Initial Environmental Examination

PUBLIC

March 2024

Philippines: Water District Development Sector Project

Plaridel Water District Subproject

Prepared by Plaridel Water District for the Local Water Utilities Administration and the Asian Development Bank (ADB).

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CURRENCY EQUIVALENTS

(as of 29 November 2023)

Currency unit	–	peso (Php)
Php1.00	=	$0.018
$1.00	=	Php 55.37

ABBREVIATIONS

ADB	–	Asian Development Bank
APs	–	Affected Persons
AWWA	–	American Water Works Association
BHS	–	Barangay Health Stations
CCC	–	Conditional Certificate of Conformance
CNC	–	Certificate of Non- Coverage
DAO	–	Department Administrative Order
DED	–	Detailed Engineering Design
DENR	–	Department of Environment and Natural Resources
DOH	–	Department of Health
DPWH	–	Department of Public Works and Highways
ECC	–	Environmental Compliance Certificate
EIA	–	Environmental Impact Assessment
EMB	–	Environmental Management Bureau
EMB-RO	–	Environmental Management Bureau–Regional Office
EMP	–	Environmental Management Plan
GRM	–	Grievance Redress Mechanism
IEE	–	Initial Environmental Examination
LGUs	–	Local Government Units
LWUA	–	Local Water Utilities Administration
MC	–	Memorandum Circular
MOA	–	Memorandum of Agreement
NAAQGV	–	National Ambient Air Quality Guideline Values
NRW	–	Non-Revenue Water
NSCP	–	National Structural Code of the Philippines
NWRB	–	National Water Resources
PAGASA	–	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PD	–	Presidential Decree
PEISS	–	Philippine Environmental Impact Statement System
PIU		Project Implementation Unit
PLAWD		Plaridel Water District
PMU	–	Project Management Unit
PNSDW	–	Philippine National Standards for Drinking Water
PPC		Price and Physical Contingency
PPE	–	Personal Protective Equipment
PSA	–	Philippine Statistics Authority
RA	–	Republic Act
REA	–	Rapid Environmental Assessment
SDGs	–	Sustainable Development Goals
SPS	–	Safeguard Policy Statement
TSP	–	Total Suspended Particulates

UNDP	–	United Nations Development Program
WD	–	Water District
WDDSP	–	Water District Development Sector Project
WDGRC	–	Water District Grievance Redress Committee

WEIGHTS AND MEASURES

ha	–	Hectare
Hp	–	Horsepower
km	–	Kilometer
km²	–	Square kilometer
Lps		Liters per second
lm	–	Meter
m	–	Meter
m²	–	Square meter
m³	–	Cubic meter
mamsl	–	Meters above mean sea level
mm	–	Millimeter

NOTE

In this report, "$" refers to US dollars.

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1. Introduction. Plaridel Water District (PLAWD) is an operational water supply utility located in Plaridel, Bulacan, Republic of the Philippines and one of the selected subprojects under the PHI: Water District Development Sector Project (WDDSP) funded by the Asian Development Bank (ADB). The project intends to improve the livability and competitiveness in urban areas outside Metro Manila through the provision of better water supply and sanitation infrastructure and services to a number of water districts (WDs). The Local Water Utilities Administration (LWUA) is the executing agency. The participating WDs, in this case PLAWD, are the implementing agencies for water supply and sanitation subprojects.

2. Environmental Safeguard. All ADB funded projects are required to strictly comply with Philippine government's environmental laws and requirements as well as ADB's Safeguard Policy Statement of 2009 (SPS). The PLAWD subproject was assessed to be environment Category B under the SPS and may have some adverse environmental impacts, but minor or temporary. Preparation of Initial Environmental Examination (IEE) report and securing Environmental Compliance Certificate (ECC) are required to monitor and mitigate the possible adverse environmental and public health impact. This IEE has been updated to comply with the safeguard requirements of SPS 2009 and ADB's Public Communications Policy (2005), which include, among others the need to update information at various stages of the project cycle and disclosure of safeguard plans to the general public. This current version of the IEE has been updated to include detailed engineering design (DED) and other information that was not included in the FS level IEE. ECC (ECC-OL-R03-2021-0714) for pipelines and water storage facilities has been secured on 13 December 2021 (Package 1) from Environmental Management Bureau (EMB) Region 3, consisting of 216 km pipelines, 300 m3 elevated water reservoir, and 1500 m3 underground water reservoir. A Certificate of Non-coverage (CNC-OL-R03-2022-11-06334) has been secured on 23 November 2022 from EMB Central Office, for the Construction of 1-unit 1500 m3 capacity Glass Fused to Steel (GFS) Water Tank.

3. Legal Framework. The policy, legal, and administrative frameworks relevant to the environmental assessment of water supply and sanitation projects in the Philippines have long been established by the following laws and regulations: (i) Presidential Decree (PD) 198-Provincial Water Utilities Act of 1973, (ii) PD 1586 – Establishing the Philippine Environmental Impact Statement System, (iii) DOH AO 2017-010 – Philippine National Standards for Drinking Water (PNSDW) of 2017, (iv) PD 1067 – Water Code of the Philippines, (v) PD 856 – Code on Sanitation of the Philippines, (vi) Republic Act (RA) No. 9275 - Philippine Clean Water Act of 2004, (vii) DENR AO 2016-08 – Water Quality Guidelines and General Effluent Standards of 2016, (viii) DAO 2017-15 - Guidelines on Public Participation under the PEISS, (ix) PD 705 – Forestry Reform Code of the Philippines; and (x) RA 11058 – Occupational Safety and Health Standards.

4. Subproject Description. The proposed subprojects aim to improve/upgrade the PLAWD water supply system to address the present demand for a potable water and alleviate the shortage of water. PLAWD Water Supply Improvement Project includes:

(i) CW10a: Design and construction of Plaridel Water Supply System pipelaying and reservoir, awarded in 12 April 2021;
(ii) CW10b: Design and construction of ground reservoir, awarded in 23 May 2022; and

(iii) CW10c: Construction of office building, not yet awarded.

5. The project, with an estimated cost of Php 335,000,000, are all design and build contracts.

6. Environmental and Socio-economic Conditions. Plaridel is a non-coastal area of Bulacan. It is surrounded by the rivers of Angat, Bulacan and Tabang River, both of which run through the town. The Angat River, otherwise known as Bulacan River, flows directly to Calumpit, Bulacan, meeting the Pampanga River. The Tabang River, a tributary with adjoining intersections dividing the middle of the present Poblacion of Plaridel, flows to the Manila Bay after passing through the towns of Guiguinto and Bulakan. The water of this river was called "tabáng" to refer to its fresh water. The geologic formation of Plaridel is Ancient Alluvium and Angat River is Recent Alluvium. Plaridel lies on the alluvial sediment plain of the Angat River which makes it particularly fertile and well suited for farming with soil textures of fine sandy loam, Prensa silty clay loam, Quingua silty loam, and Bigaa clay loam. The components of the subproject were not located in environmentally sensitive and protected areas. The proposed sites for source development are along residential and commercial areas while the proposed routes of the pipelines are within roads right-of-way.

7. Based on the Philippine Statistics Authority (PSA), the estimated population of the project area in 2020 is about 114,432 spreads across 19 barangays. Employment in Bulacan has been decreasing in the past years. This was due to rapid increase of the labor force against a low rate in the jobs generated. The majority of the jobs generated were in the non-agricultural sector, which is the service and industry sector. The annual average income of Bulakeño family was higher than the regional and national average by as much as 17 to 20 percent, respectively. It is also the second among the provinces in Central Luzon with a high average income per family. These estimates by the National Statistics in 2000 indicate that the province of Bulacan is above the average in terms of the levels of living conditions in the country. The literacy rate exhibited a decreasing trend based on the past surveys. However, the latest survey at the rate of 95.87 for the province, it is ranked second in Central Luzon and higher than the national rate. In terms of security, the province's average monthly crime rate at 2.7 in 2008 was considered to be the lowest for the past thirteen years. The said rate is lower than the regional and national rate at 4.89 and 6.28, respectively.

8. Impacts and EMP. Anticipated impacts to be considered were assessed through the following activities: (i) consultation with affected parties; (ii) desk research of information relevant to the proposed project; (iii) site visits and professional assessment (CDTA ocular inspection conducted on January 8 and 10, 2020, and ADB consultants' site visit on 13 October 2023); and (iv) evaluation of proposed design and potential impacts. Categorization of the project and formulation of mitigation measures have been guided by ADB's REA Checklist for Water Supply and SPS. Results of the environmental impacts screening show that the impact types and magnitudes for both positive and negative impacts without the mitigating measures and the resulting situations when mitigating measures will be implemented.

9. During pre-construction phase, potential nuisances, and problems to the public during construction were addressed by inclusion in the tender documents of specific provisions addressing these issues. There are no known archaeological and cultural assets in these proposed sites. Nevertheless, precautions were taken to avoid potential damage to any archaeological and cultural assets by inclusion of provisions in tender and construction documents requiring the contractors to immediately stop excavation activities and promptly

inform the authorities if archaeological and cultural assets are discovered. During site preparation, when trees (timber or other forest products) are to be removed, a tree cutting permit shall be obtained as stipulated in PD 705 or the Forestry Reform Code of the Philippines. There are 18 trees affected. Excavation and digging permits were also secured prior to pipelaying activities.

