and Resource Center Perville Day Care Center San Andres Day Care Center
San Dionisio	5	Tramo Wakas Day Care Center Bernabe II Day Care Center Bernabe III Day Care Center San Dionisio Day Care Center San Antonio De Padua Day Care Center
San Isidro	13	Napoleon Day Care Center Encarnacion Cruz Day Care Center Silverio Purok 4 Day Care Center Silverio Purok I Day Care Center Lower Matatdo Day Care Center SAV 6 Day Care Center Sitio Nazareth Day Care Center SAV 15 Day Care Center Sitio Nazareth Day Care Center Garden City Day Care Center Santos Cpd. Day Care Center UPS 5 Day Care Center Silverio Purok 3
Vitalez	1	Vitalez Day Care Center
San Antonio	16	Fatima Day Care Center SAV 5 Day Care Center Lower Barangay Day Care Center

		Area 1 Fourth Day Care Center Area 4 Day Care Center Seacom Day Care Center Creek Drive 1 Day Care Center Sta. Cecillia Day Care Center Sta. Catalina Day Care Center US Metal Day Care Center Area 7 Day Care Center Reyes Comp. Day Care Center Lino Type Day Care Center Teresita Perez Day Care Center Creek Drive 2 Day Care Center Bernardo Day Care Center
Marcelo Green	10	Dama De noche Day Care Center Sampaguita Hills Day Care Center Landscape Day Care Center Napa Day Care Center Manggahan Day Care Center Kawayanan Day Care Center Sitio Fatima Day Care Center Aroma Day Care Center Armela Day Care Center Cervantes Day Care Center
Moonwlak	10	San Agustin Day Care Center Velarde Hills Day Care Center Moonwalk Ph. 1 Day Care Center SMGI Day Care Center Samapa Day Care Center Airport Village Day Care Center Tel- Aviv Day Care Center Airborne Day Care Center Manggahan Day Care Center Timothy Day Care Center
Merville	4	Sitio All- Top Day Care Center Wella 1 Day Care Center Cubic Day Care Center Malaya Day Care Center
Sun Valley	10	Holy Rosary Day Care Center Villa Paraiso Day Care Center G. Bautista Day Care Center Camachile Day Care Center T. Relucio Day Care Center St. Joseph Marimar Day Care Center Sta. Ana Day Care Center

		Golden Angel Day Care Center Star of Hope Day Care Center Sto. Niño Day Care Center
Don Bosco	5	Sto. Rosario Day Care Center Don Bosco Day Care Center 1 Don Bosco Day Care Center 2 Malacañang Dulo 1 Day Care Center Sagrada Familia Familia Day Care Center
BF	13	Arratiles Day Care Center Gov. A. Santos Day Care Center Masville Day Care Center Sto. Tomas Day Care Center Sampaloc Site II Day Care Center Masville Learning Day Care Center Sampaloc Site II Day Care Center Clinic Ville Day Learning Center Ipil Site Learning Center Target Range Learning Center Villonco Day Care Center Estrada Day Care Center Sampaloc Site II-B Learning Center Barangay Multi Purpose Hall
San Martin De Porres	7	Sitio De Asis Day Care Center Malungay Day Care Center Sitio Pag-asa Day Care Center Sampalocan Day Care Center PNR Day Care Center SANSAMPPI Day Care Center Sto. Niño Day Care Center
TOTAL	108	

Public Elementary Schools		
Distric I	Distric II	Distric III
La Huerta E. S.	Col. E. De Leon E.S.	Baclaran E.S. Central
Masville E. S.	Don Galo E.S.	Baclaran E.S. Unit I
Parañaque E.S. Central	F. Serrano E.S.	Baclaran E.S. Unit II
Parañaque E.S. Unit I	San Agustin E.S.	Tambo E.S. Main
Parañaque E.S. Unit II	Sto. Niño E.S.	Tambo E.S. Unit I
Parañaque E.S. Unit III	R. Gatchalian E.S.	Camp Claudio E.S.
San Antonio E.S. Unit IV	Sun Valley E.S. FS	
Sampaloc Site II E.S.		
TOTAL: 21		

Public High Schools City of Parañaque, 2007
Parañaque National High School
Parañaque Science High School
Parañaque National High School- Annex
Parañaque National High School- Annex Baclaran
Baclaran High School (PNHS Annex)
Parañaque National High School (Annex)
Dr. Arcadio Santos High School
High School Masville (Annex)
High School Moonwalk (Annex)
Total : 9

Tertiary Schools (Private)	
Barangay	Name
Bf	1. AMA Computer College 2. St. Rita College 3. St. James College
San Dionisio	1. Olivarez College 2. STI Computer College 3. Datamex Computer Institute and Technology 4. Uni-Cyber Computer College and Technology 5. Universal College of Nursing
San Isidro	1, PATTS College 2, Regis Marie College 3, Infotech
Don Bosco	1, Asian Institute of Computer Studies 2, Immaculate Heart of Mary College
Marcelo Green	1, The Master's Academy
Total : 11	

Tertiary Schools (Public)	
San Dionisio	Parañaque City College of Science and Technology

Listing of Private and Public Schools in Las Piñas City

Public Elementary School		
District	Quantity	Name of School
Distric I	9	CAA ES
		Daniel Fajardo ES
		Gatchalian ES
		Ilaya ES
		Las Piñas ES Central
		Manuyo ES
		Pulanglupa ES
		Pulang lupa ES – Camella Annex
		Vergonville ES
		Distric II
Almanza ES – TS Cruz Annex		
Doña Manuela ES		
Moonwalk ES		
Moonwalk ES- Mikesell Annex		
Moonwalk ES- Golden Acres Annex		
Pamplona ES Central		
Pamplona ES I		
Pilar Village ES		
Talon ES		
Zapote ES		
Total :	20	
Public High School		
Las Piñas National High School		
Las Piñas National High School – CAA Annex		
Las Piñas National High School – Golden Acres Annex		
Las Piñas North National High School		
Las Piñas East National High School		
Las Piñas East National High School- Talon Annex		
Total :	6	

Private Elementary School
Academy of Jesus
Augustinian Abbey School
Almza Baptist Christian Academy
Arclight School
Bernardo College
BF homes School
Blessed Trinity School of Las Piñas
Bloomfield Academy
Bright Morning Star School
Camella School, Inc.
Divine Light Academy
Don Carlo Cavina School
Elizabeth Seton School
Father Angelico Lipani School
Father Abelico Lipani School- Talon 5
Immaculate Mary Montessori School
Infant Jesus Institue
Jesus Cares Christian Academy
Las Piñas Montessori school
Lights & Knowledge Learning School, Inc.
Mary Immaculate Parish Special School
Montessori de Manila
O.B. Montessori Centre, Inc.
Our Lady of Pilar Montessori Center
Regis- Grace Montessori School
Southville International School
Southwood Integrated School
St. Anthoney School
St. Joseph's Academy
St. Mark's Academy
St. Michael's School, Inc.
STI Academy- Grade School
Stop. Niño De Eucharistia Academy
Treasury of the Golden Word School
Holy Rosary Academy of Las Piñas
CAA Baptist Academy
Creative Playskool and Frade School, Inc.
Little Christian Kinderland School
Don Stevens Institute of Las Piñas
Angelus Academy
St. Francis of Assisi Collage System
St. Therese School
Young Achievers' International School
Mayflower Academy Las Piñas

Las Piñas Collage
The Central Martin Academy, Inc.
University of Perpetual Help Rizal
Total : 48

Private High School
Academy of Jesus
Almanza Baptist Christian Academy
Arclight school
Augustinian Abbey School
Bernardo College
BF Homes School
Blessed Trinity School of Las Piñas
Bloomfield Academy
Camella School, Inc.
Creative Playskool and Grade School, Inc.
Divine Light Academy
Don Carlo Cavino School
Elizabeth Seton School
Immaculate Mary Montessori School
Infant Jesus Institute
Jesus Cares Christian Academy
Las Piñas College
Mary Immaculate Parish Special School
Mary Treasure School
Metro Hill School
Montessori De Manila
O.B. Montessori Center, Inc.
Our Lady of Pilar Montessori Center
South Ville International School
Southwood Integrated School
St. Anthony School
St. Francis of Assisi College System
St. Joseph's Academy
St. Mark's Institute
St. Michael's School, Inc.
St. Therese School
STI Academy
Sto. Niño De Eucaristia Academy
Treasury of the Golden Word School
University of Perpetual Help Rizal
Young Achiever's International School
Total : 36

Colleges
Private
Bernardo College
Las Piñas College
University of Perpetual Help Rizal
PMMS Colleges
Saint Francis of Assisi College System
Dr. Felemon C. Aguilar Memorial College
AMA Computer College, Las Piñas
ABE International College of Business and Accountancy Las Piñas
Southville International School and Collage
Colegio de Santa Monica
STI College, Las Piñas
Total : 15

ANNEX C: Listing of Hospitals in Paranaque City

- Medical Center Paranaque - Dr. A. Santos Avenue, Sucat Road
- Olivarez General Hospital - Dr. A. Santos Avenue, Sucat Road
- Our Lady of Peace Hospital - Coastal Road, San Dionisio
- Parañaque Community Hospital - Quirino Avenue, La Huerta
- Protacio Medical Services - Quirino Avenue, Tambo
- South Superhighway Medical Center - West Service Road, South Superhighway
- Sta. Rita de Baclaran Hospital - G. Cruz Street, Baclaran
- Sto. Niño de Cebu Maternity Hospital - Sucat Road
- UHBI - Parañaque Doctors' Hospital - Doña Soledad Avenue, Better Living Subdivision

TOTAL: 9

Listing of Hospitals in Las Piñas City

- A. Zarate General Hospital - Naga Road, Pulang Lupa
- Alabang Medical Clinic - Alabang-Zapote Road, Pelayo Village, Talon
- Callejo Medical Clinic - A. Real Street, Talon I
- Christ the King General Hospital - Real Street, Pamplona
- Golden Acres Doctors' Hospital - Crystal Street, Golden Acres Subdivision, Talon V
- Las Piñas City Medical Center - Talon V
- Las Piñas Doctors' Hospital - J. I. Aguilar Avenue, Pulang Lupa II
- Las Piñas General Hospital and Satellite Trauma Center - Diego Cera Avenue, Pulang Lupa
- Pamplona Medical Clinic - Real Street, Pamplona
- University of Perpetual Help Rizal Delta Medical Center - Alabang-Zapote Road, Pamplona

