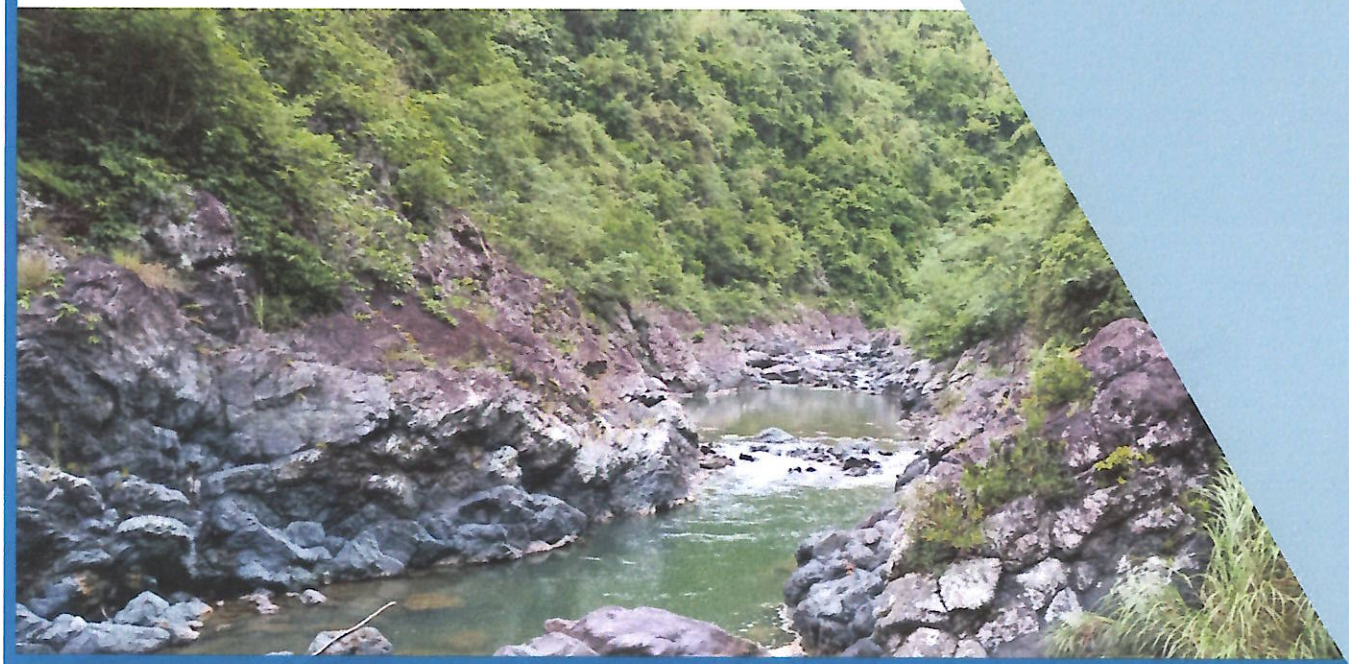

EXECUTIVE SUMMARY FOR THE PUBLIC (2020)

UPPER WAWA DAM:
WAWA BULK WATER SUPPLY PROJECT

Antipolo City and Municipalities of San Mateo and Rodriguez

Province of Rizal

aperçu CONSULTANTS INC.

WawaJVCo INC.

EXECUTIVE SUMMARY

FOR THIS PUBLIC

(2020)

UPPER WAWA DAM:

WAWA BULK WATER SUPPLY PROJECT

Anticipated City and Municipalities FY 3 on Metrics and Roadmaps

Prepared by Nissan

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EXECUTIVE SUMMARY FOR THE PUBLIC

1.0 PROJECT FACT SHEET

Name of Project	:	Wawa Bulk Water Supply Project – Upper Wawa Dam Component	
Project Location	:	Rizal Province - City of Antipolo and Municipalities of San Mateo and Rodriguez	
Project Type/ Nature	:	Infrastructure: Dam	
Proposed Installed Capacity	:	518 MLD	
Summary of Major Components	:	Major Components	Brief Description
		Upper Wawa Dam, Spillway and Reservoir	**Type**: Earth Core Rockfill Dam (ECRD) or Roller Compacted Concrete (RCC) **Spillway type:** Gated Ogee weir with open air chute channel **Energy Dissipation**: Ski jump with Deflector with an Excavated plunge pool **Crest Level:** EL 140.0 m ASL **Full Supply Level (FSL):** EL 135.0 m ASL **Minimum Operating Level (MOL):** EL 87.0 m ASL **Maximum Water Level:** EL 135.0 m ASL **Spillway Design flood**: PMF (7,300 m^3/s) **Inundated Area at FSL:** 414.28ha **Inundated Area at MOL:** 74.33ha **Dam Height (above riverbed):** 84 m **Dam Crest Length:** 425 m **Drainage Area**: 258 km^2 **Number of Bays:** 4 **Ogee level**: 121.70 m **Gate Type**: Radial gates with flap gates **Number of gates:** 4 **Spillway Check Flood:** Probable Maximum Period **Spillway Design Flood:** 10,000 years Return Period
		Pumping Station	Type: Wet Pit, circular shape, 3 pits Pump Type: Vertical Turbine Type Number of Pumps: 6 (4 100% operating, 2 stand-by) Pump Capacity: 1.5m^3/s each, net head ≥100 m
		Conveyance Pipe	From: Pump Station To: Calawis WTP (to be developed by MWC) Approximate Length: 3,480m Diameter: 1800mm Type: Buried Steel Pipe
Commercial Operation Date	:	December 31, 2025	
Name of Proponent	:	WawaJVCO, Inc.	
Address	:	16th F, Three E-Com Center, Mall of Asia Complex, Pasay City	
Contact Details	:	Telephone No.: (02) 396 5320 E-mail Address.: mjtan@primemetroinfra.com	
Proponent Authorized Representative	:	Mr. Melvin John M. Tan Authorized Representative	

WawaJVCo, Inc. (WawaJVCo) prepared an Environmental Impact Statement (EIS) for the application of an Environmental Compliance Certificate (ECC) for the Wawa Bulk Water Supply Project – Upper Wawa Dam Component or UWD Project. The UWD Project has a dam type of Earth Core Rockfill Dam (ECRD) or Roller Compacted Concrete (RCC), with a water storage capacity of 120.1 million cubic meters (MCM) and produces at least 518 million liters of water per day (MLD). It is one of the three project components of the Water Bulk Supply Project - located in Region 4A, along with the Tayabasan Basin System (along Tayabasan River) and the Water

Treatment Plant & Transmission System (located in Barangay Calawis, to be developed by Manila Water Company or MWC).