10. The proposed project will not entail any involuntary resettlement and there are no adverse impacts on surrounding structures since the location of proposed project components is already owned by PLAWD.

11. Adverse environmental impacts during construction are temporary, less than significant and can easily be mitigated. There will be no massive construction activities that can damage the environment. Typical construction issues are manageable with the implementation of environmental management plan for (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience.

12. Environmental problems due to operation of the proposed water supply can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures. PLAWD shall ensure that the potable water consistently passes the requirements of the Philippine National Standards for Drinking Water (PNSDW) of 2017. To achieve this, implementation of the water safety plan with regular water quality monitoring shall be undertaken.

13. An Environmental Management Plan (EMP) has been updated to effectively manage environmental issues. This includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional set-up is presented in the implementation arrangement and discusses the roles during implementation and the required monitoring. It also outlines the requirements and responsibilities during pre-construction, construction, and operation phases.

14. Public Consultation and Information Disclosure. PLAWD has undertaken various activities concerning information disclosure, public consultation, and public participation for the proposed PLAWD subproject. These were done to achieve a meaningful stakeholders' consultation and ensure success. During the planning phase, information regarding the proposed sub-project was disclosed to the public. Key informant interviews (KIIs) and focus group discussions (FGDs) with Sangguniang Bayan of Plaridel and PLAWD officials and staff was held on October 2019 to request for cooperation and gather information and recommendations relative to the needs of the community particularly on water supply system. KIIs and FGDs focused mainly on complaints of residents regarding water quality, availability, and pressure. PLAWD presented the action plan on how to resolve complaints, which includes the improvement of water supply project under WDDSP funded by ADB. PLAWD conducted another public consultation/hearing on 29 November 2019 participated by a total of 105 participants/representatives from various institutions/organizations. Presentations on the proposed water supply improvement project and the proposed tariff adjustment/increase on water consumptions of the concessionaires were presented and discussed. Stakeholders/participants were encouraged and requested to raise their views on social and environmental issues to the topics presented. Stakeholders expressed their support for the PLAWD subprojects. Most of the comments / feedback of the public were on tariff rates. On 13 October 2023, ADB consultants conducted site visits on completed and partially completed subproject components and interviewed several residents that were affected

by the pipelaying activities. Overall, they were satisfied with the improved water supply provided by WDDSP, although they have experienced inconveniences during construction period, which include traffic congestion, dust, and noise. Some residents with small food businesses also suffered from loss of income because of the restriction of customers' access to their stalls during construction.

15. Consultations and information disclosure activities done during the detailed design and construction phase are as follows:

(i) Courtesy call/Kick-off/Pre-Construction meeting via Zoom was held on September 7, 2021.
(ii) A perception survey was conducted from November to December 2021. All barangays, especially households near the project area were given questionnaires. There were 147 respondents. About 47% are male and 53 are female. Of the 62 respondents who stated that they were already aware of the Project, they were asked how they knew about the PLAWD Water Supply Improvement. Some 42.9% said they heard the Project from government and barangay officials followed by officials from PLAWD with 37.4% and news from friends, relatives, and neighbors with 25.3%. (See copy of the questionnaire)
(iii) IEC flyers have been distributed by PLAWD through its Customer Service Desk since January 6, 2022, up to present. (See copy of IEC flyer)
(iv) Videos on PLAWD projects are being played on the LED screen at the Customer Service lounge from January 6, 2022, up to present.

16. Grievance Redress Mechanism. Plaridel Water District utilizes the customer information hotline to address all grievances and complaints from the public, including environmental and social concerns related to the project. PLAWD receives, evaluates, and facilitates the resolution of affected persons (APs) concerns, complaints, and grievances about the social and environmental performance related to various subprojects, including WDDSP. The GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the subproject. This mechanism was disclosed in public consultations during detailed design and in meetings during the construction phase.

17. Complaints are received through phone calls, Facebook page, and personal appearance of complainants at PLAWD's office. Feedback form can be downloaded from Plaridel Water District official website (https://plaridelwaterdistrict.ph). The PLAWD Environment and Social Safeguards Focal (Environment: Alvin S. Chinchuntic (achinchuntic.plawd@gmail.com); Social Safeguards: Alberto A. Mendoza (aamendoza.plawd@gmail.com)) consolidate the complaints received and coordinate with contractors concerned for project related complaints for their appropriate action.

18. Records were kept by the PLAWD-PIU of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were in effect, and final outcome. All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by PLAWD. Complaints about the environmental performance of projects issued an Environmental Certificate of Compliance (ECC) can also be brought to the attention of DENR-EMB. The process of handling such complaints is described in the Revised Procedural Manual (2007) for the IRR of PD 1586.

19. *Conclusion and Recommendations.* PLAWD's water supply subproject will benefit the public by contributing to the long-term improvement in the water supply system of the project coverage area and providing safe drinking water to residents and commercial establishments in the municipality. The potential adverse environmental impacts are primarily associated with the construction period, which can be minimized through mitigating measures and environmentally sound engineering and construction practices.

20. With the implementation of the mitigation measures as proposed in the EMP, the subproject is not expected to cause irreversible adverse environmental impacts. Also, the water supply subproject can be implemented in an environmentally acceptable manner without the need for further environmental assessment study, except for the conduct of public consultations for compliance and further input. Should there be any significant change in the project scope, an updated or a new IEE will be prepared.

21. The proposed PLAWD subproject is hereby recommended for implementation with the following requirements to be strictly followed: (i) Tendering process shall ensure environmentally responsible procurement by requiring the inclusion of EMP provisions in the bidding and construction contract documents; (ii) Contractor's submission of a CEMP which shall be included in the construction contract (CEMP for CW10a was submitted to ADB 22 May 2023 while CEMP for CW10b was submitted on 17 February 2023); (iii) Contract provisions on creation and operation of the WDGRC shall be included in construction contracts; (iv) LWUA, with its regulatory function, shall ensure that capability building for MKWD shall be pursued; and (v) PLAWD shall continue the process of public consultation and information disclosure during detailed design and construction phases.

1 INTRODUCTION

1. Plaridel Water District (PLAWD) operates as a water supply utility in Plaridel, Bulacan, Republic of the Philippines. It is among the selected subprojects under the PHI: Water District Development Sector Project (WDDSP), funded by the Asian Development Bank (ADB). The project intends to improve the livability and competitiveness in urban areas outside Metro Manila through the provision of better water supply and sanitation infrastructure and services to a number of water districts (WDs). The Local Water Utilities Administration (LWUA) serves as the executing agency, while the participating WDs, such as PLAWD, act as implementing agencies for water supply and sanitation subprojects.

2. The PLAWD was formed on March 2, 1987, through the issuance of Conditional Certificate of Conformance (CCC) No. 277, transitioning from waterworks under the local government into a public utility service.

3. Currently, PLAWD utilizes groundwater sources and has ten (10) pumping stations, two of which are non-operational due to water quality problem serving about 19 barangays.

4. The project aims to expand PLAWD's water supply system coverage and meet the water supply demand until 2030 through the construction of storage facilities (reservoirs), and installation of transmission and distribution pipelines. Through this project, PLAWD will be able to develop and improve the water supply systems in all the 19 barangays of Plaridel especially those remote barangays that are not yet fully serviced. These barangays are Sipat, Lagundi, Bagong Silang, Bintog, Sto. Niño, Bulihan, Culianin, Parulan, and Agnaya.

5. The project can contribute to the Philippines' efforts in achieving the Sustainable Development Goals (SDGs) given by the United Nations Development Program (UNDP), specifically the SDG No. 6, which is the "Clean Water and Sanitation". The project shall address the increasing water demand of the municipality while balancing out the climate change affects that is observed, though increasing the community's resilience.

6. The WDDSP and its subprojects, as an ADB funded project, are required to comply with the Philippine government's environmental laws and requirements as well as ADB's Safeguard Policy Statement of 2009 (SPS). A preliminary environmental assessment was conducted utilizing ADB's Rapid Environmental Assessment (REA) Checklist for Water Supply (Annex 1), resulting in the classification of this project under Environment Category B, necessitating the drafting of this Initial Environmental Examination (IEE) Report. In accordance with national regulations, specifically the Philippine Environmental Impact Statement System (PEISS), water supply projects featuring water sources, treatment facilities, and Level III distribution systems necessitate the submission of an online Environmental Compliance Certificate (ECC) application. An IEE Checklist Report may be required which is under the discretion of the EMB-RO. ECC (ECC-OL-R03-2021-0714) for pipelines and water storage facilities has been secured on 13 December 2021 (Package 1) from Environmental Management Bureau (EMB) Region 3, consisting of 216 km pipelines, 300 m^3 elevated water reservoir, and 1500 m^3 underground water reservoir. A Certificate of Non-coverage (CNC-OL-R03-2022-11-06334) has been secured on 23 November 2022 from EMB Central Office, for the Construction of 1-unit 1500 m^3 capacity Glass Fused to Steel (GFS) Water Tank.