TOTAL: 10

ANNEX D: Listing of Churches in Paranaque City

Name	Address
The Rogationist Fathers Inc	Multinational Village, Moonwalk
The Church of Jesus Christ & Latter Day of Saints	Segunda St., San Isidro
Tata Dune Chapel	San Dionisio
Sucac Evangelical Church	Banahaw St., San Isidro
Sto. Niño Chapel (Wawa)	Wawa, Sto. Niño
Sto. Niño Chapel (Ilaya)	Ilaya, Sto Niño
Sta. Rita de Casia	Sta. Rita St., Baclaran
Sta. Monica Parish Church	Don Galo
St. Francis de Sales Chapel	Banner Ave., San Antonio
St. Francis De Asisi	St. Francis St., Moonwalk
St. Andrew's Cathedral	La Huerta
San Antonio de Padua Parish Church	SAV I, San Antonio
San Antonio Chapel	San Dionisio
San Agustin Parish Church	San Agustin Village, Moonwalk
Perpetual Church	La Huerta
Our Lady of Fatima	Quirino Avenue, Tambo
National Shrine of Mary Help of Christians	Don Bosco
Mary Queen of Apostles Parish Church	SAV 6, San Isidro
Mama Mary Chapel	La Huerta
Iglesia ni Cristo	Sampaguita St., Sto. Niño
Iglesia ni Cristo	UPS 5, San Isidro
Iglesia Evangelica Unida de Cristo	Unida St., Baclaran
IEMELIF (Protestant)	Quirino Avenue, Tambo
Holy Rosary Parish Church	Moonwalk
Holy Eucharist Parish Church	Moonwalk Village, Moonwalk
Bettany Church	Purok 7, Moonwalk
Bethel Church	Armstrong Ave., Moonwalk
The Rogationist Fathers Seminary	Carmelite, Merville
St. Paul's Chapel	La Huerta
St. Joseph Parish Church	Quirino Avenue, Tambo
Seaside Chapel	Puyat Compound, Tambo
San Nicolas Parish Church	La Huerta
Redemptorist Church	Redemptorist Road, Baclaran
R. C. Chapel	Dr. A. Santos Ave., San Isidro
Our Lady of the Most Holy Rosary Parish Church	Sampaguita St., Sun Valley
Martyr's Memorial United Methodist Church	Quirino Avenue, Tambo
Holy Family Chapel	6 Gladiola St., Sun Valley
TOTAL	37

Listing of Churches in Las Piñas City

Churches	
Catholic	
Name	Address
Five Wounds Of Our Lord Parish	364 Real Street (alabang-zapote Road), Talon
Good Shepherd Parish	Cherry Blossom St., Manuela Subdivision
Holy Family Parish	Crm Ave. Cor. Dulce, Bf Homes, Almanza
Mary Immaculate Parish	Apollo li St. Moonwalk Village, Talon V
Mart, Mother of The Church Parish	Vista Grande, Bf Resort Vil., Talon li
Our Lady of Fatima Parish	Our Lady of Fatima Avenue, Philamlife Village, Pamplona 2
Saint Joseph The Worker Parish	Bf Mariposa Subd., Talon Tres
San Isidro Labrador Parish	Zodiac Ave., Veraville Homes I, Almanza Uno
Christ The King Parish	San Isidro Subd., Pamplona
Our Lady Of The Pillar Parish	Mercury Rd., Pilar Village
Santo Cristo Parish	Soldiers' Hills Subd.
Last Supper Of Our Lord Parish	Manila Times Village, Pamplona
Saint Joseph Parish - Bamboo Organ	P. Diego Cera Avenue, Poblacion
Total: 13	

ANNEX E: OTHER RELEVANT STATISTICS FOR PORT OF MANILA

SUMMARY PASSENGER STATISTICS BY PDO/PMO/PORT

Philippine Ports Authority

January – March 2009

PDO/PMO/PORT	PASSENGER TRAFFIC		
	Total	Disembraked	Embraked
PDO MANILA / N. LUZON	500,319	266,526	233,793
PMO NORTH HARBOR	165,263	91,823	73,440
North Harbor (Manila)	165,263	91,823	73,440
Private Ports	0	0	0
PMO SOUTH HARBOR	335,032	174,679	160,353
South Harbor (Manila)	335,032	174,679	160,353
-Domestic	331,512	172,919	158,593
-Foreign	3,520	1,760	1,760
Pasig (Gov't)	0	0	0
Private Ports (Pasig)	0	0	0
MICT Field Office	0	0	0

April – June 2009

PDO/PMO/PORT	PASSENGER TRAFFIC		
	Total	Disembraked	Embraked
PDO MANILA / N. LUZON	661,150	347,639	313,511
PMO NORTH HARBOR	247,855	130,685	117,170
North Harbor (Manila)	247,855	130,685	117,170
Private Ports	0	0	0
PMO SOUTH HARBOR	413,295	216,954	196,341
South Harbor (Manila)	413,295	216,954	196,341
-Domestic	402,699	211,656	191,043
-Foreign	10,596	5,298	5,298
Pasig (Gov't)	0	0	0
Private Ports (Pasig)	0	0	0
MICT Field Office	0	0	0

July – September 2009

PDO/PMO/PORT	PASSENGER TRAFFIC		
	Total	Disembraked	Embraked
PDO MANILA / N. LUZON	343,742	176,743	166,999
PMO NORTH HARBOR	164,275	80,447	83,828
North Harbor (Manila)	164,275	80,447	83,828
Private Ports	0	0	0
PMO SOUTH HARBOR	179,467	96,296	83,171
South Harbor (Manila)	179,467	96,296	83,171
-Domestic	177,873	95,499	82,374
-Foreign	1,594	797	797
Pasig (Gov't)	0	0	0
Private Ports (Pasig)	0	0	0
MICT Field Office	0	0	0

October – December 2009

PDO/PMO/PORT	PASSENGER TRAFFIC		
	Total	Disembraked	Embraked
PDO MANILA / N. LUZON	433,040	212,982	220,058
PMO NORTH HARBOR	244,172	117,267	126,905
North Harbor (Manila)	244,172	117,267	126,905
Private Ports	0	0	0
PMO SOUTH HARBOR	188,868	95,715	93,153
South Harbor (Manila)	188,868	95,715	93,153
-Domestic	175,642	89,103	86,539
-Foreign	13,226	6,612	6,614
Pasig (Gov't)	0	0	0
Private Ports (Pasig)	0	0	0
MICT Field Office	0	0	0

October – December 2008

PDO/PMO/PORT	PASSENGER TRAFFIC		
	Total	Disembraked	Embraked
PDO MANILA / N. LUZON	477,916	237,185	240,731
PMO NORTH HARBOR	133,193	63,968	69,225
North Harbor (Manila)	133,193	63,968	69,225
Private Ports	0	0	0
PMO SOUTH HARBOR	344,723	173,217	171,506
South Harbor (Manila)	344,723	173,217	171,506
-Domestic	335,381	168,546	166,835
-Foreign	9,342	4,671	4,671
Pasig (Gov't)	0	0	0
Private Ports (Pasig)	0	0	0
MICT Field Office	0	0	0

July – September 2008

PDO/PMO/PORT	PASSENGER TRAFFIC		
	Total	Disembraked	Embraked
PDO MANILA / N. LUZON	417,062	224,537	192,525
PMO NORTH HARBOR	105,819	60,333	45,486
North Harbor (Manila)	105,819	60,333	45,486
Private Ports	0	0	0
PMO SOUTH HARBOR	311,243	164,204	147,039
South Harbor (Manila)	311,243	164,204	147,039
Pasig (Gov't)	0	0	0
Private Ports (Pasig)	0	0	0
MICT Field Office	0	0	0

SUMMARY SHIPPING STATISTICS BY PDO/PMO/PORT

January – March 2009

PDO/PMO/PORT			SHIPCALLS		
			Total	Domestic	Foreign
PDO MANILA / N. LUZON			5,475	4,261	1,214
PMO NORTH HARBOR			1,189	1,090	99
		North Harbor (Manila)	988	988	0
		<i>Private Ports</i>	201	102	99
PMO SOUTH HARBOR			1,889	1,478	411
		South Harbor (Manila)	573	162	411
		Pasig (Gov't.)	133	133	0
		<i>Private Ports (Pasig)</i>	1,183	1,183	0
MICT Field Office			539	25	514

April-June 2009

PDO/PMO/PORT			SHIPCALLS		
			Total	Domestic	Foreign
PDO MANILA / N. LUZON			5,721	4,484	1,237
PMO NORTH HARBOR			1,251	1,140	111
		North Harbor (Manila)	1,058	1,058	0
		<i>Private Ports</i>	193	82	111
PMO SOUTH HARBOR			2,046	1,579	467
		South Harbor (Manila)	622	155	467
		Pasig (Gov't.)	89	89	0
		<i>Private Ports (Pasig)</i>	1,335	1,335	0
MICT Field Office			514	27	487

July- September 2009

PDO/PMO/PORT			SHIPCALLS		
			Total	Domestic	Foreign
PDO MANILA / N. LUZON			5,868	4,468	1,400
PMO NORTH HARBOR			1,238	1,129	109
	North Harbor (Manila)		1,027	1,027	0
	<i>Private Ports</i>		211	102	109
PMO SOUTH HARBOR			1,919	1,429	490
	South Harbor (Manila)		598	108	490
	Pasig (Gov't.)		66	66	0
	<i>Private Ports (Pasig)</i>		1,255	1,255	0
MICT Field Office			493	26	467

October – December 2009

PDO/PMO/PORT			SHIPCALLS		
			Total	Domestic	Foreign
PDO MANILA / N. LUZON			5,644	4,383	1,261
PMO NORTH HARBOR			1,365	1,243	122
	North Harbor (Manila)		1,118	1,118	0
	<i>Private Ports</i>		247	125	122
PMO SOUTH HARBOR			1,794	1,336	458
	South Harbor (Manila)		553	95	458
	Pasig (Gov't.)		63	63	0
	<i>Private Ports (Pasig)</i>		1,178	1,178	0
MICT Field Office			496	27	469

NUMBER OF SHIPCALLS

2009

PDO/ PMO			SHIPCALLS		
			Total	Domestic	Foreign
PDO MANILA / N. LUZON			22,341	17,368	4,973
	Manila - N. Harbor		5,043	4,602	441
	Manila - S. Harbor		7,650	5,822	1,828
	- <i>M.I.C.T.</i>		2,042	105	1,937
	Limay		6,924	6,435	489
	San Fernando		682	404	278

October – December 2008

PDO/PMO/PORT			SHIPCALLS		
			Total	Domestic	Foreign
PDO MANILA / N. LUZON			5,643	4,441	1,202
PMO NORTH HARBOR			1,166	1,113	53
	North Harbor (Manila)		1,035	1,035	0
	<i>Private Ports</i>		131	78	53
PMO SOUTH HARBOR			1,998	1,561	437
	South Harbor (Manila)		622	185	437
	Pasig (Gov't.)		115	115	0
	<i>Private Ports (Pasig)</i>		1,261	1,261	0
MICT Field Office			556	28	528

SUMMARY CARGO STATISTICS BY PDO/PMO/PORT

January – March 2009

PDO/PMO/PORT	GRAND TOTAL	DOMESTIC			FOREIGN		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA / N. LUZON	13,863,888	6,243,922	2,697,103	3,546,819	7,619,966	6,333,273	1,286,693
PMO NORTH HARBOR	3,854,620	3,272,474	1,378,935	1,893,539	582,146	570,520	11,626
North Harbor (Manila)	3,113,703	3,113,703	1,241,458	1,872,245	0	0	0
Private Ports	740,917	158,771	137,477	21,294	582,146	570,520	11,626
PMO SOUTH HARBOR	2,457,345	1,319,450	1,118,277	201,173	1,137,895	1,093,651	44,244
South Harbor (Manila)	1,486,790	348,895	166,628	182,267	1,137,895	1,093,651	44,244
Pasig (Gov't)	70,836	70,836	60,426	10,410	0	0	0
Private Ports (Pasig)	899,719	899,719	891,223	8,496	0	0	0
MICT Field Office	3,421,680	171,788	82,833	88,955	3,249,892	2,182,055	1,067,837