The Wawa Bulk Water Supply Project is one of the Flagship Infrastructure Projects of the national government and is approved by the National Economic and Development Authority (NEDA). The UWD Project is under DAO 2019-16 otherwise known as Streamlining the EIA Process and Requirements for Projects under the Build, Build, Build Program and currently listed in no. 78 of the Infrastructure Flagship Projects included in the "Build Build Build Program" of the government.

The Upper Wawa Dam Component has an estimated catchment area of 242 km^2. It will involve the construction of an 84-meter high dam with a storage capacity of 120.1 MCM for water supply. Along with it is a proposed flood control component that can hold 43.7 MCM of flood water. Raw water from the proposed dam will be pumped to the Calawis Water Treatment Plant to be developed by Manila Water Company. Generally, the project aims to address the increasing water demand and flood concerns in Metro Manila.

2.0 PROJECT PROPONENT

WawaJVCo is a joint venture between Prime Metroline Infrastructure Holdings Corporation (Prime Infra) and San Lorenzo Ruiz Builders (SLRB), passed by the Philippine Competition Commission (PCC) in Commission Decision No. 41-M-049/2017 on 19 December 2017. It was established to develop the Wawa Bulk Water Supply Project which was approved by the Metropolitan Waterworks and Sewerage System (MWSS) Board of Trustees on 14 November 2019.

3.0 PROJECT DESCRIPTION

3.1 Project Location, Area and Accessibility

The proposed Upper Wawa Dam Component will be located in the Province of Rizal, specifically in Barangay Calawis in Antipolo City, Barangay Pintong Bukawe in San Mateo, and Barangay San Rafael in Rodriguez (**Figure 1**). The project is geographically located at latitude 14°42'4.11"N and longitude 121°12'5.20"E and is within the Upper Marikina River Basin Protected Landscape (UMRBPL), which is a protected area under the category of protected landscape by Presidential Proclamation No. 296, dated 24 November 2011. The project reservoir will cover six (6) river systems: Wawa River, Montalban River, Boso-Boso River, Payagwan River, Tayabasan River, and Sapa Bute-Bute River.

The Indigenous Peoples (IPs) that inhabit the project area are the Dumagat/Remontados. The IPs on the side of Rodriguez Municipality have been granted a Certificate of Ancestral Domain Title (CADT), while those in Barangay Calawis, Antipolo City are recognized by the National Commission on Indigenous Peoples (NCIP) as covered by the Antipolo City Ancestral Domain. WawaJVCo is currently in the advance stages of the Free, Prior and Informed Consent (FPIC) process with NCIP for the project's first component. The proponent already signed a Memorandum of Agreement (MOA) for the Antipolo Ancestral Domain and is already scheduled to conduct the MOA Negotiation for the Montalban Ancestral Domain.

The project site may be accessed by vehicles coming from Aurora Boulevard corner Katipunan Avenue, Quezon City via Marcos Highway for about 20km. From Marcos Highway, two roads (about 3 km apart) relative to the project area exist: the Calawis Road (eastern route) and the Pintong Bukawe Road (western route). The Pintong Bukawe Road is the current access to the Upper Wawa Dam and ends at Sitio Casili. To access the dam area, one must cross the river by foot during the dry season or via bamboo boat during the wet season. The Calawis Road, on the other hand, gives access to the tail-end of the reservoir along the Tayabasan and Sapa Bute Bute River, which are both located in Barangay Calawis.