7. The SPS of 2009 integrates the three operational safeguard policies of ADB on the environment, involuntary resettlement, and indigenous peoples, into a unified policy framework. ADB shall work with borrowers to implement the provisions of this policy framework in the form of project review and supervision, and capacity development support. The SPS also promotes participation of project-affected people and key stakeholders in project design and implementation.

8. The provisions of the ADB SPS of 2009 were carefully observed during the preparation of this report. This IEE Report is prepared to meet the following objectives:

(i) Provide a clear description of the proposed projects and all its components;

(ii) To present the national and local legal and institutional framework within which the environmental assessment has been carried out;

(iii) To provide information on the existing geographic, ecological, environmental, and social conditions, within the project's area of influence;

(iv) To assess the project's likely positive and negative direct and indirect impacts on physical, biological, socioeconomic, and physical cultural resources in the project's area of influence;

(v) To present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, and manage adverse environmental impacts;

(vi) To describe the process undertaken during project design to engage stakeholders, the planned information disclosure measures, and the process for carrying out consultation with affected people and facilitating their participation during project implementation;

(vii) To describe the project's grievance redress mechanism for resolving project-related complaints;

(viii) To describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and

(ix) To identify who is responsible for carrying out the mitigation and monitoring measures.

9. The development and updating of this IEE were based on several field visits, review of secondary data, detailed engineering design (DED), secured national environmental safeguard requirements and permits, consultation with the Local Government Units (LGUs), officials of PLAWD, and the stakeholders from the community, and other relevant information that were not previously available before.

2 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 Environmental Safeguards Framework

10. The ADB, in its operations, requires the consideration of environmental issues in all aspects. The requirement of having an environmental assessment in all of ADB's project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans is stated in the SPS.

2.1.1 Screening and categorization

11. Projects are screened to identify their expected environmental impacts which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. This will determine the category of environmental assessment required for the project. Environment categories are to be determined through the use of Rapid Environmental Assessment (REA). REA uses sector-specific checklists developed based on ADB's past knowledge and experience. The water supply REA checklist used for PLAWD project consists of questions related to sensitivity and vulnerability of environmental resources in project area, and the potential for the project to cause significant adverse environmental impacts. The accomplished REA is in **Annex 1.**

12. SPS 2009 classifies projects into four (4) categories:

(i) Category A. Projects could have significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts.

(ii) Category B. Projects could have some adverse environmental impacts, but of lesser degree or significance than those in Category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

(iii) Category C. Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

(iv) Category FI. Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

2.1.2 Environmental Management Plan

13. Identification of potential impacts and risks along with the mitigating measures through environmental assessment must be carried out. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

2.1.3 Public Disclosure

14. In order for the affected people, other stakeholders, and the general public to provide inputs to further improve the project's design and implementation, the ADB shall post in their website the following documents:

(i) for Environmental Category A projects, a draft EIA report at least 120 days before Board consideration;

(ii) final or updated EIA and/or IEE upon receipt; and (iii) environmental monitoring reports submitted by the project management unit (PMU) during project implementation upon receipt.

2.2 International Guidelines

15. The International Finance Corporation (IFC) established an Environmental, Health, and Safety (EHS) Guidelines with general and industry-specific examples of Good International Industry Practice (GIIP). In line with this, all ADB-funded projects must adopt the IFC-EHS Noise Guidelines.

16. Under the noise management section are noise prevention and mitigation measures, noise level guidelines, and noise monitoring. PLAWD must closely observe the IFC-EHS Noise Guidelines during the construction phase.

2.3 National Laws

17. The policy, legal, and administrative frameworks relevant to the environmental assessment of water supply and sanitation projects in the Philippines have long been established by the following laws and regulations:

(i) Presidential Decree (PD) 198 – Provincial Water Utilities Act of 1973;
(ii) PD 1586 – Philippine Environmental Impact Statement System (PEISS);
(iii) Department of Health (DOH) Administrative Order 2017-010 – Philippine National Standards for Drinking Water (PNSDW) of 2017;
(iv) PD 1067 – Water Code of the Philippines;
(v) PD 856 - Code on Sanitation of the Philippines;
(vi) Republic Act (RA) 9275 – Philippine Clean Water Act of 2004;
(vii) Department of Environment and Natural Resources (DENR) Administrative Order (AO) 2016-08 – Water Quality Guidelines and General Effluent Standards of 2016;
(viii) DAO 2017-15 - Guidelines on Public Participation under the PEISS
(ix) PD 705 – Forestry Reform Code of the Philippines; and
(x) RA 11058 – Occupational Safety and Health Standards

18. The overall institutional framework is found in PD 198 PD 198 (Provincial Water Utilities Act of 1973). PD 198 indicates that the LWUA and WD setup as defined by LWUA, is mandated to promote the development of WDs in the country as a government corporation. It is mandated to "primarily be a specialized lending institution for the promotion, development, and financing of local water utilities." In order to carry out the said mandate, the LWUA has major subsidiary roles such as:

(i) prescribing minimum standards and regulations in order to assure acceptable standards of construction materials and supplies, maintenance, operation, personnel training, accounting, and fiscal practices for local water utilities; and

(ii) providing technical assistance and personnel training programs.

19. The formation of local WDs is also mandated in PD 198. These WDs were initially mandated to serve a single LGU or a cluster of LGUs by resolutions of the Local LGUs. These WDs, once formed, become a legally autonomous body of the LGU. A board of directors, consisting of five (5) members representing different sectors, are appointed by either the mayor or the governor shall control the WD. The board of directors shall appoint WD's general manager.

20. PD 1586 (Philippine Environmental Impact Statement System (PEISS)) and its implementing rules and regulation under the DENR Administrative Order No. 30 of 2003 (DAO 2003-30) cover the environmental assessment provision. The PEISS allows the project manager to receive an Environmental Compliance Certificate (ECC) from the Environmental Management Bureau (EMB) prior to the introduction of an infrastructure or development project. Under ADB's Special Assessment Report on Environmental Safeguards (2006), the Philippine environmental assessment program complies with the environmental assessment criteria of ADB.

21. To ensure that the quality of the water supplies is kept on a level that is suitable for human consumption, DOH Administrative Order 2017-010 (DAO 2017-010) or the Philippine National Standards for Drinking Water (PNSDW) of 2017 which prescribes the standard quality for drinking waters was issued as guide for government and private developers and operators, bulk water suppliers, water refilling station operators and other drinking-water providers. The established threshold of each water quality parameter in the PNSDW of 2017 will ensure the safety of drinking water and protect the public health.

22. Appropriation and utilization of waters for various purposes shall be governed by PD 1067 or the Water Code of the Philippines and its amended Implementing Rules and Regulations (IRR). The National Water Resources Board (NWRB) shall administer and enforce the provisions thereof.

23. Pursuant to RA 9275 or the Philippine Clean Water Act of 2004, DENR Administrative Order No. 08 series of 2016 or the Water Quality Guidelines and General Effluent Standards of 2016, defines the standards for the discharge of all industrial and municipal wastewater while PD 856 (Philippine Sewage Code) also includes sewage and septic tanks. To ensure the compliance of the facility with the specified effluent requirements, the project applicant must obtain a discharge permit from the EMB-RO.

24. During site preparation, when trees (timber or other forest products) are to be removed, a tree cutting permit shall be obtained as stipulated in PD 705 or the Forestry Reform Code of the Philippines.

25. To ensure a safe and healthful workplace for all the workforce and protection against all hazards in their work environment, adherence to Department of Labor and Employment (DOLE) Occupational Safety and Health Hazard Standards must be followed, with emphasis on the following:

(i) Personal Protective Equipment (PPE-Rule 1040) which specify the use and types of eyes and face protection, respiratory protection, hand and arm protection, safety belt life lines and safety nets and safety shoes;

(ii) Personal Protective Equipment, and minimum space requirement for gas, electric welding and cutting operations (Rule1100);
(iii) Fire protection and control rule (Rule 1940);
(iv) Notification and record keeping requirements (Rule 1050);
(v) Mandatory provisions of a safety program for local Contactors in line with overall safety program of the Proponent; and
(vi) Effective preparedness program against accidents and untoward incidents through ready medical assistance as well as early detection, warning and response measures.

26. **Table 2-1** presents the summary of environmental regulations and mandatory requirements for the proposed subproject.