April – June 2009

PDO/PMO/PORT	GRAND TOTAL	DOMESTIC			FOREIGN		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA / N. LUZON	15,925,672	6,673,841	2,965,864	3,707,977	9,251,831	7,476,263	1,775,568
PMO NORTH HARBOR	4,233,543	3,330,244	1,395,296	1,934,948	903,299	869,985	33,314
North Harbor (Manila)	3,176,603	3,176,603	1,247,586	1,929,017	0	0	0
Private Ports	1,056,940	153,641	147,710	5,931	903,299	869,985	33,314
PMO SOUTH HARBOR	2,830,320	1,646,406	1,253,507	210,899	1,356,914	1,318,156	47,758
South Harbor (Manila)	1,712,901	346,987	154,228	192,759	1,365,914	1,318,156	47,758
Pasig (Gov't)	57,589	57,589	48,479	9,110	0	0	0
Private Ports (Pasig)	1,059,830	1,059,830	1,050,800	9,030	0	0	0
MICT Field Office	3,735,497	195,169	70,375	124,794	3,540,328	2,359,580	1,180,748

July – September 2009

PDO/PMO/PORT	GRAND TOTAL	DOMESTIC			FOREIGN		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA / N. LUZON	24,946,594	7,125,987	3,211,166	3,914,821	17,820,607	13,547,882	4,272,725
PMO NORTH HARBOR	4,388,730	3,513,748	1,505,957	2,007,791	874,982	834,276	40,706
North Harbor (Manila)	3,341,673	3,341,673	1,354,329	1,987,344	0	0	0
Private Ports	1,047,057	172,075	151,628	20,447	874,982	834,276	40,706
PMO SOUTH HARBOR	2,828,875	1,335,455	1,196,121	139,334	1,493,420	1,432,713	60,707
South Harbor (Manila)	1,749,942	256,522	129,424	127,098	1,493,420	1,432,713	60,707
Pasig (Gov't)	45,294	45,294	37,874	7,420	0	0	0
Private Ports (Pasig)	1,033,639	1,033,639	1,028,823	4,816	0	0	0
MICT Field Office	11,222,209	540,497	213,935	326,565	10,681,712	7,165,508	3,516,204

October – December 2009

PDO/PMO/PORT	GRAND TOTAL	DOMESTIC			FOREIGN		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA / N. LUZON	16,290,164	7,252,018	3,138,876	4,113,142	9,038,146	7,148,959	1,889,187
PMO NORTH HARBOR	4,929,192	4,066,963	1,807,830	2,259,106	862,256	837,534	24,772
North Harbor (Manila)	3,832,409	3,832,409	1,625,861	2,206,548	0	0	0
Private Ports	1,096,783	234,527	181,969	52,558	862,256	837,534	24,722
PMO SOUTH HARBOR	2,618,752	1,266,146	1,121,319	144,827	1,352,606	1,279,764	72,842
South Harbor (Manila)	1,629,995	277,389	138,850	138,539	1,352,606	1,279,764	72,842
Pasig (Gov't)	42,306	42,306	38,012	4,294	0	0	0
Private Ports (Pasig)	946,451	946,451	944,457	1,994	0	0	0
MICT Field Office	4,372,127	236,673	91,822	144,851	4,135,454	2,850,438	1,285,016

October - December 2008

PDO/PMO/PORT	GRAND TOTAL	DOMESTIC			FOREIGN		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA / N. LUZON	15,181,098	6,750,697	2,892,082	3,858,615	8,430,401	6,881,918	1,548,483
PMO NORTH HARBOR	3,779,024	3,500,647	1,519,697	1,980,950	278,377	278,377	0
North Harbor (Manila)	3,415,109	3,415,109	1,434,159	1,980,950	0	0	0
Private Ports	363,915	85,538	85,538	0	278,377	278,377	0
PMO SOUTH HARBOR	2,588,275	1,415,091	1,147,367	267,724	1,173,184	1,121,438	51,746
South Harbor (Manila)	1,589,075	415,891	167,331	248,560	1,173,184	1,121,438	51,746
Pasig (Gov't)	65,371	65,371	54,585	10,786	0	0	0
Private Ports (Pasig)	933,829	933,829	925,451	8,378	0	0	0
MICT Field Office	4,139,621	204,043	75,587	128,456	3,935,578	2,613,761	1,321,817

July – September 2008

PDO/PMO/PORT	GRAND TOTAL	DOMESTIC			FOREIGN		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA / N. LUZON	17,496,938	6,92,023	3,104,123	3,877,900	10,514,915	8,003,359	2,511,556
PMO NORTH HARBOR	4,523,944	3,858,938	1,737,592	2,121,346	665,006	656,806	8,200
North Harbor (Manila)	3,748,298	3,748,298	1,652,897	2,095,401	0	0	0
Private Ports	775,646	110,640	84,695	25,945	665,006	656,806	8,200
PMO SOUTH HARBOR	2,998,256	1,350,159	1,083,066	267,093	1,648,097	1,560,747	87,350
South Harbor (Manila)	2,067,542	419,445	178,768	240,677	1,648,097	1,560,747	87,350
Pasig (Gov't)	74,130	74,130	55,054	19,076	0	0	0
Private Ports (Pasig)	856,584	856,584	849,244	7,340	0	0	0
MICT Field Office	4,785,874	230,422	95,622	134,800	4,555,452	2867,592	1,687,860

2009

PDO/PMO/PORT	GRAND TOTAL	DOMESTIC			FOREIGN		
		Total	Inward	Outward	Total	Import	Export
PDO MANILA/NORLUZ	61,687,825	26,667,432	11,590,343	15,077,089	35,020,393	28,488,707	6,531,686
Manila – N. Harbor	17,406,085	14,183,402	6,088,018	8,095,384	3,22,683	3,112,315	110,368
Manila – S. Harbor	10,734,949	5,385,457	4,689,224	696,233	5,349,492	5,123,942	225,550
- M.I.C.T.	15,639,479	822,314	335,952	486,362	14,817,165	10,015,945	4,801,220
Lamay	14,670,054	5,929,723	143,058	5,786,665	8,740,331	7,957,902	782,429
San Fernando	3,237,258	346,536	334,091	12,445	2,890,722	2,278,603	612,119
PDO SOUTHERN LUZON	29,820,142	13,328,832	6,521,146	7,385,918	16,491,310	14,192,237	2,299,073
Batangas	20,807,830	7,032,623	2,698,270	4,334,353	13,775,207	13,235,401	539,806
Calapan	1,279,234	1,279,234	143,177	1,136,057	0	0	0
Legazpi	4,210,246	3,712,950	2,139,709	1,573,241	497,296	358,851	138,445
Puerto Princesa	3,522,832	1,304,025	964,223	339,802	2,218,807	597,985	1,620,822

Reference for Figure 3-15

Paranãque and Las Pinãs: Water Quality Sampling Data (by OEC)

PARAMETERS	WATER QUALITY CRITERIA FOR CLASS 'C' WATERS
pH	6.5-8.5
TEMPERATURE, °C	3°C MAX RISE
TSS, mg/L	NOT MORE THAN 30 mg/L INCREASE
BOD, mg/L	7 (10)
COD, mg/L	NO CRITERIA
TOTAL COLIFORM, MPN/100ml	5000

W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
7.40	7.50	7.15	7.25	7.30	7.20	7.60	7.00	7.00	7.30
27.6	28.9	28.7	27.1	25.9	27.9	26.5	26.8	27.4	26.3
5.6	9.2	5.7	21.8	23.3	1.1	14.4	12.2	17.2	8.2
44.0	20.0	17.0	46.0	13.0	22.0	13.0	15.0	14.0	19.0
91.0	38.0	27.0	80.0	25.0	51.0	22.0	31.0	26.0	28.0
22×10^6	14×10^6	49×10^5	79×10^5	35×10^6	33×10^5	23×10^5	49×10^5	33×10^5	35×10^6

W11	W12	W13	W14	W15	W16	W17	W18	W19
7.25	7.50	7.50	7.30	7.20	7.20	7.05	7.40	7.36
26.6	27.0	30.6	30.0	29.7	26.9	26.4	26.7	30.0
3.3	9.4	25.0	7.0	12.9	<0.1	16.0	<0.1	20.0
17.0	16.0	39.0	12.0	22.0	12.0	33.0	16.0	38.0
36.0	30.0	71.0	28.0	38.0	26.0	46.0	48.0	98.0
49×10^5	17×10^6	92×10^6	46×10^5	33×10^5	35×10^6	35×10^6	13×10^6	~

Annex 5

RESIDENT PERCEPTION SURVEY

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Summary

Based on the survey conducted, it reflected a relatively low awareness of the respondents to the proposed project. But for those who are aware, survey showed that their sources of information were through their neighbors/friends, barangay officials, and laborers/staff of the project. Majority of the respondents agreed that the proposed project will be beneficial. Perceived benefit was basically for health improvement. Other benefits include mitigation of water pollution and improvement of the community. But some of the respondents are not aware of any benefit yet. Job employment, good water source and conservation of water were suggested by the respondents as perceived benefits. As for the perceived effects of the proposed project, some are not yet aware of any negative effect the project may cause them. But some said that the project will not cause any negative effect to the community. A few of the respondents perceived that the project may cause water pollution, health problems, or may cause the residents near the river be relocated.

The respondents gave suggestions to the company regarding the proposed project such as to give importance on the health in the community, to implement the rules and regulations on constructing the STP, to provide relocation programs in case there will be displacement of households or settlers in the area. The survey also showed that the respondents are strongly in favor with the proposed project.

I . Methodology

Primary data collection was employed in the study of this aspect. They were gathered through a survey method which consisted of both structured and open-ended questions to elicit response from the respondents. The number of respondents taken from the affected barangays varied from one barangay to another which consisted of mostly barangay officials as key informants at first and they totaled to 150. The primary data consisted of 1) demographic and socio-economic characteristics of the respondents and their households; and 2) respondents' awareness and perception towards the proposed sanitation project.

Stratified sampling was used to select respondents from the barangays that would be affected by the sanitation project. In the selection of the barangay officials, as much as possible, every sector in the barangay, from the Kagawads (barangay council members) down to the traffic enforcers, was well represented. The direct impact barangays are Barangays Manuyo Dos, Pamplona Dos and Tres, Pulang Lupa Uno and Dos, Don Galo, San Dionisio, Tambo, Baclaran, Sto. Niño and lastly Moonwalk from the cities of both Las Piñas and Parañaque.

Table 1.1 – The direct impact barangays

Barangay	
Name of Barangay	
Barangay Manuyo Dos	16
Barangay Pamplona Dos	8
Barangay Pamplona Tres	5
Barangay Pulang Lupa Uno	12
Barangay Pulang Lupa Dos	12
Barangay Don Galo	6
Barangay San Dionisio	19
Barangay Tambo	17
Barangay Baclaran	28
Barangay Sto. Nino	15
Barangay Moonwalk	12
TOTAL	150

This survey was conducted to document the present socio-economic conditions specifically of the residents within the direct impact areas since secondary data on these aspects are lacking or outdated. The basic socio-demographic profile of the 150 respondents in the direct impact areas of the project are discussed hereunder:

1.1 Age

Based on the survey, about 27% of the respondents (40) in the directly affected areas are under 31-40 years old followed by those who are under 41-50 years old which consist of 36 individuals or 24% of the total. The rest are 21-30, that is 17% or 25 individuals while 12% or 18 respondents are at 51-60 years of age.