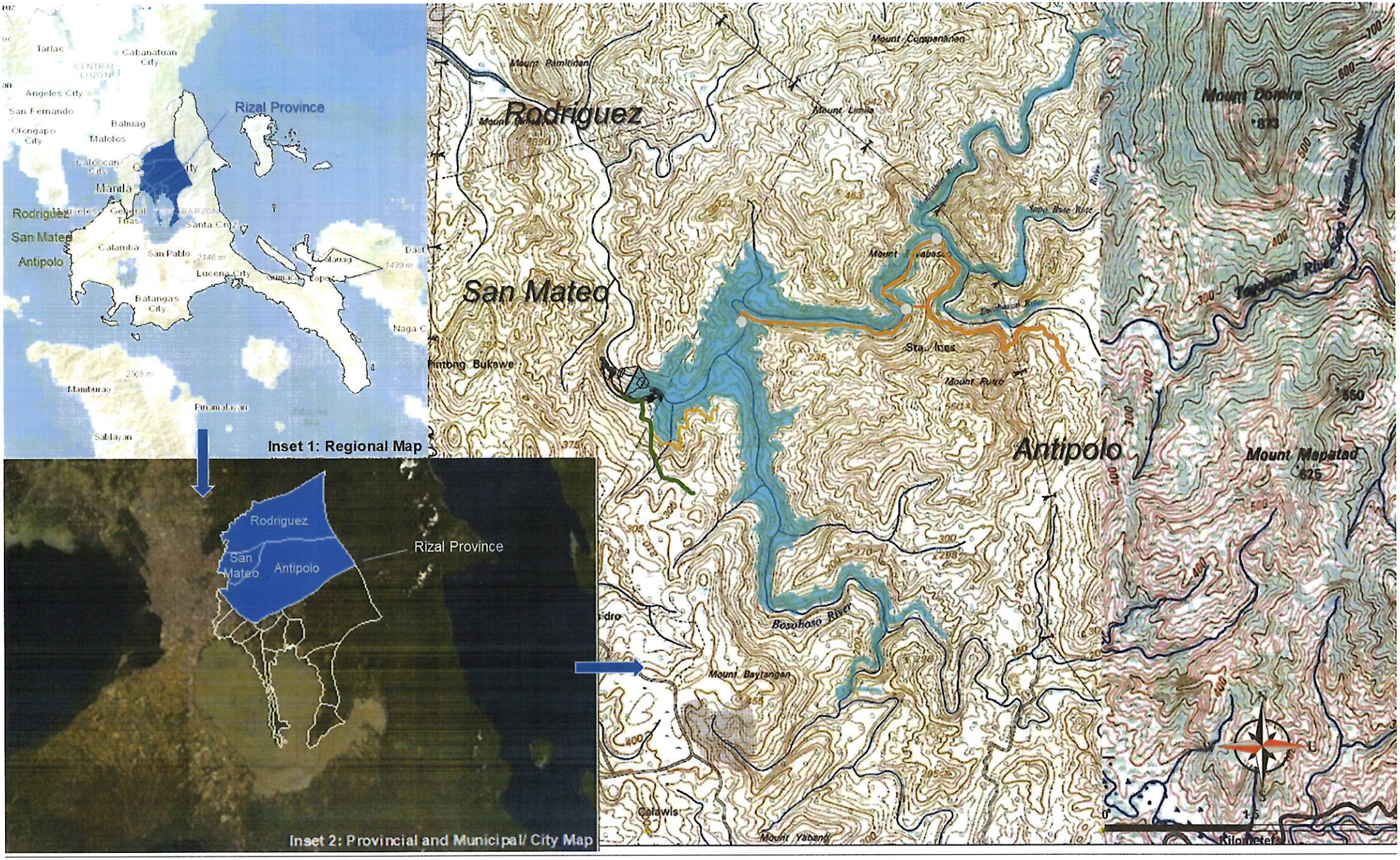

Figure 1. Location of the Project

ENVIRONMENTAL IMPACT STATEMENT

Wawa Bulk Water Supply Project – Upper Wawa Dam

Legend

- Pump Station
- Transmission Pipeline via Tunnel Optional
- UWD Optional Access Road (New)
- UWD Access Road (Original)
- Access Road to WTP / Transmission Pipe
- UWD Dam and Diversion Tunnel
- Transmission / Water Conveyance Pipeline
- UWD Reservoir

DATA INFORMATION/SOURCE:

Project Components: Wawa JVCO, Inc. (2020)
Basemap: NAMRIA Topographic Map:
Sheet 3230-III Quezon City and Sheet 7272-II Baras
Created by: APERCU CONSULTANTS, INC (2020)

WawaJVCo INC.

apercu CONSULTANTS INC.

SCALE: 1: 30,000 | PAGE: 4

3.2 Project Type and Process/Technology

Dam was chosen as the best technology option for this project as it can produce and store large amounts of water that can sustain the increasing demand of water supply in the Philippines. Developing a dam in areas with inadequate water supply would not only significantly improve the amount of water that can be sourced but would also serve as a barrier to reduce the impact of upcoming calamities such as floods around the area.

The UWD Project has a dam type of Earth Core Rockfill Dam (ECRD) or Roller Compacted Concrete (RCC). The reservoir of the project will have a surface area of approximately 414.28 hectares, extending 8.2 km upstream and can store about 120.1 MCM of water.

The dam was designed to convey water from the reservoirs through the pumping stations and conveyance pipeline with a designated delivery point called "Interface Point" near the Calawis Water Treatment Plant (CWTP). Based on water demand, the flow to be conveyed to the CWTP would be 518 MLD. The pumping stations will have a guaranteed flow capacity of 518 MLD in normal capacity and 259 MLD for additional back-up/standby. Using a vertical turbine, the pump station can deliver the raw water from the reservoir up to the interface point at CWTP through conveyance pipeline. By pumping water from the reservoir, the project will supply raw water to CWTP (which will be managed by Manila Water Company in Barangay Calawis in Antipolo, Rizal) for treatment and will then be supplied to consumers during periods of peak consumption. The overall process of the Project is shown in **Figure 2**.

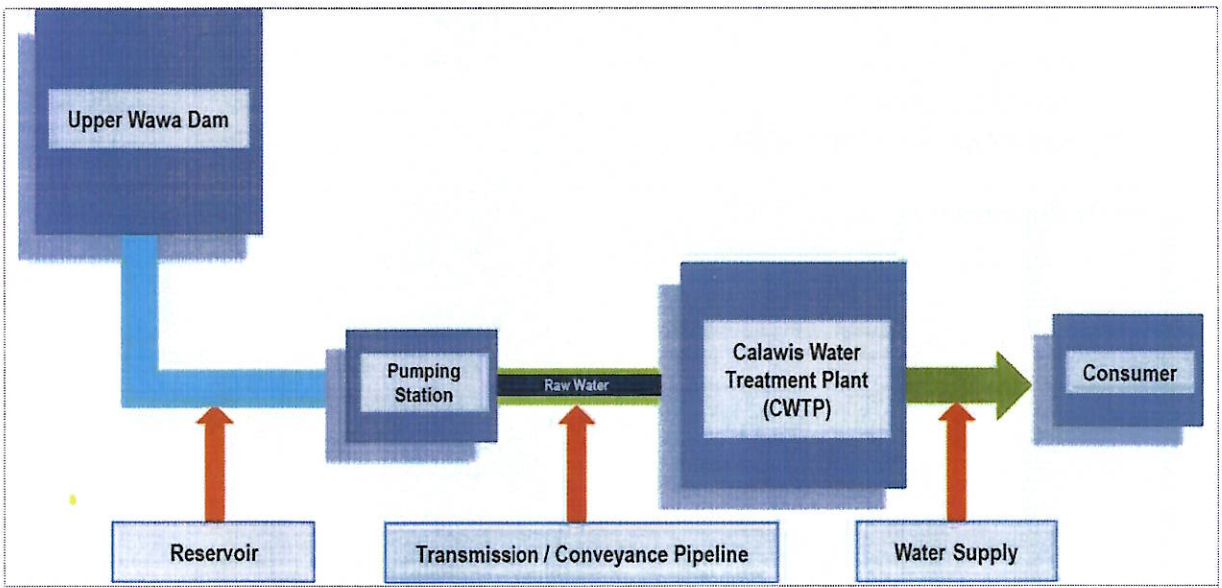

Figure 2 – Schematic Diagram of the Upper Wawa Dam Project

3.3 Project Components

3.3.1 Dam

The Earth Core Rockfill Dam (ECRD) will include a central clay core with a watertight material. The upstream and downstream of the clay core is a fine filter (2A zone) followed by a coarse filter/drain (2B zone) which are designed to accommodate the drainage of water towards the downstream and prevent transfer of material through the dam and possible washout and piping mechanisms development that could lead to dam breach. The general description of the zones is presented in **Table 1** below.

Table 1
Dam Zones Description

Zone	Component	Description
Zone 1	Core Design	Impervious earth fill – selected lateritic soil or hardfill in case of a Roller Compacted Concrete (RCC) Dam
Zone 2A	Filter Design	Filter zone to prevent the migration of materials between different zones, such as core and shell
Zone 2B	Drainage Design	Transition/drainage zone. Selected rockfill from quarry
Zone 3	Shell Design	Best quality higher strength rock, compacted to provide section stability
Zone 4	Riprap	Rock blocks from quarry, to act as erosion protection on the upstream and downstream face of the dam. For durability reasons the rock type will be based on ongoing geotechnical investigations

3.3.2 Spillway

The Spillway is a gated control spillway, a free surface conveyance structure and a dissipation structure. The spillway's axis location is chosen carefully to ensure a safe and reliable release of flows downstream, and to avoid excessive excavations. It will be able to operate, fully or partially, after an earthquake event with up to 10.000 years return period. This spillway allows the discharge of Probable Maximum Flood (PMF) of 7,300m³/s. The works comprising the Spillway Structure are divided in five (5) parts (**Figure 3**):

- The approach channel;
- The control structure;
- The transition chute,
- The steep chute; and,
- The energy dissipation structure.