Table 2-1: Summary of Environmental Regulations and Mandatory Requirements for the Proposed Subproject

Laws, Rules and Regulations	Description/Salient Features	Permit/Clearance	Required for the Project
PD 1586 and its implementing rules and regulations	Requires project proponents to secure ECC from the DENR before an infrastructure project is constructed. DAO 03-30 provides the implementing rules and regulations for PD1586 and the Revised Procedural Manual of DAO 03-30 integrates DENR policies to promote EIA as a planning and decision-making tool. DENR MCNo.2011-005 further streamlined the PEISS.	ECC for proposed projects under the EIS system or Certificate of Non-Coverage (CNC) for proposed projects not covered by the system.	An online ECC application is required for water supply projects with water source, treatment facilities, and Level III distribution system in order to secure an ECC. An IEE Checklist Report may be required which is under the discretion of the EMB-RO.
Permit to Cut Trees	Required by the DENR before cutting any tree in both public and private properties.	Permit to Cut is secured from the EMB-RO where the tree/s to be cut are located	To be secured before cutting of trees during site preparation
IFC-EHS Noise Guidelines	Provides measures on noise prevention and mitigation measures, noise level guidelines, and noise monitoring.	None	To be implemented during construction period.
(DOLE Occupational Safety and Health Hazard Standards	Ensures a safe and healthful workplace for all the workforce and protection against all hazards in their work environment	None	To be implemented during construction and operation period.
DAO 2017-010 or the PNSDW of 2017	Prescribes the standard quality for drinking waters as guide for government and private developers and operators, bulk water suppliers, water refilling station operators and other drinking-water providers. The established threshold of each water quality parameter in the PNSDW of 2017 will ensure the safety of drinking water	None	Periodic reports shall be submitted to DOH during the operation period.

Laws, Rules and Regulations	Description/Salient Features	Permit/Clearance	Required for the Project
	and protect the public health.		
Water Code of the Philippines (PD 1067) and its amended rules and regulations	Establishes the principles for appropriation, control and conservation of water resources in the country and defines the rights and obligations of water users	Water Permit and Permit to Drill from the National Water Resources Board (NWRB)	Water Permits for the existing pumping stations already secured
DOH Administrative Order No. 2014-0027	Mandates all drinking water service providers to develop and implement their Water Safety Plan	None	PLAWD to update their Water Safety Plan upon completion of the Water Supply Improvement Project

2.4 Local Laws

27. The legal administrative framework relevant to creating the PLAWD is the Conditional Certificate of Conformance (CCC) No. 277 dated March 2, 1987.

3 DESCRIPTION OF THE PROJECT

3.1 Existing Situation of Plaridel Water District's Water Supply and Resources

28. The present source of water supply for domestic, commercial and institutional demands in the Municipality of Plaridel is groundwater through wells and infusion of 2 Million Liters per Day (MLD) from Bulacan Bulk Water of Luzon Clean Water Development Corporation.

29. PLAWD has ten (10) pumping stations, two of which are non-operational due to issues with water quality. The eight (8) operational pumping stations have a total combined discharge of around 293 liters per second (Lps). The wells have diameters ranging from 100 to 150 millimeters (mm), depths ranging from 52 to 185 meters (m) and discharge capacities ranging from 24 to 67 Lps.

Table 3-1: Pumping Stations of PLAWD

Pump Station	Location (Brgy.)	Depth (m)	Discharge (Lps)	Pump Rating (Hp)	Genset (kVA)
PS 02	Tabang	185	67.00	50	166
PS 03	Bintog	52	32.60	30	75
PS 04	Sipat	101	48.12	50	75
PS 06	Culianin	65	24.45	15	36
PS 07	Parulan	78	28.60	30	-
PS 08	Bulihan	78	28.60	30	-
PS 09	Lalangan	141	34.18	30	-
PS 10	Tabang (Sitio Santiago)	140	30.17	30	-

30. PLAWD utilizes gas chlorinating facility in each pumping station to treat the water prior to distribution. PLAWD has a 330 m³ elevated steel tank located in Brgy. Lalangan at elevation of around 30 m above ground level. Health and safety protocols are in place and consistent with the implementing rules and regulations of water supply on water disinfection (Section 3) of the Code on Sanitation of the Philippines (P.D. 856) in handling and storage of chlorine gas. A copy

of the chlorine safety data sheet is provided in all pump stations which operators can refer to. Emergency shower and eyewash are also provided in all pump stations, and the operators are provided with full-face chemical cartridge respirators **(Annex 7).**

31. PLAWD is currently servicing 19 barangays with four (4) barangays (i.e. Sto. Niño, Lagundi, Lalangan and Bagong Silang) affected by low water pressure ranging from 2 to 3 psi especially during peak hours. There are also residents in some remote barangays who still do not have water service connections. These barangays are Sipat, Lagundi, Bagong Silang, Bintog, Sto. Niño, Bulihan, Culianin, Parulan, and Agnaya which are targeted to provide with service connections in the near future.

32. **Figure 3-1** shows the service coverage area of PLAWD:

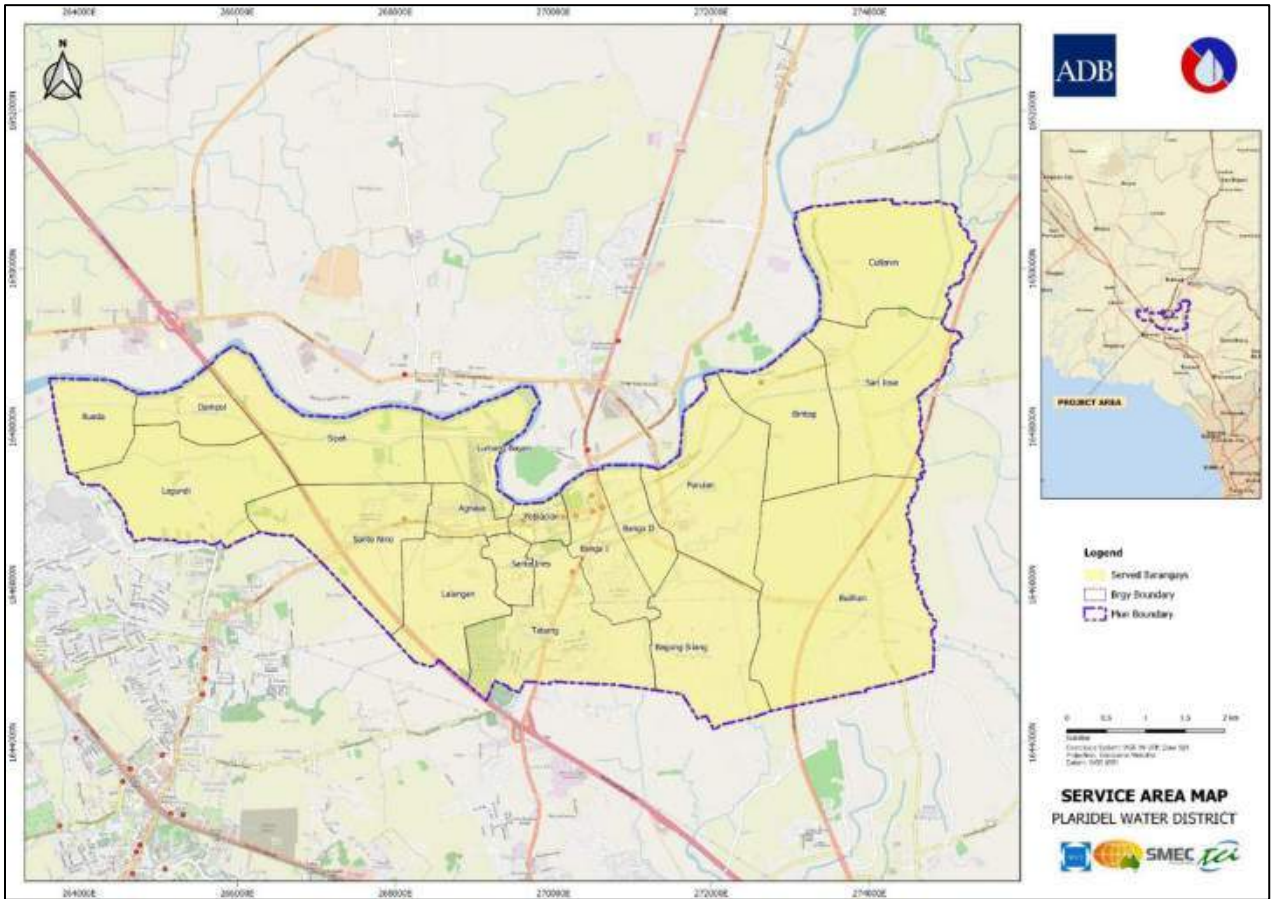

Figure 3-1: Service Coverage Area of PLAWD

33. The existing transmission and distribution pipelines of PLAWD consist of both uPVC and steel pipes with sizes ranging from 50 to 300 mm. Other water system appurtenances include gate valves and fire hydrants.

Table 3-2: Existing Transmission and Distribution Lines of PLAWD

Pipe Diameter (mm)	Length (lm)	Material
300	1,835	Steel Pipe

Pipe Diameter (mm)	Length (lm)	Material
250	531	Steel Pipe
200	14,330	uPVC Pipe
150	14,437	uPVC Pipe
100	25,103	uPVC Pipe
75	649,427	uPVC Pipe
50	39,658	uPVC Pipe

34. **Figure 3-2** and **Figure 3-3** show the water supply layout map and network schematic map of PLAWD.