Although those individuals who opted not to mention their age which consisted of 11% of the respondents or 17 individuals. There are 14 or 9% that are between 61 years old and above while 3 or 2% belong to bracket of 15-17 years old while 2 individuals or 1% are at the age of 18-20. (Table 1.2)

Table 1.2 – Age of Respondents

Age Distribution of Respondents by barangay	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
15 to 17	0	0	0	0	0	0	1	0	2	0	0	3	2%
18 to 20	0	0	0	0	1	0	1	0	0	0	0	2	1%
21 to 30	3	2	0	1	3	0	4	0	4	1	2	25	17%
31 to 40	3	1	2	5	5	1	3	4	6	5	5	40	27%
41 to 50	4	3	1	1	1	1	5	6	7	3	4	36	24%
51 to 60	1	0	1	4	1	3	2	3	2	1	0	18	12%
61 up	3	1	1	1	1	1	0	1	3	2	0	14	9%
No answer	2	1	0	0	0	0	3	3	4	3	1	17	11%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.2 Ethnicity

Table 1.3 below shows that most of the residents in the directly impacted barangays have Tagalog ethnicity with 120 individuals or 80% while 19 respondents or 13% are Visayan ethnic. The rest 5, 4, and 2 or 3%, 3% and 1% respectively belong to Ilocano, Cebuano and other ethnicity.

Table1.3 – Ethnicity of the respondents

Ethnicity	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Tagalog	14	7	3	11	6	5	15	15	23	13	8	120	80%
Cebuano	1	0	0	0	1	0	0	1	1	0	0	4	3%
Ilocano	0	0	0	0	0	0	1	0	4	0	0	5	3%
Visayan	1	1	2	1	4	1	3	1	0	1	4	19	13%
Others	0	0	0	0	1	0	0	0	0	1	0	2	1%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.3 Main Occupation

Based on the survey, about 1% of the respondents in the directly affected area have no income. For the respondents who are working, 48% source their livelihood from being barangay officials (72 respondents) followed by being government officials (41%) or 61 respondents. About 6% or 9 respondents are engaged in personal business. The rest are tricycle or jeepney drivers.

Table 1.4 – Main Occupation of respondents

Occupation of Respondent	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
None	0	0	0	0	0	0	0	1	0	0	0	1	1%
Gov't/Private Employee	5	2	2	0	3	0	5	10	15	7	12	61	41%
Business (store, carinderia, etc.)	0	0	0	0	2	2	0	0	5	0	0	9	6%
Laborer/Construction worker	1	1	0	0	0	1	0	0	0	0	0	3	2%
Driver (tricycle, jeep, taxi, etc.)	0	3	0	0	0	0	0	1	0	0	0	4	3%
Barangay Officials	10	2	3	12	7	3	14	5	8	8	0	72	48%
Others	0	0	0	0	0	0	0	0	0	0	0	0	0%
No answer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.4 Monthly Income

The estimated income per month of respondents is presented in Table 1.5. Approximately more than half (57%) of the respondents (86) have an estimated income of around P0 to 5,000.00 per month followed by 33 respondents (33%) with an income of 5,001.00 to 10,000.00 and about 5% or 8 respondents are earning P10,000.00 to 15,000.00 per month. Only 3% or 5 respondents earn 15,001.00 to 20,000.00 per month and 1% or 1 respondent earns more than 20,000.00 monthly.

Based on the estimated income per month, majority of the respondents are way below the annual poverty threshold level in the country of around P12,309.00, hence they are considered poor. Only around 13 respondents have income level between P10,000.00-15,000.00 per month and 5 respondents have income level between P15,000.00 to 20,000.00 per month while 2 respondents have income level of P20,000.00 per month or more.

Table 1.5 – Monthly Income of respondents

Monthly Income	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
1,000.00 to 4,999.00	10	4	4	11	9	2	13	9	15	7	2	86	57%
5,001.00 to 10,000.00	3	2	1	0	3	3	6	7	11	4	9	49	33%
10,001.00 to 15,000.00	1	2	0	0	0	0	0	1	1	3	0	8	5%
15,001.00 to 20,000.00	0	0	0	1	0	1	0	0	1	1	1	5	3%
20,001.00 and above	2	0	0	0	0	0	0	0	0	0	0	2	1%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.5 Expenses

As it shows, most of the respondents spend their income for food that comprise of 77% or 115 individuals. This is followed by those who spend for rice/palay which are 61% of or 91 respondents. Groceries are also basic needs for everyday life, so it takes the third most prioritized by the respondents at 52% or 78 individuals. Next to this is the 69 individuals or 46% that spend for liquefied petroleum gas (LPG). One third of the respondents 50 individuals or 33% spend money for medicine. And the rest are ranked from 29% down to 5% for the rest of the items in the table.

Table 1.6 – Expenses of respondents

Expenses	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
food	13	7	3	7	8	3	13	15	25	11	10	115	77%
rice/palay	12	5	3	8	10	6	7	9	16	6	9	91	61%
cellphone card	2	2	2	4	1	0	2	7	13	4	5	42	28%
mineral water	4	3	2	5	4	5	4	8	17	6	8	66	44%
groceries	7	5	2	5	6	5	4	9	20	7	8	78	52%
soft drinks	2	1	3	1	0	0	2	3	11	1	3	27	18%
liquor (tandua/gin/beer)	3	1	1	1	0	1	1	1	7	1	0	17	11%
gas/LPG	7	4	1	5	7	4	4	6	20	9	2	69	46%
transportation (jeep/tricycle/bus)	3	0	3	0	1	0	5	6	13	4	9	44	29%
Medicine	7	0	2	0	6	2	1	6	13	3	10	50	33%
Others	1	0	0	0	1	0	2	0	2	1	0	7	5%
Total	61	28	22	36	44	26	45	70	157	53	64	150	

1.6 Relationship to Household

As seen in Table 1.7 below, majority of the surveyed respondents at 45% or composed of 67 individuals is the household head. It is followed by the spouse of household head who are 37% or 55 respondents. A few of them, 16% or 24 individuals are single and stay at the same household as sons/daughters. The rest of the respondents are relatives and others at 2% and 1% respectively.

Table 1.7 – Relationship to Household of respondents

Position in Household Distribution of Respondents	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Household Head	8	4	2	9	7	6	5	6	10	9	1	67	45%
Spouse of Household Head	5	2	1	3	1	1	8	8	11	6	9	55	37%
Son/ Daughter	3	2	1	0	3	0	5	3	6	0	1	24	16%
Relatives	0	0	0	0	0	0	1	1	1	0	0	3	2%
Others	0	0	0	0	0	0	0	0	1	0	0	1	1%
No answer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	4	12	11	7	19	18	29	15	12	150	100%

1.7 Sex

Based on the survey data, female key informants comprise of 77 individuals or 51% are male or 73 individuals or 49%. (Refer to Table 1.8).

Table 1.8 – Sex distribution of respondents

Sex Distribution of Respondents by Barangay	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Male	9	6	4	11	8	4	6	5	12	8	0	73	49%
Female	7	2	1	1	4	2	13	12	16	7	12	77	51%
No answer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.8 Marital Status

There are about 109 individuals or 73% who are married and 24% or 36 respondents who are still single. Just a few of them are living-in, widowed and separated at 4%, 3% and 3% respectively. (Please refer to Table 1.9 below)

Table 1.9 – Marital Status of respondents

Marital Status	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Married	16	4	3	10	7	6	14	11	16	13	9	109	73%
Single	3	4	1	1	2	1	7	6	8	1	2	36	24%
Separated	0	0	0	0	0	0	1	1	0	0	1	5	3%
Widowed	1	0	1	0	1	0	0	0	3	0	0	6	4%
Live-in	0	0	0	2	0	0	0	0	1	1	0	4	3%
No Answer	0	0	0	0	0		0	0	0	0	0	0	0%
Total	20	8	5	13	10	7	22	18	28	15	12	150	100%

1.9 Religious Affiliation

Table 1.10 (below) presents the religious affiliation of the respondents. Majority of the respondents in all affected barangays are Roman Catholics, around 84%. The remaining 26% of respondents belong to other religious groups such as Iglesia ni Cristo (6%), Born Again Christians and Baptists, (7%), and others (1%).

Table 1.10 – Religious Affiliation of respondents

Religion	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
None	0	0	0	0	0	0	2	0	0	0	0	2	1%
Catholic	13	8	5	12	12	4	11	17	19	14	11	126	84%
Christian/Baptist	3	0	0	0	0	0	4	0	3	0	1	11	7%
Iglesia ni Cristo	0	0	0	0	0	2	2	0	5	0	0	9	6%
Others	0	0	0	0	0	0	0	0	1	1	0	2	1%
No Answer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.10 Family Members

More than half (53%) of the respondents (79) belong to a medium-sized family with 4 to 6 members. This is followed by around 24% (36 respondents) belonging to large-sized family with 7 to 9 members and around 17% (26) respondents belong to small-sized family with 1 to 3 members. 3 respondents belong to very large households of more than 10 members and above (4%) and 3 others of bigger than 10 members and above (3%).

Table 1.11 – Household size of respondents

Household size <i>Number of Family Members</i>	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
											Sub-Total	Sub-Total	%
1 to 3	1	0	1	1	3	2	2	4	7	5	0	26	17%
4 to 6	9	4	3	9	5	4	11	7	12	9	6	79	53%
7 to 9	4	4	1	2	4	0	4	3	8	1	5	36	24%
10 above	2	0	0	0	0	0	2	1	1	0	0	6	4%
Others	0	0	0	0	0	0	0	2	0	0	1	3	2%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.11 Years of residence

Most of the respondents (56%) had been living in their area for more 10 years (84 respondents) while 46 respondents (30%) had been there as residents since birth. Only a few are new to the area for less than 9 years with the rest of the respondents (14%).

Table 1.12 – Years of Residence of respondents

Years of residence	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Since birth	0	0	1	2	1	3	7	10	12	7	3	46	30%
0 to 2 years	0	0	0	1	0	0	2	0	1	0	0	4	3%
3 to 5 years	0	1	0	0	1	0	1	0	3	0	1	7	5%
6 to 8 years	0	0	2	0	0	0	1	0	0	1	0	4	3%
9 to 10 years	1	1	0	0	1	0	1	0	1	0	0	5	3%
10 years and above	15	6	2	9	9	3	7	7	11	7	8	84	56%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.12 Educational Attainment

Table 1.13 shows that almost all of the respondents are educated. Majority of which graduated from college or at least in the college level 55% or 83 respondents. Around 31% (46) of the respondents finished high school and around 13 respondents (9%) finished elementary. Eight (8) respondents (5%) are vocational graduates.

Table 1.13 – Highest Education Attainment of respondents

Educational Attainment	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
None	0	0	0	0	0	0	0	0	0	0	0	0	0%
Elementary level/Graduate	5	0	1	1	1	1	1	1	0	2	0	13	9%
High School level/Graduate	4	4	0	6	4	1	8	6	7	5	1	46	31%
College level/Graduate	7	3	3	5	7	4	9	7	19	8	11	83	55%
Vocational	0	1	1	0	0	0	1	3	2	0	0	8	5%
Others	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.13 House Materials

Table 1.14 (below) presents the housing materials of the respondents in the directly affected communities. Almost half (43%) or 64 respondents indicated that the walling used in their houses is of mixed concrete and 51 respondents have concrete material. Around 26 or 17% of the respondents indicated that the walling used in their houses is made of light materials like nipa and bamboo. The rest (4%) or 6 respondents are either made of salvaged materials or others (2%).

Table 1.14 – House Materials of respondents

House materials of respondents	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Nipa/bamboo	4	2	0	11	0	3	3	1	1	1	0	26	17%
Mixed concrete	5	3	0	0	2	3	9	9	15	10	8	64	43%
Concrete	6	2	6	0	9	5	6	6	10	4	3	51	34%
Salvage Material	0	0	0	1	1	1	1	1	2	0	0	6	4%
Others	1	1	0	0	0	0	0	0	0	0	1	3	2%
Total	16	8	6	12	12	12	19	17	28	15	12	150	100%

1.14 Cooking equipment

71% of the respondents, that is 107 individuals use liquefied Petroleum Gas (LPG) fueled stove for cooking. This is followed by the those individuals (23) or 15% that use charcoal and the rest of the respondents (6%) use electric stove and other use the most commonly used materials in the past like firewood at 4% and others at 1%.