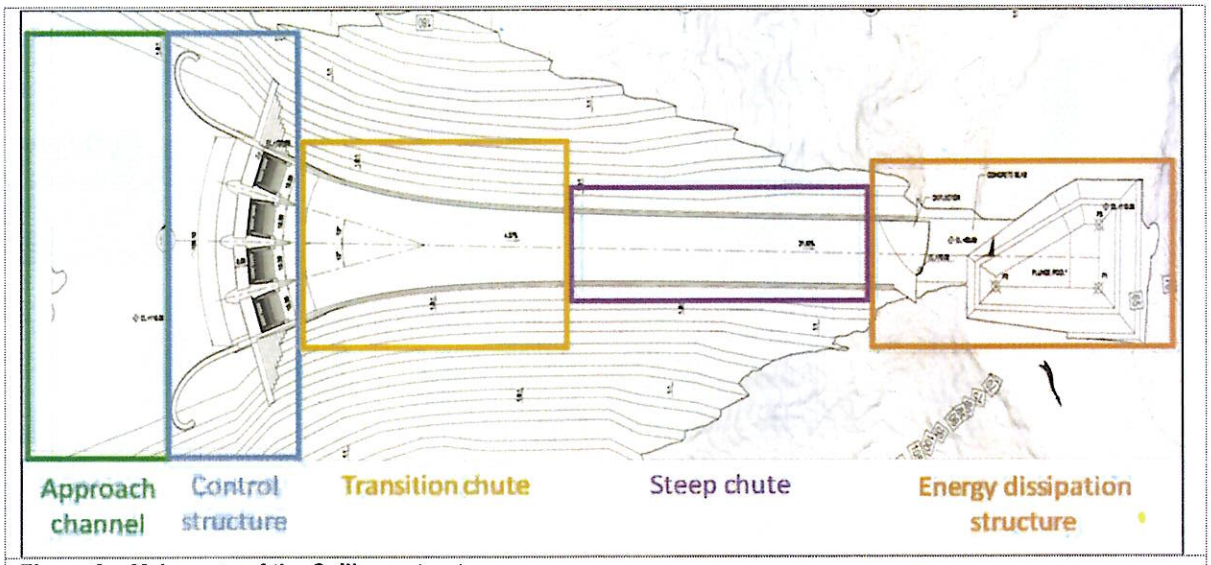

Figure 3 – Main parts of the Spillway structure
Source: Tender Design Report by Tractebel, June 2020.

3.3.3 Reservoir

The dam will impound a reservoir that will have a Full Supply Level (FSL) of 135 meters above sea level (masl). At the FSL, the reservoir will have a surface area of approximately 414.28 hectares extending 8.2km upstream and with water holding capacity of 120.1 MCM. The reservoir will cover six (6) river systems: Wawa River, Montalban River, Boso-Boso River, Payagwan River, Tayabasan River and Sapa Bute-Bute River.

3.3.4 Pumping Station

A pumping station is required to deliver the water from the reservoir through conveyance pipeline up to the interface point at CWTP. The pumping station that will be developed for this project will have a capacity of 777 MLD (518 MLD for normal service capacity and 259 MLD for standby/backup capacity) to cope up with water supply generation. The pump will have a characteristic total dynamic head (TDH) of the networks which include the geometrical height and the friction losses in the rising main pipes.

3.3.5 Transmission / Water Conveyance Pipeline

The transmission or conveyance pipeline will be buried in a trench pipeline, with a probable tunneled portion. The pipeline follows a route from the pumping station to Calawis Treatment Plant at the edge of the canyon. This route will be above the elevation of the reservoir to provide access to the pumping station for operation and maintenance reasons all over the year. The pipeline will have a 3.474 km long road and will be placed under the access road, from pumping station to Calawis WTP.

The characteristics for the pumping station and conveyance pipeline are shown below:

Table 2
Characteristics of Pumping Station and Transmission Pipeline

Pumping Station	
Type	Wet Pit, circular shape, 3 pits
Pump Type	Vertical Turbine Type
Number of Pumps	6 (4 100% operating, 2 stand-by)
Pump Capacity	1.5m³/s each, net head ≥100 m
Operating Levels	
Maximum operating level	135 masl
Mean operating level	120 masl
Minimum operating level	87 masl
Calawis water level in flocculation tank	164.5 masl
Conveyance Pipeline	
From	Pump Station
To	Calawis WTP (to be developed by MWC)
Approximate Length	3.474 km
Type and size of Transmission Pipe	Buried Steel Pipe, Dia. 1800mm

3.4 Resource Utilization

The Project has chosen the Wawa Basin, specifically the Wawa River, because of its viability and potential as a water supply source. The Upper Wawa Dam in the Wawa Basin will be a good source of water for the increasing demand of water supply in Manila. No other water sources alternatives were thoroughly studied to be developed, as those alternative sources will either not yield the required 518MLD requirement and supply raw water to the offtake delivery point (MWC's CWTP) or will be able to provide the 518MLD requirement but will require higher operation and maintenance (O&M) costs.

The source of electricity for the pumping stations will be supplied by power tapping from the grid through a 34kV overhead line. A 12 MVA outdoor MV/LV transformer will be installed close to the pump station to supply power to the pumps and associated equipment. The overhead line will be able to transport the 12 MVA serviced to the pump station, the control building and around area. The project intends to open quarry areas as source of aggregate rocks for concrete to be used for construction of the project components.

WawaJVCo is set to prioritize qualified residents from Barangay Calawis, Barangay San Rafael, Barangay Pintong Bukawe, Antipolo City, Municipality of Rodriguez and Municipality of San Mateo for the project's

manpower requirements which are anticipated to be approximately 1,000 personnel during the construction phase and around 40 personnel during the operation phase.

3.4 Project Alternatives

Table 3 shows the summary of project alternatives considered for the Upper Wawa Dam Project.