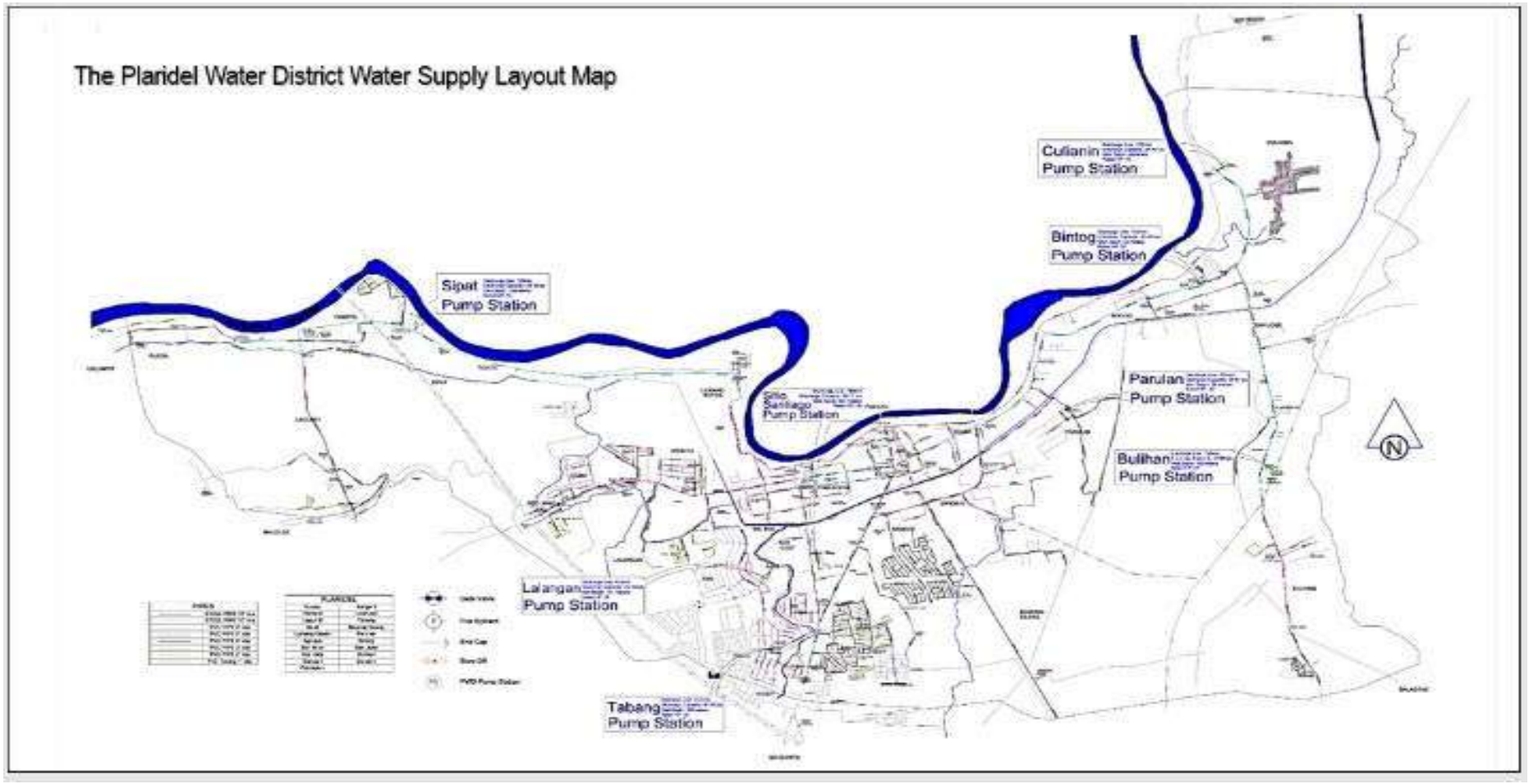

Figure 3-2: PLAWD Water Supply Layout Map

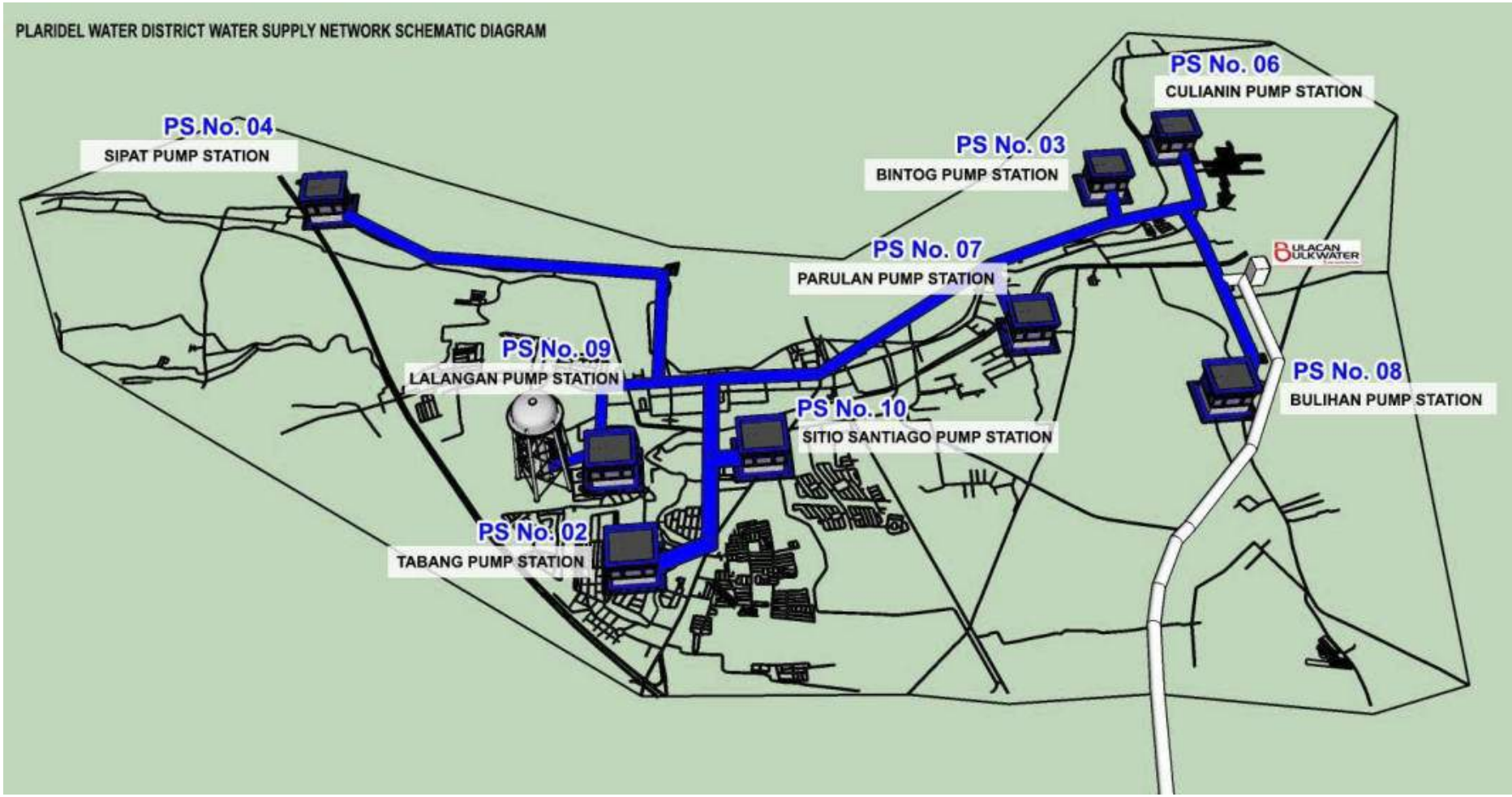

Figure 3-3: PLAWD Water Supply Network Schematic Map

3.1.1 Operation and Maintenance

35. The operation and maintenance of the existing water supply system is handled by the PLAWD's Engineering and Operations Department. The operation and maintenance expenses are comprised of pumping expenses, water treatment, annual dues to be paid to other agencies (e.g., National Water Regulatory Board), customers' account, and administration and general expenses.

3.1.2 Water Use and Consumption

36. As of December 2018, PLAWD has 18,329 service connections of which 16,614 are classified as residential/domestic, 1,632 as commercial, 81 as government/institutional and 2 bulk/industrial. Based on the data gathered from PLAWD, the average unit consumption for domestic connection is estimated at around 135 Liters per capita per day (Lpcd), 1.4 m^3/day for commercial connection, 3 m^3/day for institutional connection and 52.5 m^3/day for bulk/industrial connection.

3.1.3 Service Connections

37. Service connections in PLAWD are classified as domestic/residential, commercial, industrial/bulk and government/institutional. The projections for the number of service connections for each category were based on the potential for growth of the service area and discussion with PLAWD officials.

38. The total number of service connections is projected to reach 31,722 by year 2030 broken down as 29,318 domestic/residential, 2,288 commercial, 113 institutional/government and three (3) industrial/bulk. A ratio of 4.5 persons per connection was used throughout the projection period to estimate the number of the population served.