Table 1.15 – Cooking equipment of respondents

Cooking Equipment	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Electric stove	0	1	0	1	1	0	0	2	4	0	0	9	6%
Charcoal	5	0	2	1	3	0	3	3	1	3	2	23	15%
Kerosene stove	2	1	0	0	2	2	3	2	3	2	0	17	11%
Firewood	9	5	3	8	6	5	13	12	23	11	12	6	4%
LPG	2	0	1	2	2	0	0	1	0	1	1	107	71%
Others	0	1	0	0	0	0	0	0	0	0	0	1	1%
Total	18	8	6	12	14	7	19	20	31	17	15	150	

1.15 Appliances

The most common appliance that majority of the respondents use is the television/radio that totals to 130 individuals or 87%. Electric fan is also very common as one of these basic appliances which comprise a total of 79% or 119 individuals. This is followed by 60% or 90 respondents who have DVD player and both 49% who have refrigerator and washing machine. Other respondents, 11%, have various appliances that are not mentioned in the survey form. (Please refer to Table 1.16 below.)

Table 1.16 – Appliances of respondents

Appliances	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Television/radio	12	8	3	12	10	6	18	15	23	12	11	130	87%
Refrigerator	6	2	3	6	5	5	8	9	12	7	11	74	49%
DVD player	7	6	4	9	6	5	11	10	16	8	8	90	60%
Washing machine	6	2	3	6	6	5	8	9	15	6	8	74	49%
Electric fan	12	6	5	9	11	6	11	13	22	13	11	119	79%
Others	4	0	0	0	2	1	2	0	1	3	4	17	11%
Total	47	24	18	42	40	28	58	56	89	49	53	150	

1.16 Has there been any member of the family that got sick?

It is important to know if there are members of the family that got sick in the past 12 months before the sanitation project is put up to determine whether or not the project causes of illnesses in the communities that are directly affected. As seen in the Table 1.17, 57% or 85 individuals responded Yes while 43% or 65 respondents answered No.

Table 1.17 – Members of the respondents’ families that got sick in the past 12 months

Did anybody from your family get sick?	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Yes	11	4	1	6	7	3	8	7	21	10	7	85	57%
No	5	4	4	6	5	3	11	10	7	5	5	65	43%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.17 Type of illness

The most common illness that most of the members of the family of the respondents suffered from is diarrhea with 49% or 74 individuals. This is followed by 40% or 60 family members who had coughs, colds or flu. 25% or 37 individuals suffered from fever and headache and the rest suffered from other illnesses and URI/URTI at 9% and 2% respectively. (Please refer to Table 1.18 below.)

Table 1.18 – Type of illness of the respondents’ family members

What illness?	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Fever/headache	5	2	0	3	4	0	4	3	6	5	5	37	25%
Cough/colds/flu	8	2	3	3	4	2	4	6	16	7	5	60	40%
Diarrhea	1	0	10	10	1	10	10	10	16	1	5	74	49%
URI/URTI	0	0	1	0	0	2	0	0	0	0	0	3	2%
Others	2	1	0	1	1	1	2	2	0	1	2	13	9%
Total	16	5	4	7	10	5	10	11	22	14	17	150	

1.18 Source of drinking water

It is common knowledge that a lot of diseases can be either water or food related. There are very common water-borne related diseases like diarrhea or amoebiasis and many others. Finding out the sources of drinking water of the respondents will help determine, again, if the STP project has something to do with these diseases. As shown by the Table 1.19 below, 54% or 82 respondents drink purified water bought from or delivered by the refilling water stations. Some of these also drink the tap water from their own faucet. 38% or 57 individuals directly drink tap water provided by their local water supply and the rest which is 11% take their water from their neighbors.

Table 1.19 – Source of drinking water of respondents

Source of drinking water	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Own tap water	6	1	1	7	2	3	11	7	12	6	1	57	38%
Taken from neighbors	5	1	1	2	1	1	0	4	2	0	0	17	11%
Water from refilling station	5	6	3	5	9	2	8	9	15	9	11	82	54%
Total	16	8	5	14	12	6	19	20	29	15	12	74	

1.19 Source of water for everyday use

Table 1.20 below shows that 81% of the respondents (121 individuals) have their own faucets. 18% of these or 27 respondents take their water from their neighbors. Only 1% of these respondents have their water delivered by trucks that sell water to residents who have no access to tap water.

Table 1.20 – Source of water for everyday use of respondents

Source of water for everyday use	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Own tap water	9	7	4	8	9	5	19	13	23	14	10	121	81%
Taken from neighbors	7	1	1	4	3	0	0	4	5	1	1	27	18%
Truck delivery	0	0	0	0	0	1	0	0	0	0	1	2	1%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

1.20 Having own toilet?

Based on the survey done, 95% of the respondents (142) have their own toilets. Only 4% (6 individuals) use their neighbors' and only 2 of them use public toilet.

Table 1.21 – Respondents having own toilets

Toilet used?	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Own toilet	13	7	4	12	12	6	18	16	28	14	12	142	95%
Neighbor's	2	1	1	0	0	0	0	1	0	1	0	6	4%
Public Toilet	1	0	0	0	0	0	1	0	0	0	1	2	1%
Total	16	8	5	12	12	6	19	17	28	15	13	150	100%

1.21 Type of toilet

The types of toilets that respondents use are shown by Table 1.22 below. 86% or 131 individuals have water-sealed toilets, and a few of them 13% (19 respondents) use open-pit toilets and just 1% percent use other type of toilet.

Table 1.22 – Type of toilet of respondents

Type of toilet?	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Open-pit toilet	16	1	1	0	1	0	0	0	0	0	0	19	13%
Water-sealed toilet	0	7	4	12	11	6	19	17	28	15	12	131	86%
Others	0	0	0	0	0	0	0	0	0	0	0	2	1%
Total	16	8	5	12	12	6	19	17	28	15	12	152	100%

1.22 Toilet with septic tank (pozo negro)

This last item in the survey form is also one of the most important items. Table 1.22 shows that 86% or 129 individuals are very much aware that their toilets have septic tanks that is commonly known as pozo negro. 14% or 21 respondents do not have them.

Table 1.23 – Respondents having septic tank in their toilets

Does your toilet have septic tank?	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Yes	11	6	4	11	9	6	19	15	24	13	11	129	86%
No	5	2	1	1	3	0	0	2	4	2	1	21	14%
Not aware	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

II – Perception on the Project

2.1 Awareness and Perceptions of the Respondents about the Project

Based on the survey conducted, below are the awareness and perceptions of the residents. Awareness about the proposed project is relatively low with an average of 79% or 118 respondents. Only 21% or 32 respondents claimed that they are aware of the project.

Table 2.1 – Awareness of respondents on the project

Awareness and perceptions of respondents about the project	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Yes	2	0	3	2	3	1	4	6	5	5	1	32	21%
No	14	8	2	10	9	5	15	11	23	10	11	118	79%
No answer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

2.2 Sources of information

Since majority of the respondents are not aware of the project, 79% have no answer as to the source of information. For those who are aware, their sources of information about the proposed project came from local neighbors/friends (2%), barangay officials (8%), and laborers/staff of the project (1%) as presented in Table 2.2.

Table 2.2 – Sources of information of respondents

Sources of information about the project	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Through barangay officials	2	0	3	2	3	1	3	4	5	3	1	27	18%
Company Staff	0	0	0	0	0	0	0	0	0	2	0	2	1%
Consultation	0	0	0	0	0	0	0	0	0	0	0	0	0%
Neighbors, relatives, hearsay, radio	0	0	0	0	0	0	1	2	0	0	0	3	2%
Others	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	2	0	3	2	3	1	4	6	5	5	1	150	

2.3 Perception of Respondents about the Project

Around 98% of respondents or 147 individuals agreed that it will be beneficial while only 2% or 3 of the respondents disagreed and said no.

Table 2.3 – Perception of respondents about the project

Generally, is the project beneficial?	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub- Total	%
Yes	15	8	5	12	12	6	18	17	28	15	11	147	98%
No	1	0	0	0	0	0	1	0	0	0	1	3	2%
No answer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

2.4 Perceived Benefits.

Majority of the respondents (32%) noted that the most important benefit they will derive from the project is the avoidance of illnesses or diseases as shown in Table 2.4. Other benefits include mitigation of water pollution (25%), improvement of the community and others are not aware of any effect yet (7%) and other various benefits like job employment, good water source and conservation of water that total to 15%.

Table 2.4 – Perceived benefits by respondents

Perceived benefits	TOTAL	
	Sub-Total	%
Health improvement	48	32%
Mitigation of water pollution	38	25%
Improvement of the community	31	21%
Not aware of any effect yet	10	7%
Others	23	15%
Total	150	100%

2.5 Perceived Effects

A big percentage of the respondents (41%) are not aware of any negative effects of the proposed sanitation project, while others say that it would not cause any negative effects to the community (29%), water and river pollution (4%), health problems (5%), and others said that it will be depending on how the project will be constructed (7%).

Around 8% of the respondents did not indicate any answer as to the perceived costs of the project.

Table 2.5 – Perceived effects by respondents

Perceived Effects	TOTAL	
	Sub-Total	%
Not aware of any effect yet	61	41%
No negative effect	44	29%
Many will be displaced	15	10%
Water pollution	6	4%
Health problems	5	3%
It depends on how it is constructed	7	5%
Others	12	8%
Total	150	100%

2.6 Suggestion of the respondents

The respondents have many suggestions for the company to consider. The highest portion of the respondents (28%) perceived that health in the community should be given importance. About 17% or 26 respondents suggested that they should implement rules and regulations on constructing the STP which should be done in a proper site.

Approximately, 21% said that they do not have anything to suggest to the company. The remaining suggestions are public or community consultation or hearing (5%), relocation program for those who will be displaced, if there are any (4%), cleanliness with 4%, prioritize the project so people would benefit from it immediately (4%) and others that composed about 13% of the respondents. (Please refer to Table 2.6 below.)

Table 2.6 – Suggestions of respondents to the company

Suggestions to the company	TOTAL	
	Sub-Total	%
Health in the community	42	28%
Construct the STP well	26	17%
Not aware of any	32	21%
Public or community consultation	7	5%
Relocation for the displaced residents	6	4%
Cleanliness	6	4%
Prioritize the project	6	4%
Proper plant site	6	4%
Others	19	13%
Total	150	100%

2.7 Consent of respondents for the Project

Consent of respondents for the project is relatively high with an average of 98% or 147 respondents as presented by 2.7. Only an average of 2% respondents disagreed to have the sanitation project constructed in area.

Table 2.7 – Consent of respondents for the project

Are you in favor of the proposed STP project in your area?	Brgy. Manuyo Dos	Brgy. Pamplona Dos	Brgy. Pamplona Tres	Brgy. Pulang Lupa Uno	Brgy. Pulang Lupa Dos	Brgy. Don Galo	Brgy. San Dionisio	Brgy. Tambo	Brgy. Baclaran	Brgy. Sto. Nino	Brgy. Moonwalk	TOTAL	
												Sub-Total	%
Yes	16	8	5	12	12	6	18	17	27	15	11	147	98%
No	0	0	0	0	0	0	1	0	1	0	1	3	2%
No answer	0	0	0	0	0	0	0	0	0	0	0	0	0%
Total	16	8	5	12	12	6	19	17	28	15	12	150	100%

Annex 6

Sub-Pilot Project Description

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Preface

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Preface

In order to the implementation programs of sewerage systems in Parañaque and Las Piñas Cities, several supporting programs related to the sewerage systems would be useful to promote and enhance the sewerage and sanitation development.