Table 3
Summary of Project Alternatives Considered

Environmental Aspects	Major Criteria	Description
Site Location	Wawa River in Rizal Province	▪ The Proponent has an existing water permit for the area/ river. ▪ No alternative location was considered, since the Wawa River within the project is already identified as a great source of water. ▪ The location of the water treatment plant to be developed by MWC is already fixed which is also agreed to be the delivery offtake point of the UWD Project.
Design	Capacity Dam Type Spillway	▪ The water storage will have a capacity of 120.1 MCM that produces at least 518 MLD. ▪ An Earth Core Rockfill Dam (ECRD) structure or a Roller Compacted Concrete (RCC) dam structure will be built to maintain the project's stability. ▪ The spillway will allow the discharge of PMF flood with a discharge of 7,300m³/s.
Source Alternatives		▪ No other alternative sources of water can yield the 518 MLD capacity requirement in the Offtake agreement.
Technology/ Operation Processes	Chosen type of technology: Dam	Dam is considered to be more reliable because of the following: ▪ It produces and stores high amount of water per day that can sustain water supply demands ▪ It Can accommodate stronger cyclic loading of bigger intensities and is less demanding in terms of foundation quality. ▪ It is capable of providing processed clean water to both urban and rural areas. ▪ It provides flood control benefits. Dam also has greater advantage because: ▪ It is the best technology option to sustain the demand of water supply in the Philippines. ▪ It is capable of providing water supply services that can support irrigation systems. ▪ It has a reliable and efficient functioning of water supply.
Environmental Conditions		▪ It is prone to moderate impact from earthquake-induced slope instability considering the terrain and slope of the project area. ▪ There is no active faults in the project area, and therefore, no threat from fault ruptures. ▪ It has low liquefaction potential since the project area is underlain by competent bedrock. ▪ No ground rupture is expected. ▪ Since the location of the project site is located far away from a volcano (Mt. Taal) and coastal areas, low level of threat was considered from volcanic hazard and tsunami.

4.0 PROJECT IMPACT AREA AND ANALYSIS OF KEY ENVIRONMENTAL IMPACTS

The Project's identified primary impact areas will include areas where the infrastructure components will be sited, as well as surface areas to be inundated as a result of building a dam along the Wawa River (**Table 4**). These also include areas that will be used to set up temporary facilities (e.g. office, workers' camp, motor pool area, staging areas) and stockpile of spoil materials.

Table 4
Location of Primary Impact Areas

Infrastructure	Barangay	Municipality
Dam	San Rafael	Rodriguez
Spillway	San Rafael	Rodriguez
Pumping Stations	San Rafael	Rodriguez
Transmission / Conveyance Pipeline	San Rafael to Calawis	Rodriguez to Antipolo
Diversion Tunnels	San Rafael	Rodriguez
Access roads	Pintong Bukawe and San Rafael	San Mateo and Rodriguez
Temporary Facilities		
• Quarry 1	San Rafael	Rodriguez
• Quarry 2	San Rafael	Rodriguez
• Disposal Areas	San Rafael and Calawis	Rodriguez and Antipolo
• Deposit of Hazardous Materials	San Rafael	Rodriguez
• Powder Magazine	San Rafael	Rodriguez
• Store and Associated Open Storage Areas	San Rafael and Calawis	Rodriguez and Antipolo
• Generators	San Rafael and Calawis	Rodriguez and Antipolo
• Fuel Tanks	San Rafael and Calawis	Rodriguez and Antipolo
• Mechanical Workshops	San Rafael and Calawis	Rodriguez and Antipolo
• Truck and Equipment Washing Area	San Rafael	Rodriguez
• Site Office	San Rafael	Rodriguez
• Batching Plants	San Rafael and Calawis	Rodriguez and Antipolo
• Parking Area	San Rafael	Rodriguez
• Store	San Rafael and Calawis	Rodriguez and Antipolo
• Crushing and Screening Plant	San Rafael	Rodriguez
• Camp and Offices	San Rafael and Calawis	Rodriguez and Antipolo
• Wastewater Treatment Plant	San Rafael and Calawis	Rodriguez and Antipolo

Table 5 provides the impacts that are expected during the construction and operational phases of the Project.

Table 5
Impacts and Mitigating Measures during the Construction and Operational Phase of the Upper Wawa Dam Project

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
CONSTRUCTION PHASE			
Land Module	Land Use and Classification	Change of Land Use	• Implement a Watershed Management Framework that will include a comprehensive land use and watershed management plan such as replacement planting and reforestation, and as part of the Catchment Area Treatment (CAT) Plan. • Apply for a Special Use Agreement within Protected Areas (SAPA), which shall include a Comprehensive Development Management Plan, and a PAMB Clearance once the ECC is released.
Land Module	Land Use and Classification	Encroachment into Environmentally Critical Areas (ECA)	• Coordinate with PAMB and comply with the Protected Area Management Plan of the Upper Marikina River Basin Protected Landscape (UMRBPL). • Conduct of a Free, Prior and Informed Consent (FPIC) process facilitated by NCIP Region IV-A. • Apply for a Special Use Agreement within Protected Areas (SAPA) and PAMB Clearance once the ECC is released.
Land Module	Land Use and	Land Tenurial	• Verify with NCIP with regards to the presence of tenured

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
	Classification	Issues	lands. • Verify with DENR-FMB and PAMB with regards to the extent and location of the NGP planting sites in the project site. • Secure agreements with concerned IP groups and social forestry project implementers.
Land Module	Land Use and Classification	Temporary Impairment of Visual Aesthetics	• Designate specific spoils dump area. • Maximize utilization of spoils/debris and muck. • Dispose rock from both surface and underground excavation works considering the spoils area layout that will maximize the storage volume while minimizing geographical extent; slope height, angle, and stability; and spoil area filling sequence and compaction of waste material. • Re-vegetate exposed areas using indigenous species as part of the Watershed Management Framework.
Land Module	Land Use and Classification	Devaluation of Land Value as a Result of Improper Solid Waste Management	• Develop a Solid Waste Management Plan (SWMP) at work areas and worker's camps that includes practices to manage, reduce and reuse waste, and the establishment of a Materials Recovery Facility. • Coordinate with the LGU to determine the capacity to absorb new waste streams. • Implement strict rules on proper solid waste management that are to be complied with by all personnel engaged or associated with the project. • Engage third party collectors if the local LGU network cannot accommodate the additional waste. • Appoint a licensed waste contractor for transfer of any hazardous waste from the construction site.
Land Module	Geology	Change in Surface Landform / Topography / Terrain/ Slope	• Conduct geotechnical studies, engineering design and innovative construction methods to minimize occurrence of destructive geologic processes. • Conduct detailed slope stability assessment for construction at slopes exceeding 22%, and hazard assessment for slopes exceeding 60% and extending more than 200 m in vertical slope distance. • Use grouting where seepages may occur to minimize water infiltration into natural fractures.
Land Module	Geology	Change in Sub-surface / Underground Geomorphology	• Conduct geotechnical studies to determine areas with potential for having tensional fault or potentially open faults or fractures in the reservoir that could be intruded by pressurized water, and to identify potential instability in the subsurface structures of the rocks. • Use rock bolts, steel support and linings to prevent collapse of any tunnel or chamber.
Land Module	Geology	Changes in Rate of Erosion and Sedimentation	• Implement reforestation and watershed management activities which will contribute to erosion management. • Provide enclosures to sand and gravel stockpiles to minimize transport of sediments during heavy rains. • Provide siltation ponds or silt traps around the work areas. • Execute major earthworks during dry season; install temporary drainage structures if construction activities will extend into the rainy season.