39. Table 3-3 shows the projected number of service connections and corresponding number of served population by years 2018, 2021, and 2030.

Table 3-3: 2018 Existing Served Population and Water Demand

Barangay	Population	Service Area Pop'n	Domestic			Commercial			Institutional		Industrial/Bulk		Total			UFW (m^3/day)	Average Day Demand (m^3/day)
			No. of Conn	Served Pop'n	Water Demand	No. of Conn	Served Pop'n	Water Demand	No. of Conn	Water Demand	No. of Conn	Water Demand	No. of Conn	Served Pop'n	Water Demand		
1. Agnaya	2,632	2,579	500	2,250	362.6	68	306	102.0	3	10.5	-	-	571	2,556	475.1	71.0	546.1
2. Bagong Silang	3,573	3,502	407	1,832	295.3	10	45	15.0	2	7.0	-	-	419	1,877	317.3	47.4	364.7
3. Banga I	7,473	7,324	1,192	5,364	864.5	431	1,940	646.5	3	10.5	1	53	1,627	7,304	1,574.0	235.2	1,809.2
4. Banga II	9,683	9,489	1,381	6,215	1,001.7	169	761	253.5	8	28.0	-	-	1,558	6,976	1,283.2	191.7	1,474.9
5. Bintog	4,434	4,345	709	3,191	514.3	47	212	70.5	4	14.0	-	-	760	3,403	598.8	89.5	688.3
6. Bulihan	6,111	5,989	683	3,074	495.4	44	198	66.0	4	14.0	-	-	731	3,272	575.4	86.0	661.4
7. Culianin	4,240	4,155	349	1,571	253.2	4	18	6.0	-	-	-	-	353	1,589	259.2	38.7	297.9
8. Dampol	3,323	3,257	561	2,525	407.0	28	126	42.0	5	17.5	-	-	594	2,651	466.5	69.7	536.2
9. Lagundi	4,564	4,473	718	3,231	520.7	42	189	63.0	3	10.5	-	-	763	3,420	594.2	88.8	683.0
10. Lalangan	2,220	2,176	243	1,094	176.3	10	45	15.0	3	10.5	-	-	256	1,139	201.8	30.2	232.0
11. Lumang Bayan	5,969	5,850	1,109	4,991	804.4	61	275	91.5	5	17.5	-	-	1,175	5,266	913.4	136.5	1,049.9
12. Parulan	8,164	8,001	1,410	6,345	1,022.6	88	396	132.0	3	10.5	-	-	1,501	6,741	1,165.1	174.1	1,339.2
13. Poblacion	4,025	3,945	743	3,344	539.0	117	527	175.5	16	56.0	-	-	876	3,871	770.5	115.1	885.6
14. Rueda	1,855	1,818	292	1,314	211.8	12	54	18.0	2	7.0	-	-	306	1,368	236.8	35.4	272.2
15. San Jose	4,755	4,660	679	3,056	492.5	42	189	63.0	4	14.0	-	-	725	3,245	569.5	85.1	654.6
16. Santa Ines	3,176	3,113	470	2,115	340.9	24	108	36.0	3	10.5	-	-	497	2,223	387.4	57.9	445.3
17. Santo Niño	11,793	11,557	1,170	5,265	848.6	82	369	123.0	3	10.5	-	-	1,255	5,634	982.1	146.8	1,128.9
18. Sipat	6,299	6,173	936	4,212	678.8	49	221	73.5	3	10.5	-	-	988	4,433	762.8	114.0	876.8
19. Tabang	21,668	21,235	3,062	13,779	2,220.8	304	1,368	456.0	7	24.5	1	53	3,374	15,147	2,753.8	411.5	3,165.3
Total	**115,959**	**113,641**	**16,614**	**74,768**	**12,050.4**	**1,632**	**7,347**	**2,448.0**	**81**	**283.5**	**2**	**105**	**18,329**	**82,115**	**14,886.9**	**2,224.6**	**17,111.5**

Table 3-4: 2021 Served Population and Water Demand Projections

Barangay	Population	Service Area Pop'n	Domestic			Commercial			Institutional		Industrial/Bulk		Total			UFW (m^3/day)	Average Day Demand (m^3/day)
			No. of Conn	Served Pop'n	Water Demand	No. of Conn	Served Pop'n	Water Demand	No. of Conn	Water Demand	No. of Conn	Water Demand	No. of Conn	Served Pop.	Water Demand		
1. Agnaya	2,695	2,641	512	2,303	380.0	73	329	109.5	3	10.5	-	-	588	2,632	500.0	74.7	574.7
2. Bagong Silang	3,844	3,767	670	3,017	497.8	12	54	18.0	2	7.0	-	-	684	3,071	522.8	78.1	600.9
3. Banga I	7,952	7,793	1,251	5,629	928.8	477	2,147	715.5	3	10.5	1	52.5	1,732	7,776	1,707.3	255.1	1,962.4
4. Banga II	10,378	10,170	1,730	7,787	1,284.9	192	864	288.0	9	31.5	-	-	1,931	8,651	1,604.4	239.7	1,844.1
5. Bintog	4,769	4,674	885	3,983	657.2	52	234	78.0	5	17.5	-	-	942	4,217	752.7	112.5	865.2
6. Bulihan	6,530	6,399	852	3,835	632.8	49	221	73.5	5	17.5	-	-	906	4,056	723.8	108.2	832.0
7. Culianin	4,375	4,287	434	1,951	321.9	4	18	6.0	-	-	-	-	438	1,969	327.9	49.0	376.9
8. Dampol	3,479	3,409	700	3,152	520.1	31	140	46.5	5	17.5	-	-	736	3,292	584.1	87.3	671.4
9. Lagundi	4,909	4,811	896	4,031	665.1	47	212	70.5	3	10.5	-	-	946	4,243	746.1	111.5	857.6
10. Lalangan	2,371	2,324	422	1,901	313.7	12	54	18.0	3	10.5	-	-	437	1,955	342.2	51.1	393.3
11. Lumang Bayan	6,615	6,483	1,328	5,974	985.7	73	329	109.5	6	21.0	-	-	1,407	6,303	1,116.2	166.8	1,283.0
12. Parulan	8,782	8,606	1,756	7,901	1,303.7	101	455	151.5	4	14.0	-	-	1,861	8,356	1,469.2	219.5	1,688.7
13. Poblacion	4,171	4,088	775	3,487	575.4	129	581	193.5	17	59.5	-	-	921	4,068	828.4	123.8	952.2
14. Rueda	1,915	1,877	364	1,640	270.6	13	59	19.5	2	7.0	-	-	379	1,699	297.1	44.4	341.5
15. San Jose	5,083	4,981	847	3,810	628.7	48	216	72.0	4	14.0	-	-	899	4,026	714.7	106.8	821.5
16. Santa Ines	3,417	3,349	586	2,638	435.3	27	122	40.5	3	10.5	-	-	616	2,760	486.3	72.7	559.0
17. Santo Niño	12,890	12,632	1,455	6,547	1,080.3	97	437	145.5	4	14.0	-	-	1,556	6,984	1,239.8	185.3	1,425.1
18. Sipat	6,775	6,639	1,214	5,462	901.2	58	261	87.0	3	10.5	-	-	1,275	5,723	998.7	149.2	1,147.9
19. Tabang	23,780	23,304	4,102	18,457	3,045.4	357	1,607	535.5	8	28.0	1	52.5	4,468	20,064	3,661.4	547.1	4,208.5
Total	**124,729**	**122,234**	**20,779**	**93,505**	**15,428.6**	**1,852**	**8,340**	**2,778.0**	**89**	**311.5**	**2**	**105.0**	**22,722**	**101,845**	**18,623.1**	**2,782.8**	**21,405.9**