1. Supporting Program for Hygienic Improvement of Poverty Families

Unhygienic conditions of poor families without or insufficient sanitary facilities could not be improved after the sewerage system completed, and it is difficult to charge the sewerage tariff to the households without water supply connection.

Therefore, in parallel with MWSI sewerage treatment implementation project, LGUs should promote for poverty families to improve their domestic hygienic conditions. Establishing Revolving Fund for Promoting Water supply and Sanitary Facility Installation is recommended to encourage the households to install water supply and sanitary facilities.

The predicted cost for the promotion would be as follows (per one family);

Water supply facility (Water pipe and tap)	P4,000
Water Closet (supply and install)	P6,800
φ150 PVC with Earth Work (10m)	P13,000
Total	p23,800

Therefore LGUs should recruit a social-economic specialist to study for the promotion project.

Tasks and Duties of the Consultant (Socio-economist 3 months)are, but not limited to, as follows.

- 1) Survey on the hygienic conditions on poverty families in Parañaque and Las Piñas,
- 2) Identify the numbers of the families to be supported to improve their hygienic conditions,
- 3) Identify their affordability to repayment for the renovatiOn cost,
- 4) Calculate necessary fund for budgeting to the facilities for them to install hygienic facilities, and revolving period together with repayment period,
- 5) Prepare necessary inventory lists for the renovation and cost estimate,
- 6) Prepare implementation program for the project,
- 7) Discuss with LGUs and DOH on the program,
- 8) Identify fund source for the project, and estimate initial fund for the revolving fund,
- 9) Prepare funding list and monitoring systems for borrowers' repayment status together with payment conditions to water tariff and environmental tax,

- 10) Propose summary procedure and collection letter form system automatically to issue,
- 11) Propose revolving fund available period and predict the total number of families to borrow the fund,
- 12) Any other matters required by LGUs,
- 13) Prepare revolving fund study report and fund monitoring programs.

The cost estimate for this project is as follows;

Cost estimate for Revolving Fund System Preparation Study;

(i) Period: 3 months

(ii) Consultant (Socio-economist) recruiting: US 51,00

TOTAL US 51,000

2. Supporting Program to support Clean-up River Activities

The sub-project program supporting the sewerage system implementation project planned in Parañaque and Las Piñas Cities are wrapped up hereunder. This sub-projects aims for supporting the sewerage systems, however, projects themselves should better be implemented separately from the main projects, because the programs proposed have direct connections to other relative programs promoted by LGUs, MMDA, DENR, etc, and the sewerage project shall be done by MWSI (private entity).

a) Supporting Program for Hygienic Improvement of Poverty Families (Details in Item 1)

Establishment revolving fund for poor families' hygienic improvement: LGUs, DOH is also one of supporting programs for Clean-up River Activities.

b) Educational Programs

Garbage Collection and Recycle supporting Program: LGUs, MMDA, DepEd

School campaign program for environmental education: LGUs, DepEd

School excursion program for eco-tour: LGUs, DOE, MWSI.

The cost estimate to implement these activities LGU s is shown hereunder.

(i) Consultant: Educational Specialist	2 months	US 34,000
Solid Waste Management Specialist	2 months	US 34,000
Sewage Engineer	1 month	US 17,000
(ii) Facilities for Collecting Garbage		
Consolidation Net Container	10 sets	US 3,500
Container Station	2 sets	US 54,000
Hauling Track 4,700 cc, Loading 2t	1 set	US 40,000

(iii) Water Park Facilities

Rapid Filter (100ton/d)	1 set	US 118,000
Total		US 300,500

Consultant tasks and duties are, not limited to, as follows;

Educational specialist (2 months)

- 1) Propose target plant elementary school and clean-up zone (educational),
- 2) Prepare education program for out-side and in class curriculums,
- 3) Prepare eco-tour program to Sewerage Treatment Site,
- 4) Discuss with MWSI to propose school children school excursion schedule,
- 5) Propose the total program incorporate into elementary
- 6) School curriculum,
- 7) Prepare draft text book for elementary school
- 8) Discuss with DepEd, LGUs and Teachers' association on te overall plan.
- 9) Prepare the education Program Report

Solid Waste Management Specialist (2 months)

- 1) Identify the model zone for garbage collection and recycle supporting program by elementary school children,
- 2) Identify locations to set garbage container and consolidate garbage nets,
- 3) Prepare garbage cleaning activities by elementary school children with the educational specialist,
- 4) Discuss with MMDA how to integrate the elementary school children into MMDA duties,
- 5) Integrate the garbage collected and segregated by the children into CBNABS Pasig River cleaning activity programs.
- 6) Prepare garbage collection and recycling educational program report.

Sewage Engineer (1 month)

- 1) Preparation design, cost estimate, and specification for Water Park plan,
- 2) Discuss with MWSI on how to connect the effluent line to Rapid filter and which STP is appropriate to install,
- 3) Prepare total water park design report.

Annex 7

OUTLINE TERMS OF REFERENCE FOR CONSULTING SERVICES

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1. Introduction

The consultants will be required as a team, to provide the followings: (a) overall advisory support for Project Management; (b) detail designs, topographical and geographical surveys, technical specifications and bid documents for various project components, together with their justification;(c) support for environmental management and impact assessment; (d) support for tendering and construction supervision; (e) support for commissioning and testing the works constructed; and (f) preparation of maintenance/operational manuals and on the job training. The consultants, who will be recruited as a team, will work under the guidance of MWSI, and collaborate to assist PIU, in close cooperation with MWSS, LGUs, DENR, MMDA, and other related agencies and/or NGOs, Church groups, etc.

2. Principal Duties of the Consultant Team

The terms of reference apply to the work to be completed by the consultant team shall be specified respectively for each phase construction schedule, and the principal duties, but not limited to, required to the team are shown hereunder.

2.1 Detail Designs

Based on recommendations on the preparatory survey reports for the sewerage and sanitation improvement projects in Parañaque and Las Piñas Cities, the consultants shall prepare detailed designs necessary for implementing the works proposed for the following:

- a) Sewerage treatment plants,
- b) Sewage sludge treatment plant,
- c) Boost-up pumping stations,]
- d) Manhole pumping stations,
- e) Conversion manholes, and
- f) Inter captor piping lines.

In so doing, they shall ensure that all the required mitigation measures for environmental impacts are included in the detail designs as appropriate.

2.2 Bid for Physical Works

Following the preparation of the detailed designs, the consultants shall undertake the tasks listed below, making sure that all the required mitigation measures are included in the bidding documents, as appropriate:

- a) Preparing bidding documents and other documentation required or deemed necessary for implementing the proposed works for the detailed designs for: (a) Sewerage treatment plants, (b) Sewage sludge treatment plant, (c) Boost-up pumping stations, (d) Manhole pumping stations, (e) Conversion manholes, and (f) Inter captor piping lines;
- b) Preparing detailed cost estimates^{*1}, a program that packages contracts for constructing the works, and implementation schedules to ensure proper coordination and timing between construction and operational activities, such as the timing between constructions of sewage sludge treatment plant.

**1: Detailed cost estimates expressed in pesos should be provided for each year of the project construction period shown in the implementation schedule. This should involve: (a) estimating base prices (including the costs of the required mitigation measures) for each element for each year of implementation in terms of the designing commencement year prices without applying any contingencies, and (b) breaking down costs into local and foreign components.*

2.3 Preparation of EIA and Related Documents

- a) Definition/elaboration of necessary steps for ECC/Permission
The consultants shall define/elaborate the steps that should be taken by MWSI to facilitate effective coordination with relevant agencies in order to secure ECC/permission for implementation of the project.
- b) Project Description of the Investment Project Components
The consultants shall arrange prepare the project description (PD) required for the Sewerage Treatment Systems including whole project components shown in **Section 2.1**.
- c) Scoping of EIA for the Project Components
The consultants shall arrange to prepare for approval of EMB/NCR/DENR a detailed scoping of EIA for the Sewerage Treatment Plants including all components shown in **Section 2.1**.
- d) EIA Report on the Sewerage Treatment Project
 - (a) Collection of background data on land use, traffic (limited to the sewage sludge treatment plant zone), public health, sanitary conditions, water supply, flooding, etc and environment such as air, noise, odor, water quality of surrounding areas of the project sites..
 - (b) Assessing the potential impacts of the project both during construction and during operation, and based hereon, to recommend appropriate mitigation

measures, monitoring plan, institutional arrangements to implement such measures, and training and equipment requirements needed for them; in addition the consultants shall clearly identify all costs for environmental protection so that they could be appropriately incorporated in the project.

- e) Evaluation both positive and negative impacts of the project, in comparison with the situation without the project, paying particular attention to the impacts on water quality of receiving water bodies, including rivers and creeks.
- f) Preparing a monitoring plan that would ensure effective management of the sewage sludge with methane gas storage, offensive odor, and especially during collection and conveying the raw sludge to the host plant, and final treatment dumping.
- g) Documents for Land Compensation and Resettlement
The project implementation plan has considered any land compensation and resettlement to be avoided, however, during the design period, if involuntary land acquisition and resettlements, including those of informal settlers happen to be required by inadvertent incidents, the consultants shall propose a compensation and resettlement scheme and submit it to MWSI for review. If more than 200 families should need to be resettled, the consultants shall prepare and submit a Resettlement Action Plan to MWSI.
- h) EIA Summary
The consultants shall prepare an EIA Summary of the project in accordance with an approval format and submit to MWSI with concurrence to MWSI for disclosure.
- i) Documents to Get Preliminary Assurance of Permission

3 Terms of Reference

The consultants (consultancy firm) shall be recruited for each project implementation phase. That is, the whole project construction period is planned starting from 2013 to 2036, and divided into 4 phases. As such, after time passed, the initial situations and conditions for the project assumed or predicted at the project feasibility study stage, would be possibly changed in aspect of economical, social, regulatory, Government political, etc. Thus consultant duties would not be the same as for the phase 1. TOR for the Phase 1 is outlined hereunder.

INTERNATIONALL CONSULTANTS

A. Project Management and Design Consultant (Team Leader)

Description of Duties

1. Assist the Project Manager with establishment of a project implementation unit capable of recording the physical and financial transaction proposed under the project;
2. Assist the Project Manager with the coordination of the various agencies involved in implementation of the project;
3. Assist the Project Manager with the establishment of an effective reporting system; and with the preparation of regular monthly (short) and quarterly (long) reports for the project including evaluation of the outcomes of the project;
4. Establish a program of works for major civil works and assist PIU in the supervision of design works;
5. Assist PIU to establish tendering and constructing procedures for smaller works in manner which maximizes community and private sector involvement;
6. Identify, co-ordinate and supervise the technical assistance inputs, in the sector;
7. Prepare manuals for guidance of the Project Manager, the utilities company, private entrepreneurs and communities in the effective management and maintenance of sewage and sewage water management systems;
8. Participate in workshops, seminars or other activities as required by the Project Manager in the area of this technical specialization;
9. Supervise the detailed designs of all project system components
10. Help prepare for each physical component of the Project a design report, describing its objectives, issues, options considered and selected, the design proposed, the re-estimated cost and the justification of the component; and prepare project completion report summarizing the project design, changes made during implementation and result achieved;
11. Help prepare specifications and tender documents for international competitive bidding detailing conditions of contract, procedures for calling of tenders, criteria and arrangements for tender evaluation, and arrangements for negotiation and award of contract;
12. Assist Project Manager in identifying and resolving problems and issues, and in keeping the project on schedule and on budget; help ensure that special covenants are met;
13. Help organize and establish the PIU for the construction stage of the project;

help in other institutional development activities;

14. Prepare monthly report summarizing the consultant's activities;
15. Prepare project completion report and validate the next phase staff input plan,
16. Assist in preparation and completion of documents, reports, studies for submission to MWSI, LGUs and other relevant bodies, and;
17. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Qualification in civil engineering with emphasis on sewerage and sanitation. A minimum 20 years experience in design, project management, tendering, contract management, and construction supervision of sewerage treatment system in international development experience.