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
Land Module	Geology	Inducement of Subsidence, Liquefaction, Landslides, Mud / Debris Flow	• Place excavated materials in a designated spoils area. • Provide enclosures to sand and gravel stockpiles to minimize transport of sediments during heavy rains. • Provide siltation ponds or silt traps around the work areas. • Execute major earthworks during dry season; install temporary drainage structures if construction activities will extend up to the rainy season. • Utilize excavated materials with suitable characteristic as part of the dam embankment or as part of the aggregates for concreting. • Reinforce cement concrete walls, create walls, stream banks and bunds with boulders crates, rock bolting and fencing. • Re-vegetate exposed areas as part of the Watershed Management Framework.
Land Module	Geology	Changes in Flooding cycle	• Provide robust and constantly updated flood warning and response systems. • Coordinate with EFCOS for system integration.
Land Module	Pedology	Soil Erosion / Loss of Topsoil / Overburden and Bank Stability	• Execute major earthworks during dry season; install temporary drainage structures if construction activities will extend into the rainy season. • Maintain a natural reserve around the reservoir to limit erosion and sediment deposition. • Add sediments downstream and divert sediment-laden flows upstream to reduce erosion and maintain channel morphology. • Install riprap or other bank protection structures and regenerate the buffer zone of riparian woodland. • Develop and implement an Erosion and Sediment Control Plan that is to be incorporated into the Construction Environmental Management Plan for all construction components.
Land Module	Pedology	Change in Soil Quality / Fertility	• Conduct proper and regular maintenance of construction equipment and machinery. • Designate a machine and equipment maintenance area and fuel storage area that is cemented and equipped with proper drainage canals and oil absorbing material to minimize soil contamination. • Store and dispose used oil and other hazardous wastes in secure area and according to DENR guidelines on handling, management, and disposal of hazardous wastes.
			• Conduct complete inventory of vegetation in impact areas. • Establish and implement Watershed Management Framework that will include buffer zone establishment thru assisted natural regeneration (ANR) and enrichment planting; construction of "vengineering" structures to control siltation; earth balling activity on threatened and ecologically important flora; and protection of existing

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
Land Module	Terrestrial Ecology (Wildlife and vegetation)	Displacement /Disturbance of habitat for flora and fauna	thick vegetation which will serve as sources of seeds and seedlings. • Inform and increase awareness of locals and workers on the importance of the habitats through IECs. • Establish permanent nurseries for the seedlings and wildlings of important species, which will be collected prior to excavation and clearing activities. • Limit development activities within the proposed footprint and active construction areas by delineating the areas to be cleared, to avoid unnecessary clearing. • Establish and maintain permanent vegetation outside of active construction areas. • Implement "No Hunting" and "No Collecting" policies for fauna and flora, respectively, that will apply to all personnel engaged in the project.
Land Module	Terrestrial Ecology (Wildlife and vegetation)	Threat to existence and/or loss of important local fauna and flora species/habitat fragmentation	• Develop and implement the ANR Plan (as part of Watershed Management Framework) which will retention of vegetated areas through which wildlife may use as areas corridors. • Implement a Wildlife Rescue Plan that includes relocating the rescued wildlife to a suitable habitat.
Land Module	Terrestrial Ecology (Wildlife and vegetation)	Threat to abundance, frequency and distribution of important species	• Establish and implement the Watershed Management Framework that will also consider protecting an equivalent amount of land near the boundary of the watershed to ensure that alternative wildlife refuge is available.
Land Module	Terrestrial Ecology (Wildlife and vegetation)	Hindrance to wildlife access	• Develop and implement the ANR Plan (as part of Watershed Management Framework) which will retention of vegetated areas through which wildlife may use as areas corridors
Water Module	Hydrology	Change in drainage morphology	• Construct river diversions with sufficient capacity to convey the natural stream flow of the dam. • Provide drainage channels in active excavation and clearing work areas.
Water Module	Hydrology	Change in River Water Depth	• Provide sediment/silt traps around the construction sites to prevent sediments reaching the waterways during rainfall. • Build cofferdams upstream and downstream of the diversion to ensure dry working condition while tunneling/excavation is done. • Convey excavated materials to the dam site and use as construction material in building the dam.

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
Water Module	Hydrology	Depletion of Water Resources/ Competition in Water Use	• Use other sources of water during construction, i.e. spring water that can be found within the vicinity of the project or a deep well that can be constructed specifically intended for the project but can be donated to the locals upon the completion of the project.
Water Module	Hydrology	Reduction in volumetric flow (use of water for concreting, equipment uses, washing, personnel use)	• Source water requirements from springs that are located within close proximity to the construction site.
Water Module	Hydrology	Sediments reaching the waterways due to construction of support facilities, and tunneling/ excavation activities	• Provide sediment/silt traps around the construction site. • Build cofferdams upstream and downstream of the diversion to ensure a dry working condition while tunneling/excavation is done. • All sediments from building cofferdams and from the construction of the main dam and spillways must be conveyed properly and may be used as construction materials.
Water Module	Hydrology	Occurrence or aggravation of flooding in nearby areas due to dam failure during floods	• Construct the river diversion with sufficient capacity for PMF (Probable Maximum Flood) to convey the natural flow downstream during construction.
Water Module	Water Quality	Degradation of water quality through increased sediment from construction activities such as earthmoving and excavation	• Conduct best practice in the management of earthworks. • Provide designated settling ponds/basins for run-off within construction areas. • Designate spoils and excavated material dumping areas that are far or away from the river/springs.
Water Module	Water Quality	Water quality degradation from effluents coming from workers' camps and work areas	• Installation of on-site toilets at working areas and toilet facilities at workers' camps. • Disallow and prevent direct discharge of any wastewater into the rivers and springs.
Water Module	Water Quality	Water quality degradation from solid waste generated from workers' camps and construction areas	• Establish and Implement the Solid Waste Management Plan (SWMP). • Provide trash bins for various types of wastes in the working areas and in workers' camps. • Provide a Materials Recovery Facility. • Undertake regular segregation, collection and disposal of solid waste.
Water Module	Freshwater Ecology	Threat to existence and/or loss of important local species and	• Cover collected stockpiles from the construction of dam, especially during heavy rains to prevent erosion of sediment and silt into rivers.