Table 3-5: 2030 Served Population and Water Demand Projections

Barangay	Population	Service Area Pop'n	Domestic			Commercial			Institutional		Industrial/Bulk		Total			UFW (m^3/day)	Average Day Demand (m^3/day)
			No. of Conn	Served Pop'n	Water Demand	No. of Conn	Served Pop'n	Water Demand	No. of Conn	Water Demand	No. of Conn	Water Demand	No. of Conn	Served Pop'n	Water Demand		
1. Agnaya	3,008	2,948	573	2,580	425.7	81	365	121.5	4	14.0	-	-	658	2,945	561.2	83.9	645.1
2. Bagong Silang	4,777	4,682	1,008	4,537	748.6	14	63	21.0	3	10.5	-	-	1,025	4,600	780.1	116.6	896.7
3. Banga I	9,664	9,471	1,521	6,844	1,129.3	580	2,610	870.0	4	14.0	1	52.5	2,106	9,454	2,065.8	308.7	2,374.5
4. Banga II	12,806	12,550	2,548	11,468	1,892.2	237	1,067	355.5	11	38.5	-	-	2,796	12,535	2,286.2	341.6	2,672.8
5. Bintog	5,926	5,811	1,224	5,509	909.0	65	293	97.5	6	21.0	-	-	1,295	5,802	1,027.5	153.5	1,181.0
6. Bulihan	8,003	7,843	1,318	5,932	978.8	60	270	90.0	6	21.0	1	52.5	1,385	6,202	1,142.3	170.7	1,313.0
7. Culianin	4,974	4,875	724	3,258	537.6	5	23	7.5	2	7.0	-	-	731	3,281	552.1	82.5	634.6
8. Dampol	4,077	3,996	850	3,825	631.1	37	167	55.5	6	21.0	-	-	893	3,992	707.6	105.7	813.3
9. Lagundi	6,103	5,981	1,259	5,663	934.4	58	261	87.0	4	14.0	-	-	1,321	5,924	1,035.4	154.7	1,190.1
10. Lalangan	2,895	2,837	610	2,745	452.9	14	63	21.0	4	14.0	-	-	628	2,808	487.9	72.9	560.8
11. Lumang Bayan	8,755	8,580	1,805	8,121	1,340.0	96	432	144.0	8	28.0	-	-	1,909	8,553	1,512.0	225.9	1,737.9
12. Parulan	10,922	10,704	2,248	10,115	1,669.0	126	567	189.0	4	14.0	-	-	2,378	10,682	1,872.0	279.7	2,151.7
13. Poblacion	4,785	4,690	893	4,019	663.1	148	666	222.0	20	70.0	-	-	1,061	4,685	955.1	142.7	1,097.8
14. Rueda	2,170	2,127	453	2,037	336.1	15	68	22.5	2	7.0	-	-	470	2,105	365.6	54.6	420.2
15. San Jose	6,233	6,109	1,191	5,358	884.1	59	266	88.5	5	17.5	-	-	1,255	5,624	990.1	147.9	1,138.0
16. Santa Ines	4,246	4,161	822	3,700	610.5	34	153	51.0	4	14.0	-	-	860	3,853	675.5	100.9	776.4
17. Santo Niño	16,583	16,252	2,438	10,971	1,810.2	124	558	186.0	5	17.5	-	-	2,567	11,529	2,013.7	300.9	2,314.6
18. Sipat	8,426	8,258	1,759	7,915	1,306.0	72	324	108.0	4	14.0	-	-	1,835	8,239	1,428.0	213.4	1,641.4
19. Tabang	30,859	30,242	6,074	27,335	4,510.3	463	2,084	694.5	11	38.5	1	52.5	6,549	29,419	5,295.8	791.3	6,087.1
Total	**155,212**	**152,117**	**29,318**	**131,932**	**21,768.9**	**2,288**	**10,300**	**3,432.0**	**113**	**395.5**	**3**	**157.5**	**31,722**	**142,232**	**25,753.9**	**3,848.1**	**29,602.0**

3.1.4 Water Demand Projection

40. The total water demand is estimated to be the sum of all domestic, commercial/industrial and institutional consumptions and allowance for non-revenue water due losses in the system. In order to estimate the total water requirement of the system, the following unit consumption for each category are used: 165 liters per capita per day (Lpcd) for domestic connection, 1.5 m³/day for commercial connection, 3.5 m³/day for institutional connection and 52.50 m³/day for industrial/bulk connection. Non-revenue water is estimated at 13% of the total water demand.

41. Based on the foregoing, the projected average water demand of the system for the years 2021 and 2030 are estimated at 21,405.9 m³/day (247.8 Lps) and 29,602.0 m³/day (342.6 (Lps), respectively.

42. **Table 3-6** shows the year by year served population, water demand and service connections projections.

Table 3-6: Served Population, Water Demand, and Number of Connections

Period	Service Area Pop'n	Served Pop'n	Domestic		Commercial		Institutional		Industrial/Bulk		Total		UFW (m^3/day)	Average Day Demand (m^3/day)
			No. of Conn	Water Demand	No. of Conn	Water Demand	No. of Conn	Water Demand	No. of Conn	Water Demand	No. of Conn	Water Demand		
June 2018	122,275	79,078	16,021	11,619.0	1,551	2,326.5	81	281.8	2	105.0	17,655	14,332.3	2,141.80	16,474.0
December 2018	113,641	82,115	16,614	12,050.4	1,632	2,448.0	81	283.5	2	105.0	18,329	14,886.9	2,224.60	17,111.5
June 2019	115,039	85,397	17,308	12,553.0	1,669	2,503.5	82	287.0	2	105.0	19,061	15,448.5	2,308.40	17,756.9
December 2019	116,436	88,684	18,002	13,056.0	1,705	2,558.0	84	292.8	2	105.0	19,793	16,011.8	2,392.60	18,404.4
June 2020	117,868	91,974	18,696	13,560.0	1,742	2,613.5	85	296.3	2	105.0	20,525	16,574.8	2,476.70	19,051.5
December 2020	119,300	95,262	19,391	14,063.0	1,779	2,668.0	86	302.2	2	105.0	21,258	17,138.2	2,560.80	19,699.0
June 2021	120,767	98,551	20,085	14,567.0	1,816	2,723.5	87	305.7	2	105.0	21,990	17,701.2	2,645.00	20,346.2
December 2021	122,234	101,845	20,779	15,428.6	1,852	2,778.0	89	311.5	2	105.0	22,722	18,623.1	2,782.80	21,405.9
June 2022	123,737	104,081	21,253	15,780.0	1,876	2,814.0	90	315.0	3	157.5	23,222	19,066.5	2,849.00	21,915.5
December 2022	125,241	106,327	21,728	16,133.0	1,900	2,850.7	92	320.8	3	157.5	23,723	19,462.0	2,908.10	22,370.1
June 2023	126,781	108,568	22,202	16,485.0	1,924	2,886.7	93	324.3	3	157.5	24,222	19,853.5	2,966.60	22,820.1
December 2023	128,322	110,814	22,677	16,837.0	1,949	2,923.3	94	330.2	3	157.5	24,723	20,248.0	3,025.60	23,273.6
June 2024	129,900	113,055	23,151	17,189.0	1,973	2,953.3	95	333.7	3	157.5	25,222	20,633.5	3,084.10	23,723.6
December 2024	131,478	115,302	23,625	17,542.0	1,997	2,996.0	97	339.5	3	157.5	25,722	21,035.0	3,143.20	24,178.2
June 2025	133,095	117,543	24,099	17,894.0	2,021	3,032.0	98	343.0	3	157.5	26,221	21,426.5	3,201.70	24,628.2
December 2025	134,713	119,789	24,574	18,246.0	2,046	3,068.7	100	348.8	3	157.5	26,723	21,821.0	3,260.60	25,081.6
June 2026	136,369	122,030	25,046	18,598.0	2,070	3,104.7	101	352.3	3	157.5	27,220	22,212.5	3,319.10	25,531.6
December 2026	138,026	124,277	25,523	18,951.0	2,094	3,141.3	102	358.2	3	157.5	27,722	22,608.0	3,378.20	25,986.2
June 2027	139,724	126,518	25,997	19,303.0	2,118	3,177.3	103	361.7	3	157.5	28,221	22,999.5	3,436.70	26,436.2
December 2027	141,422	128,764	26,472	19,655.0	2,143	3,214.0	105	367.5	3	157.5	28,723	23,394.0	3,495.70	26,889.7
June 2028	143,161	131,005	26,946	20,007.0	2,167	3,250.0	106	371.0	3	157.5	29,222	23,785.5	3,554.20	27,339.7
December 2028	144,900	133,252	27,420	20,360.0	2,191	3,286.7	108	376.8	3	157.5	29,722	24,181.0	3,613.30	27,794.3
June 2029	146,683	135,492	27,894	20,712.0	2,215	3,227.0	109	380.3	3	157.5	30,221	24,476.8	3,671.80	28,244.3
December 2029	148,465	137,739	28,369	21,064.0	2,240	3,359.3	110	386.2	3	157.5	30,722	24,967.0	3,730.70	28,697.7
June 2030	150,291	139,980	28,843	21,416.0	2,264	3,395.3	111	389.7	3	157.5	31,221	25,358.5	3,789.20	28,147.7
December 2030	152,117	142,232	29,318	21,768.9	2,288	3,432.0	113	395.5	3	157.5	31,722	25,753.9	3,848.10	29,602.0

In this study, three demand variations are presented: average-day demand; maximum-day demand; and peak-hour demand. The average-day demand is the average of the daily water demands in a year. Maximum-day demand is the highest demand in a day within a year. Peak-hour demand is defined as the maximum hourly demand in a day. Past studies generally indicate an average-day to maximum-day demand ratio of 1:1.3 and an average-day to peak-hour demand ratio of 1:2. The water demand variations are shown in

43. **Table 3-7**.