Input: 24 person months

B. Construction Supervision and Alternate Project Management Consultant

Description of Duties

1. The consultant will overlap with the project management /design consultant and will assist in the preparation of tender documents, tender evaluation, negotiation and award of contract, and will assume the responsibility of project management consultant upon termination of the project management/design consultant;
2. Undertake with the help of other staff of the PIU overall construction supervision, including acting as engineers' representative to the contract, site supervision, materials testing, measurement of monthly payment claims, handling variations to the contract, disputes, claims and certifying monthly payment certificates, substantial completion and maintenance certificates and certifying the final payment certificate;
3. Assist PIU in the design and supervision of minor works associated with the project, including additional side sewer piping works, detouring piping routes, etc.;
4. Support and assist as required with public liaison and provision of technical advice to community development arrangement, such as ABS-CBN Pasig River rehabilitation activity;
5. Provide assistance, technical advice and liaison to LGUs in implementation of the project, and in their institutional development;
6. Assist in procurement activities including the preparation of tender documents, specifications, tendering, bid evaluation, and inspect of;

7. Prepared monthly/quarterly reports for submission to MWSI summarizing the project's activities and;
8. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Qualification in civil engineering with emphasis on sewerage and sanitation. A minimum 15 years experience in design, project management, tendering, contract management, and construction supervision of sewerage treatment system in international development experience.

Input: 30 person months

C. Project Performance Management and Evaluation Specialist

Description of Duties

1. Establish within PIU a project performance management and evaluation system to ascertain the impact of the project on the beneficiaries;
2. Carry out a baseline survey to provide benchmark information against which progress will be measured. The benchmark information will describe the average socio-economic characteristics of target group of typical families and households, and provide information about water supply, sanitation, health and environmental conditions and other relevant socio-economic factors in the areas;
3. Carry out periodic project performance survey to measure achievements under the project objectives;
4. Aggregate and analyze information gathered through the project performance management and evaluation system to be used for planning support service activities;
5. Record and monitor project implementation trends using key indicators;
6. Collect, record and evaluate activity and response data from those assisted under the project;
7. Identify issues and concerns which may require changes in the project design and implementation plans, and communicated these issues and concerns to the PIU;
8. Establish a project performance evaluation system built upon current performance recording and evaluation systems within the delivery organizations such as MWSI which records delivery of inputs and responses;
9. Establish response monitoring and evaluation systems at the community level to provide a framework to monitor the community's participation and

response;

10. Assist in the provision of data to produce various outputs such as (a) production of an operational plan for hygiene and sanitation measures; (b) record of baseline information in the form of a family profile of the current socio-economic conditions of project families;
11. Contribute to preparation of the project performance management and evaluation aspect of the design report for the project;
12. Prepare monthly report summarizing the consultant's activities; and
13. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Socio-economist with a minimum of 15 years experience in designing and implementing project performance management and evaluation programs. International development urban development and social infrastructure projects essential.

Input: 18 person months

D. Sewerage and Sanitation Engineer

Description of Duties

1. Prepare/finalize the detailed engineering design of sewerage treatment systems working closely with the team leader, the sewage water collection specialist, the geotechnical engineer and sewage sludge management specialist;
2. Review on the sewage collection systems with sewer line engineer, finalize positioning of the pumping stations;
3. Prepare the detailed engineering design of the pumping stations;
4. Prepare the technical specifications of sewerage treatment system facilities;
5. Prepare finalized cost estimates of the project;
6. Assist in the preparation of bid documents and provide assistance in the evaluation of bids related to the project works;
7. Provide assistance in the supervision of construction works;
8. Provide assistance in preparing and conducting training related to sewerage treatment systems;
9. Assist in preparation and review of the plant commissioning tests;
10. Contribute to preparation of the design report, and monthly/quarterly report;
11. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Qualification in engineering with specialization in sewerage treatment systems and a minimum 20 years experience in design, preparation of specification and construction supervision of sewerage treatment systems and international development experience essential.

Input: 24 person months

E. Sewage Sludge Management Specialist

Description of Duties

1. Prepare/finalize the detailed engineering design of sewage sludge treatment systems working closely with the team leader, the sewerage and sanitation engineer and the geotechnical engineer.
2. Review on the sewage sludge transportation systems and finalize numbers of the necessary sludge transportation vehicles , prepare specifications and cost estimates ;
3. Prepare the technical specifications of sewage sludge treatment system facilities;
4. Prepare finalized cost estimates of the systems;
5. Assist in the preparation of bid documents and provide assistance in the evaluation of bids related to the project works;
6. Provide assistance in the supervision of construction works;
7. Provide assistance in preparing and conducting training related to sewage sludge treatment systems;
8. Assist in preparation and review of the plant commissioning tests;
9. Contribute to preparation of the design report, and monthly/quarterly report;
10. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Qualification in engineering with specialization in sewage sludge treatment systems and a minimum 20 years experience in design, preparation of specification and construction supervision of sewage sludge treatment systems and international development experience essential.

Input: 10 person months

F. Geotechnical Engineer

Description of Duties

1. Conduct geographical and topographical survey working closely with the

- team leader, the sewerage and sanitation engineer, and the sewer line specialist;
2. Evaluate the results of the geotechnical investigations and based on the evaluation, recommend to the specialists involved in the design works appropriate measures to assure structural/technical soundness of the infrastructure.
 3. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Qualification in engineering with specialization in geographical/topographical survey and a minimum 10 years experience in design, preparation of specification of sewerage treatment systems, and geotechnical investigation and international development experience essential.

Input: 6 person months

G. Sewage Water Collection Specialist

Description of Duties

1. Identify outfall positions and decide the positions of conversion manholes and manhole pumping stations;
2. Finalize the interceptor routes and decide the pipe diameters;
3. Prepare/finalize the detailed engineering design of interceptors, manhole pumping stations and conversion manholes;
4. Prepare the technical specifications of the sewage water collection facilities;
5. Prepare finalized cost estimates of the facilities;
6. Assist in the preparation of bid documents and provide assistance in the evaluation of bids related to the project works;
7. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Qualification in engineering with specialization in sewerage systems and sewage water collection plan and a minimum 10 years experience in design, preparation of specification of sewer line systems, and international development experience essential.

Input: 20 person months

H. Mechanical and Electrical Engineers

Description of Duties

1. Assist in the finalization of the mechanical and electrical aspects of the detailed engineering designs of sewerage treatment systems;
2. Assist in the preparation operations and maintenance manuals;
3. Assist in the preparation of bid documents and provide assistance in the evaluation of bids related to the project works;
4. Provide assistance in the supervision of construction works;
5. Assist in preparation and review of the plant commissioning tests;
6. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Qualification in engineering with specialization in mechanical and electrical systems and a minimum 15 years experience in design, preparation of specification and construction supervision of mechanical and electrical facilities and international development experience essential.

Input: 16 person months

I. Environmental Engineer

Description of Duties

1. Prepare a detailed environmental monitoring plan (EMP) that incorporates in JICA Guideline of Social and Environmental Consideration;
2. Suitably modify this guideline to be fully responsive to all relevant laws, regulations and directives pertaining to environmental monitoring;
3. Work with the procurement and contracting specialists to ensure that the guidelines specified in the EMP is suitably reflected in the project bidding documents, TORs and contracts financed under the project;
4. Define/elaborate the steps that should be taken by MWSI to facilitate effective coordination with relevant agencies in order to secure ECC/permission for implementation of the project.
5. Arrange prepare the project description (PD) required for the Sewerage Treatment Systems including whole project components;
6. Arrange to prepare for approval of EMB/NCR/DENR a detailed scoping of EIA for the Sewerage Treatment Plants including all components;
7. Prepare EIA Report on the Sewerage Treatment Project;
8. Evaluation both positive and negative impacts of the project, in comparison with the situation without the project, paying particular attention to the impacts on water quality of receiving water bodies, including rivers and

creeks;

9. Prepare a monitoring plan that would ensure effective management of the sewage sludge with methane gas storage, offensive odor, and especially during collection and conveying the raw sludge to the host plant, and final treatment dumping;
10. Prepare an EIA Summary of the project in accordance with an approval format and submit to MWSI with concurrence to MWSI for disclosure;
11. Prepare documents to Get Preliminary Assurance of Permission
12. Other tasks as assigned by the Project Manager.

Qualifications and Experience: Environmentalist with a minimum 15 years experience in planning, development and implementation of environmental protection programs. Expertise in environmental inspection, monitoring, and auditing including defining appropriate procedures and mechanisms for dealing with infringement necessary.

Input: 16 person months

LOCAL CONSULTANTS

A. Project Management/Engineering Specialist (Deputy Team Leader_36 person-months)

The local project management/engineering specialist will work closely with the international team leader to: (a) ensure that all planning, coordination, and implementation of the project activities area carried out according to plan, and reflect the relevant policies, procedures and the guidelines of JICA, (b) serve as liaison between PIU, PSC (Project Steering Committee) and LGUs, (c) monitor the progress of all project activities and advise the team leader of any potential discrepancies between planning and implementation, and (d) work with team leader and relevant consultants to prepare quarterly and annual reports meeting the requirements of the donor (s), (e) Assist team leader to prepare completion report and validate the next phase staff arrangement.

B. Contract and Procurement Specialist (20 person-months)

The local contract and procurement specialist will work with the international team leader and the other international specialists to : (a) ensure that all project procurement and contracting strictly follows MWSI, GOV and JICA procedures

for open and transparent procurement, (b) be accountable for ensuring that procurement procedures reflect the highest degree of probity, transparency, economy and efficiency, (c) help PIU prepare supporting documentation (TORs, budget estimates, bidding documents) to be sent to short-listed firms, (d) prepare proposal evaluation guidelines and scoring sheets.

C. Sewerage Treatment System Design Engineer (16 person-months)

The local sewerage treatment system design engineer will work closely with the team leader and the international sewerage and sanitation engineer to: (a) prepare/finalize the detailed engineering design of sewerage treatment system facilities, (b) prepare the technical specifications of the facilities, (c) prepare finalized project cost estimates, (d) assist in the preparation of bid documents and provide assistance in the evaluation of bids related to the sewerage treatment facilities, and (e) provide assistance in the supervision of construction works;

D. Sewerage Treatment Plant Operation and Maintenance Engineer (12 person-months)

The local sewerage treatment plant operation and maintenance engineer will work closely with the team leader, international sewerage and sanitation engineer, sewage sludge management specialist, and international and local mechanical and electrical engineers to: (a) assist finalizing the detailed engineering designs, particularly in aspect of identifying the most appropriate design or minimizing operation and maintenance costs, (b) prepare operation and maintenance manuals, and (c) assist in the preparation of annual operation and maintenance budgets;

E. Mechanical and Electrical engineers (8 person-months)

The local mechanical and electrical engineer will work closely with the international mechanical and electrical engineers to: (a) assist in the finalizing the detailed engineering designs, (b) prepare cost estimates of mechanical and electrical equipment, and (c) assist in the preparation operation and maintenance manuals;

F. Geotechnical Engineers (8 person-months)

The local geotechnical engineers will work closely with the international and local sewerage and sanitation engineer, sewage sludge management specialist, geotechnical engineer, and sewage water collection specialist to: (a) evaluate the results of the geographical investigations, and (b) based on the evaluation results, recommend the specialists involved in the design works appropriate measures to assure structural/ technical soundness of the infrastructure design;

G. Sewer Lines Design Engineers (40 person-months)

The local sewer lines design engineers will work closely with the international sewer lines design engineers to: (a) identify outfall positions and decide the positions of conversion manholes and manhole pumping stations, (b) finalize the interceptor routes and decide the pipe diameters, (c) prepare/finalize the detailed engineering design of interceptors, manhole pumping stations and conversion manholes, (d) prepare the technical specifications of the sewage water collection facilities, (e) prepare finalized cost estimates of the facilities, (f) assist in the preparation of bid documents and provide assistance in the evaluation of bids related to the project works, and (g) other tasks as assigned by the Project Manager.