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
		habitat	• Construct drainage canals to trap and prevent sediment from being washed into nearby river sections. • Implement a proper segregation, re-use, recycle and disposal of wastes. • Conduct regular monitoring of diversity of aquatic fauna and in-situ water quality.
Water Module	Freshwater Ecology	Threat to abundance, frequency and distribution of species	
Water Module	Freshwater Ecology	Weirs/ dams may block migration of fish.	• Provide fish passage sites to allow migratory fish to pass through.
Air Module	Ambient Air Quality	Degradation of air quality due to fugitive particulates and emissions	• Divide active construction sites into smaller areas, if possible. • Provide dust suppression measures, e.g., water application and speed restriction, in active construction areas and access roads. • Replace vegetation in non-structure areas and compact exposed soil surfaces to minimize wind erosion of topsoil. • Provide tarpaulin cover on trucks loaded with construction materials. • Haul spoils/excavated earth materials immediately after excavation.
Air Module	Ambient Air Quality	Degradation of air quality due to SO_x and NO_x emissions	• Conduct regular maintenance of heavy equipment and motor vehicles and use low-sulfur fuel to minimize SO_x and NO_x emissions.
Air Module	Ambient Noise Quality	Noise pollution	• Conduct regular maintenance of motor vehicle mufflers. • Provide barriers and shield if any stationary vibrating equipment. • Schedule noisy activities during daytime as much as possible.
People Module	Affected Communities	Physical and economic displacement of PAPs/PAFs	• Prepare and implement a resettlement and livelihood restoration program with disturbance/damage compensation in a timely manner, i.e. prior to project construction. The process should be participatory and should involve the project stakeholders, PA land claimant/holders, host LGU representatives, and LGU/barangay of the receiving community where the relocation site is located.
People Module	Affected Communities	Limited influx of construction-related workers in host barangays	• Include in the contractors' contracts the provision of preferential employment for locals and decent accommodation for outside workers that should be provided with basic utilities such as water, electricity, health care and sanitation facilities.
People Module	Affected Communities	Impact on indigenous peoples and culture/lifestyle	• Comply with NCIP requirements after completion of the CP/FPIC process for the Tayabasan Multi-Basin System project which will also affect the same CADT
People Module	Affected Communities	Impact on physical cultural resources	• Conduct a dialogue/consultation during the required FPIC process for the project. There is a proposal to relocate the "Istampang Bato" to the Wawa Ecotourism Site which will be decided on during the consultation with the Dumagat community.

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
People Module	Affected Communities	Threats to delivery of basic social services and resource competition	• Construct a resettlement site with complete basic social services and utilities according to approved Philippine standards. • Construct roads that will follow the government standards for the construction of infrastructure projects.
People Module	People	Traffic Congestion	• Set a proper speed limit within the identified busy, congested and prone to traffic areas only e.g. the start of access road construction. • Conduct frequent water spraying of roads to reduce dust resuspension, especially along the Sapinit Road and Pintong Bukawe Road which will be the access road leading to the dam area. • Install a safety and reflectorized traffic signs from and to the Project Site and at the community with languages translated to Tagalog for easy understanding of the people. • Install prominent Speed and Traffic Signs along all access road.
OPERATION PHASE			
Land Module	Pedology	Soil erosion/ Loss of topsoil/ overburden	• Implement quarterly monitoring of slope stability around the reservoir. • Enhance slope stability with reforestation of areas around the reservoir and of the watershed by the continuous implementation of the Watershed Management Framework.
Land Module	Pedology	Change in Soil Quality / Fertility	• Implement an environmental management plan that includes a spill control procedure. • Conduct proper and regular maintenance of equipment. • Store and dispose used oil and other hazardous wastes in secure area and according to DENR guidelines on handling, management, and disposal of hazardous wastes.
Land Module	Geology	Changes in Rate of Erosion and Sedimentation	• Implement reforestation and other watershed management activities to manage and minimize possible erosion in the area.
Land Module	Geology	Change in Surface Landform/ Topography/ Terrain/ Slope	• Re-vegetate cleared out areas to visually assimilate the old terrain and to maintain slope stability. • Manage water level fluctuations to prevent uncontrolled flow in and outside of designed drainages.
Land Module	Watershed Management Framework	Loss of terrestrial wildlife and vegetation due to drowning during reservoir filling	• Establish and implement Watershed Management Framework • Assist LGUs in protection of nearby forested areas to ensure that alternative wildlife refuge is available. • Implement EMoP section on monitoring of flora, reptile species and other wildlife species.

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
Land Module	Watershed Management Framework	Loss of terrestrial wildlife and vegetation due to loss of habitats	• Stop clearing of habitats once the project is operational and restore and/or enhance habitats as part of the Watershed Management Framework. • Protect nearby forested areas to ensure that alternative wildlife refuge is available. • Implement a Wildlife Rescue Plan that includes relocating the rescued wildlife to a suitable habitat. • Implement EMoP section on monitoring of flora, reptile species and other wildlife species.
Water Module	Hydrology	Change in drainage morphology	• Relocate inhabitants within the inundated areas. • Maintain the required ecological flow by the National Water Resources Board in the river for environmental use of flora and fauna. • Develop the spillways design based on the Probable Maximum Flood to accommodate or convey practically all excess inflows into the reservoir to avoid flooding or avoid dam breach.
Water Module	Hydrology	Reduction in volumetric flow downstream of the lower reservoir	• Maintain the required ecological flow by the National Water Resources Board.
Water Module	Hydrology	Change in stream/water depth	• Relocate locals living within the identified inundation areas. • Maintain the ecological flow by the National Water Resources Board to ensure the ecological sustainability at the project site and minimize detrimental effects on water regime.
Water Module	Hydrology	Depletion of water resources/ competition in water use	• Consider the ecological sustainability to maintain environmental flows in the rivers,
Water Module	Hydrology	Occurrence or aggravation of flooding in nearby areas	• Design the spillways based on the probable maximum flood to accommodate and convey all excess inflows into the reservoir and to prevent flooding upstream or failure by dam breach.
Water Module	Hydrology	Sedimentation behind the dam	• Provide adequate protection to the river/reservoir bank in the catchment area. • Extract deposited coarse material from the riverbed, if necessary. • Dredge sediment deposits and use sediment trapping devices, if necessary. • Use gated structures for flushing sediment while maintaining river regime.
Water Module	Water Quality	Degradation of water quality in the reservoir	• Regular clearing of vegetation will be implemented at the reservoir. • Regular release of water from the reservoir to downstream to prevent algal bloom and maintain water quality.
Water Module	Freshwater Ecology	Change in water regime	• Maintain the ecological flow by the National Water Resources Board to ensure the ecological sustainability at the project site and minimize detrimental effects on

PROJECT PHASE/ ENVIRONMENTAL ASPECT	ENVIRONMENTAL COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACTS	MITIGATING MEASURES
			water regime.
Air Module	Ambient air quality	Air pollution from standby generators and vehicle emissions	• Conduct regular maintenance of mufflers of standby generators and other pertinent equipment. • Use low-sulfur fuel.
Air Module	Micro-climate	Micro-climate effects due to GHG emissions	• Formulate and implement a greening program to provide carbon sequestration of the project in coordination with the local National Greening Program.
Air Module	Ambient Noise	Noise pollution from equipment	• Incorporate noise criteria in the specifications and selection of equipment. • Conduct regular maintenance of mufflers of standby generators and other pertinent equipment. • Use effective noise-attenuating materials for the structure and walling. • Plant appropriate vegetation as sound attenuation barriers.
People Module	Affected Communities	Generation of benefits from the project	• Ensure the relocation site will have upgraded dwellings, better public structures (elementary school, health center, covered court, etc.). • Support development of small and micro business enterprises from the anticipated tourism development will also improve the lives of host communities. Increased revenue from permits, taxes and share from national wealth taxes will help the host LGUs and barangays better serve the local residents through infrastructure development, improved social services, capacity building, etc.
People Module	Affected Communities	Impact on riverine communities and those dependent on agroforestry products	• Organize the affected PA occupants into agroforestry associations or cooperatives and involve them in the management of fund acquired for the payment of environmental services through management of plant nurseries, guarding of watersheds, and participation and watershed reforestation and management. • Replace the affected farm lots or agroforestry areas with private fam lots.
People Module	Affected Communities	Implementation of CSR projects	• Aligned the CSR Project with the development needs of the host LGUs and barangays.

5.0 IDENTIFIED STAKEHOLDERS

The stakeholders identified to be invited to the public hearing is presented in **Table 6**.

Table 6
Identified Stakeholders for the Public Hearing

Stakeholders	Address
Concerned National Government Agencies/ Offices and Government Unit	
DENR-EMB Central Office	Diliman, Quezon City
Concerned Regional and Provincial Government Agencies/ Offices and Government Unit	
Office of the Governor	Antipolo City, Rizal
DENR-EMB Region IV-A Director	Ermita, Manila, Metro Manila
DENR Region IV-A Director	Calamba City, Laguna
DENR-PENRO Rizal	Taytay, Rizal
Concerned offices in the Municipalities of Rodriguez & San Mateo, and Antipolo City	
Office of the Mayor	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Vice Mayor	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Department Heads	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
MENRO	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Municipal Engineer	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Municipal Tourism Officer	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Public Employment Service Office (PESO)	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Municipal Social Welfare and Development Office	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Municipal Health Office	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Municipal Planning and Development Office	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Sangguniang Bayan Office	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Municipal Agriculture Office	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal

Stakeholders	Address
Municipal Assessor's Office	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Barangay San Rafael LGU	Rodriguez, Rizal
Barangay Pintong Bukawe LGU	San Mateo, Rizal
Barangay Calawis LGU	Antipolo, Rizal
Concerned Communities and Peoples Organization	
Religious Groups	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Barangay Health Workers	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
SK Council	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Academe and School Heads	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Parent-Teacher Associations	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Residents of Barangay San Rafael	Rodriguez, Rizal
Residents of Barangay Pintong Bukawe	San Mateo, Rizal
Residents of Barangay Calawis	Antipolo, Rizal
Fisherfolks and Farmers	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Transport Sector (TODA)	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Womens Group	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Senior Citizens	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
Cultural Sector	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal
NGOs	Rodriguez, Rizal San Mateo, Rizal Antipolo, Rizal

6.0 PROPONENT'S STATEMENT OF COMMITMENT AND CAPABILITY

This is to certify that the proponent WawaJVCo., Inc. is capable and committed to implement the necessary mitigating measures to minimize the adverse effects and enhance the beneficial impact by the proposed **Wawa Bulk Water Supply Project – Upper Wawa Dam Component** located in the **City of Antipolo and Municipalities of San Mateo and Rodriguez.** In witness hereof, we hereby set my hands this 18 DEC 2020 day of _____ 2021 at QUEZON CITY, Philippines

Mr. Melvin John M. Tan
Authorized Representative
WawaJVCo., Inc.

SUBSRIBED AND SWORN TO before me this 18 DEC 2020 day of _____ 2021, affiant exhibiting their Community Tax Certificate No. _____ issued at _____ on _____.

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ATTY. JOSE FLORO P. CRISOLOGO
NOTARY PUBLIC
Adm Matter No. NP-023 (2020-2021)
[illegible]0054-C / Jan. 2, 2020 / Q.C.
[illegible]pliance No VI-0017262
IBP [illegible]ate No. LRN 03688 / Q.C.
Attorney Roll No. 49462
TIN No. 111-979-403
Aun. Nu. 41 Commonwealth Ave. Q.C.

7.0 EIS COPY DISTRIBUTION AND FURTHER INFORMATION

The draft Environmental Impact Statement (EIS) and this ESP will be posted in the EMB website (www.emb.gov.ph) at least 20 days before the public hearing. Upon completion of the review, a copy of the final EIS will be available to the public from the following government unit and agencies:

Agency	Address
DENR – EMB	DENR Compound, Visayas Avenue, Diliman, 1100 Quezon City, Philippines
Provincial Government of Rizal	City of Antipolo, Rizal
Municipal Government of Rodriguez	Rodriguez Municipal Hall, Rodriguez, Rizal
Municipal Government of San Mateo	San Mateo Municipal Hall, San Mateo, Rizal
City Government of Antipolo	Antipolo City Hall, Antipolo, Rizal
Barangay Office of San Rafael	San Rafael Barangay Hall, Rodriguez, Rizal
Barangay Office of Pintong Bukawe	Pintong Bukawe Barangay Hall, San Mateo, Rizal
Barangay Office of Calawis	Calawis Barangay Hall, Antipolo, Rizal

A copy will also be available from the office of WawaJVCo., Inc. at 16th F, Three E-Com Center, Mall of Asia Complex, Pasay City.