H. Architectural Engineers (24 person-months)

The local architectural engineers will work closely with the team leader, the international sewerage and sanitation engineers and the sewage sludge management specialist to: (a) prepare detailed designs of sewerage treatment plants buildings, (c) prepare technical specifications and cost estimates of the buildings, and (c) assist to prepare bid documents.

I. Construction Costing Engineer (16 person-months)

The local construction costing engineer will work closely with the team leaders and the local civil and construction supervisor to: (a) all project financed construction is done strictly according to plans, contracts and accepted engineering construction practice in Philippines, and (b) full records of all assets being built are properly maintained (daily reports of contractor activities, quantities of goods and materials used).

J. Construction Supervisors (30 person-months)

The local construction supervisor will work closely with the team leader to: (a) closely monitor the day-to-day progress of the civil works construction and ensure that the works are undertaken in accordance with approved plans and specifications, (b) inspect materials delivered on the site to determine if they are in accordance to the required technical standards, (c) take samples of materials used in construction to be tested in the materials testing laboratory, (d) measure the amount work done by civil works contractors to determine if they are consistent with claims for progress payments, (e) evaluate contractors' requests for deviations from or variations in the contract plans and specifications, (f) ensure safety of personnel and materials at the subproject sites (if any), and (g) full records of work progress, important progress mile stones, and operations are smoothly carried out to the satisfaction of the client.

SPACE AND LOGISTIC REQUIREMENT

The office and laboratory space, furnishings, appliances, design and construction supervision equipment, computers and other logistic needs of the consultants will be specified by the consultant, and the inputs available at present assessed. To the extent that such inputs are not available, provision will be made for them in the consultants' proposal.

Attached:

Estimated Inputs for Engineering Design and Supervision

Attachment Estimated Inputs for Engineering Design and Supervision								
	Position	No of Staff	Person-Months			Travel Times		Per Diem (Days)
			Foreign	Local	Total	Int'l (Air)	Car-month	
1	Consultants							
	International							
	Project Management and Design Consultant (Team Leader)	1	24		24	6		600
	B. Construction Supervision and Alternate Project Management Consultant	1	30		30	5		840
	Project Performance Management and Evaluation Specialist	1	18		18	2		480
	Sewerage and Sanitation Engineer	1	24		24	10		600
	Sewerage Sludge Management Specialist	1	10		10	3		150
	Geotechnical Engineer	1	6		6	2		300
	Sewage Water Collection Specialist	1	20		20	4		540
	Mechanical and Electrical Engineers	1	16		16	3		360
	Environmental Engineer	1	16		16	2		300
	SUBTOTAL	9	164		164	37		4170
	Local							
	Project Management/Engineering Specialist (Deputy Team Leader)	1		36	36			
	Contract and Procurement Specialist	1		20	20			
	Sewerage Treatment System Design Engineer	1		16	16			
	Sewerage Treatment Plant Operation and Maintenance Engineer	1		12	12			
	Mechanical and Electrical engineers	2		8	8			
	Geotechnical Engineers	3		8	8			
	Sewer Lines Design Engineers	3		40	40			
	Architectural Engineers	2		24	24			
	Construction Costing Engineer	1		16	16			
	Construction Supervisors	2		30	30			
	SUBTOTAL	17		210	210			
	TOTAL (CONSULTANTS)		164	210	374	37		4170
2	Support Staff							
	Draft persons	2		40	40			
	Secretary	1		36	36			
	Driver 1	1		36	36		36	
	Driver 2	1		36	36		36	
	TOTAL (SUPPORT STAFF)	5		148	148		72	
3	Total Cost Estimates (Unit: US 1,000)							
	Foreign Engineers remuneration (US 18,800/m)		3,083					
	Per-diem Allowance (US 3,880/m)							539
	International Trip (US 1,200/round)					44		
	Local Engineers Remuneration (US 4,700/m)			987				
	Support Staff cost (US 700/m)			104				
	Office cost (US 4,700/m including room charge, 3 years)	169						
	Rental Cars fee (US 950/unit)						68	
	Total Sum (in US)		4,995					
	Note:							
	Conversion Rate: 1US=85 J¥ 1US =43Php							

Annex 8

PROJECT BUDGET BREAKDOWN WITH EACH PHASE BUDGET BREAK DOWN

1 .Overall Project Budget Breakdown

Phase 1~Phase 4 Total										(Unit: million)
Breakdown of Cost	Foreign Currency Portion(JPY)			Local Currency Portion(Php)			Total(JPY)			
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others	
Sewerage Treatment system Construction works Ph-4(Civil)	0	0	0	6,441	6,441	0	12,238	12,238	0	
Sewer Collection system Construction works Ph-4(Civil)	0	0	0	1,129	910	219	2,145	1,730	416	
Plant Facilities Installation works Ph-4	0	0	0	9,396	9,396	0	17,852	17,852	0	
Equipment and Materials Procurement	0	0	0	2,412	1,284	1,129	4,584	2,439	2,145	
Price Escalation	0	0	0	6,109	5,688	421	11,607	10,808	799	
Physical Contingency	0	0	0	2,606	2,429	177	4,952	4,616	336	
Consulting Services	1,750	1,750	0	814	814	0	3,296	3,296	0	
Land Acquisition	0	0	0	3,123	0	3,123	5,935	0	5,935	
Administration Cost	0	0	0	1,341	0	1,341	2,548	0	2,548	
VAT	0	0	0	3,529	0	3,529	6,706	0	6,706	
Import Tax	0	0	0	0	0	0	0	0	0	
Interest during construction	989	0	989	0	0	0	989	0	989	
Commitment Charge	378	0	378	0	0	0	378	0	378	
Total	3,117	1,750	1,367	36,901	26,962	9,939	73,229	52,978	20,251	

2. Phase 1

Phase 1							(Unit: million)		
Breakdown of Cost	Foreign Currency Portion(JPY)			Local Currency Portion(Php)			Total(JPY)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Sewerage Treatment system Construction works Ph-1(Civil)	0	0	0	2,491	2,491	0	4,733	4,733	0
Sewer Collection system Construction works Ph-1(Civil)	0	0	0	219	0	219	416	0	416
Plant Facilities Installation works Ph-1	0	0	0	2,534	2,534	0	4,815	4,815	0
Equipment and Materials Procurement Ph-1	0	0	0	355	0	355	674	0	674
Price Escalation	0	0	0	1,878	1,699	179	3,567	3,227	340
Physical Contingency	0	0	0	805	730	75	1,529	1,386	143
Consulting Services	437	437	0	203	203	0	823	823	0
Land Acquisition	0	0	0	90	0	90	170	0	170
Administration Cost	0	0	0	375	0	375	713	0	713
VAT	0	0	0	1,087	0	1,087	2,065	0	2,065
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	300	0	300	0	0	0	300	0	300
Commitment Charge	113	0	113	0	0	0	113	0	113
Total	849	437	412	10,036	7,657	2,380	19,918	14,984	4,934

3. Phase 2

Phase 2							(Unit: million)		
Breakdown of Cost	Foreign Currency Portion(JPY)			Local Currency Portion(Php)			Total(JPY)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Sewerage Treatmentsystem Construction works Ph-2(Civil)	0	0	0	1,722	1,722	0	3,272	3,272	0
Sewer Collection system Construction works Ph-2(Ci8vil)	0	0	0	345	345	0	656	656	0
Plant Facilities Installation works Ph-2	0	0	0	2,481	2,481	0	4,715	4,715	0
Equipment and Materials Procurement Ph-2	0	0	0	774	0	774	1,470	0	1,470
Price Escalation	0	0	0	1,630	1,388	242	3,096	2,637	459
Physical Contingency	0	0	0	695	594	102	1,321	1,128	193
Consulting Services	438	438	0	203	203	0	824	824	0
Land Acquisition	0	0	0	421	0	421	800	0	800
Administration Cost	0	0	0	340	0	340	646	0	646
VAT	0	0	0	942	0	942	1,790	0	1,790
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	242	0	242	0	0	0	242	0	242
Commitment Charge	93	0	93	0	0	0	93	0	93
Total	773	438	335	9,554	6,734	2,820	18,926	13,233	5,693

4. Phase 3

Phase 3							(Unit: million)		
Breakdown of Cost	Foreign Currency Portion(JPY)			Local Currency Portion(Php)			Total(JPY)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Sewerage Treatment system Construction works Ph-3(Civil)	0	0	0	1,432	1,432	0	2,720	2,720	0
Sewer Collection system Construction works Ph-3(Civil)	0	0	0	380	380	0	722	722	0
Plant Facilities Installation works Ph-3	0	0	0	2,830	2,830	0	5,377	5,377	0
Equipment and Materials Procurement Ph-3	0	0	0	775	775	0	1,472	1,472	0
Price Escalation	0	0	0	1,666	1,666	0	3,166	3,166	0
Physical Contingency	0	0	0	708	708	0	1,346	1,346	0
Consulting Services	438	438	0	203	203	0	824	824	0
Land Acquisition	0	0	0	1,526	0	1,526	2,900	0	2,900
Administration Cost	0	0	0	390	0	390	741	0	741
VAT	0	0	0	951	0	951	1,807	0	1,807
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	286	0	286	0	0	0	286	0	286
Commitment Charge	109	0	109	0	0	0	109	0	109
Total	833	438	395	10,862	7,995	2,867	21,471	15,628	5,844

5. Phase 4

Phase 4							(Unit: million)		
Breakdown of Cost	Foreign Currency Portion			Local Currency Portion			Total		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Sewerage Treatment system Construction works Ph-4(Civil)	0	0	0	796	796	0	1,513	1,513	0
Sewer Collection system Construction works Ph-4(Civil)	0	0	0	185	185	0	351	351	0
Plant Facilities Installation works Ph-4	0	0	0	1,550	1,550	0	2,945	2,945	0
Equipment and Materials Procurement Ph-4	0	0	0	509	509	0	967	967	0
Price Escalation	0	0	0	935	935	0	1,777	1,777	0
Physical Contingency	0	0	0	398	398	0	755	755	0
Consulting Services	438	438	0	203	203	0	824	824	0
Land Acquisition	0	0	0	1,087	0	1,087	2,064	0	2,064
Administration Cost	0	0	0	236	0	236	448	0	448
VAT	0	0	0	549	0	549	1,043	0	1,043
Import Tax	0	0	0	0	0	0	0	0	0
Interest during construction	161	0	161	0	0	0	161	0	161
Commitment Charge	64	0	64	0	0	0	64	0	64
Total	662	438	225	6,448	4,577	1,871	12,914	9,133	3,780