Table 3-7: Water Demand Variations

Period	Average Day Demand		Maximum Day Demand		Peak-Hour Demand	
	(m^3/day)	(Lps)	(m^3/day)	(Lps)	(m^3/day)	(Lps)
June 2018	16,474.0	190.7	21,416.20	247.9	32,948.0	381.3
December 2018	17,111.5	198.0	22,244.95	257.5	34,223.0	396.1
June 2019	17,756.9	205.5	23,083.97	267.2	35,513.8	411.0
December 2019	18,404.4	213.0	23,925.72	276.9	36,808.8	426.0
June 2020	19,051.5	220.5	24,766.95	286.7	38,103.0	441.0
December 2020	19,699.0	228.0	25,608.70	296.4	39,398.0	456.0
June 2021	20,346.2	235.5	26,450.06	306.1	40,692.4	471.0
December 2021	21,405.9	247.8	27,827.67	322.1	42,811.8	495.5
June 2022	21,915.5	253.7	28,490.15	329.7	43,831.0	507.3
December 2022	22,370.1	258.9	29,081.13	336.6	44,740.2	517.8
June 2023	22,820.1	264.1	29,666.13	343.4	45,640.2	528.2
December 2023	23,273.6	269.4	30,255.68	350.2	46,547.2	538.7
June 2024	23,723.6	274.6	30,840.68	357.0	47,447.2	549.2
December 2024	24,178.2	279.8	31,431.66	363.8	48,356.4	559.7
June 2025	24,628.2	285.0	32,016.66	370.6	49,256.4	570.1
December 2025	25,081.6	290.3	32,606.08	377.4	50,163.2	580.6
June 2026	25,531.6	295.5	33,191.08	384.2	51,063.2	591.0
December 2026	25,986.2	300.8	33,782.06	391.0	51,972.4	601.5
June 2027	26,436.2	306.0	34,367.06	397.8	52,872.4	611.9
December 2027	26,889.7	311.2	34,956.61	404.6	53,779.4	622.4
June 2028	27,339.7	316.4	35,541.61	411.4	54,679.4	632.9
December 2028	27,794.3	321.7	36,132.59	418.2	55,588.6	643.4
June 2029	28,244.3	326.9	36,717.59	425.0	56,488.6	653.8
December 2029	28,697.7	332.1	37,307.01	431.8	57,395.4	664.3
June 2030	28,147.7	325.8	36,592.01	423.5	56,295.4	651.6
December 2030	29,602.0	342.6	38,482.60	445.4	59,204.0	685.2

3.1.5 Water Quality

44. PLAWD water quality monitoring results at source and distribution system for year 2019 for physical-chemical test and microbiological test were shown in **Table 3-8** and
45. **Table 3-9**. Four (4) parameters (Color, Turbidity, ph and Lead) for physical test at consumer's tap, and twelve (12) parameters (Color, Turbidity, ph, Lead, TDS, Nitrate, Arsenic, Cadmium, Iron, Manganese, Chloride and Sulfate) for chemical test at source. Water sampling for physical-chemical test were done yearly by CRL Laboratory, based in Clark, Pampanga, and for microbiological test was done monthly by Scientia Tech Company, Antipolo City.For those

that did not pass the microbiological water quality test, there was no disruption of water services from the source until the re-test would yield "passed" results. Before the re-test, a sanitary survey is conducted within 24 hours to determine the cause of contamination. If re-test fails, corrective action is applied. An advisory to "Boil water" or other household water treatment options is issued, or an alternative drinking water supply is provided.

Table 3-8: Physical-Chemical Test Result Summary, 2019

Consumer's Tap		Parameters				Remarks
		Color	Turbidity	pH	Lead	
Location	units	TCU/ACU	NTU	-	mg/L	
	limits	5/10	5	6.5 to 8.5	0.01	
Tabang		1.0 TCU	1	6.94 @25°C	ND (<0.002)	Passed
Bintog		1.0 TCU	1	7.32 @25°C	ND (<0.002)	Passed
Sipat		1.0 TCU	1	6.90 @25°C	ND (<0.002)	Passed
Parulan		1.0 TCU	1	7.30 @25°C	ND (<0.002)	Passed
Bulihan		1.0 TCU	1	7.29 @25°C	ND (<0.002)	Passed
Culianin		1.0 TCU	1	7.28 @25°C	ND (<0.002)	Passed
Plaridel Heights		1.0 TCU	1	7.01 @25°C	ND (<0.002)	Passed
Sitio Santiago		1.0 TCU	1	6.98 @25°C	ND (<0.002)	Passed

Source		12 Parameters												Remarks
		Color	Turbidity	pH	Lead	TDS	Nitrate	Arsenic	Cadnium	Iron	Manganese	Chloride	Sulfate	
Location	units	TCU/ACU	NTU	-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
	limits	5/10	5	6.5 to 8.5	0.01	600	50	0.01	0.003	1	0.4	250	250	
Tabang		1.0 TCU	1	6.99 @25°C	ND (<0.002)	358	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	147	Passed
Bintog		1.0 TCU	1	7.28 @25°C	ND (<0.002)	402	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	170	Passed
Sipat		1.0 TCU	1	6.83 @25°C	ND (<0.002)	269	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	88	Passed
Parulan		1.0 TCU	1	7.43 @25°C	ND (<0.002)	600	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	250	Passed
Bulihan		1.0 TCU	1	6.76 @25°C	ND (<0.002)	258	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	80	Passed
Culianin		1.0 TCU	1	7.20 @25°C	ND (<0.002)	357	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	147	Passed
Plaridel Heights		1.0 TCU	1	7.20 @25°C	ND (<0.002)	124	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	ND (<0.05)	Passed
Sitio Santiago		1.0 TCU	1	6.95 @25°C	ND (<0.002)	260	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	88	Passed
Banga I (additional)		1.0 TCU	1	7.39 @25°C	ND (<0.002)	409	ND (<0.23)	ND (<0.002)	ND (<0.003)	ND (<0.05)	ND (<0.02)	22	167	Passed

Table 3-9: Microbiological Test Result Summary, 2019

JANUARY						
Sampling Location	Date	Results				
		Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Lumang Bayan, Remedios, San Pedro	January, 31	<1.1 MPN	<1.1 MPN	160	Passed	-
Sipat Brgy. Hall, Sipat	January, 31	<1.1 MPN	<1.1 MPN	90	Passed	-
Dampol Highschool, Dampol	January, 31	<1.1 MPN	<1.1 MPN	60	Passed	-
Rueda, Rueda Brgy. Hall	January, 31	<1.1 MPN	<1.1 MPN	>5700	Did not Pass	Passed
Landungin Brgy. Hall, Lagundi	January, 31	<1.1 MPN	<1.1 MPN	100	Passed	-

JANUARY

Sampling Location	Date	Results				
		Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Sta. Monica Subd. Ibarra Villafuerte	January, 31	<1.1 MPN	<1.1 MPN	120	Passed	-
Mary Grace Subd. Aurora F. Sumulong Eatery	January, 31	<1.1 MPN	<1.1 MPN	50	Passed	-
Lalangan, Phil-Stte Guard House	January, 31	<1.1 MPN	<1.1 MPN	90	Passed	-
Agnaya Brgy. Hall, Agnaya	January, 31	<1.1 MPN	<1.1 MPN	1500	Did not Pass	Passed
Sta. Ines Bukid, Julianna Ensinas	January, 31	<1.1 MPN	<1.1 MPN	130	Passed	-
Tabang Looban, Faustino Sebastian	January, 31	<1.1 MPN	<1.1 MPN	60	Passed	-
Rocka Ville, Lito Samson	January, 31	<1.1 MPN	<1.1 MPN	150	Passed	-
Banga II, Banga II Brgy. Hall	January, 31	<1.1 MPN	<1.1 MPN	60	Passed	-
Parulan, Parulan Brgy. Hall	January, 31	<1.1 MPN	<1.1 MPN	100	Passed	-
Bintog, Bintog Brgy. Hall	January, 31	<1.1 MPN	<1.1 MPN	1000	Did not Pass	Passed
Culianin, James Conching	January, 31	<1.1 MPN	<1.1 MPN	35	Passed	-
San Jose, Donato Jacinto	January, 31	<1.1 MPN	<1.1 MPN	60	Passed	-
Bulihan, Bulihan Brgy. Hall	January, 31	<1.1 MPN	<1.1 MPN	45	Passed	-
Bagong Silang, Bagong Silang Brgy. Hall	January, 31	<1.1 MPN	<1.1 MPN	90	Passed	-
La Mirada Subd., Eliza Sangria	January, 31	<1.1 MPN	<1.1 MPN	170	Passed	-
Bangal, R Javier	January, 31	<1.1 MPN	<1.1 MPN	60	Passed	-
Poblacion, Gorgonia Mariano	January, 31	<1.1 MPN	<1.1 MPN	100	Passed	-
NHA, Rhonnel Reyes	January, 31	<1.1 MPN	<1.1 MPN	50	Passed	-

Limits:
Total Coliform <1.1 MPN/100mL, Thermotolerant Coliform <1.1 MPN/100mL, HPC<500 CFU/mL

FEBRUARY

Sampling Location	Date	Results				
		Total Coliform	Therm tolerant Coliform	HPC	Remarks	Re-test
Rueda Saklolo, Tabang Looban	February, 28	<1.1 MPN	<1.1 MPN	160	Passed	-
Premitivo, Rocak Ville	February, 28	<1.1 MPN	<1.1 MPN	220	Passed	-
Aurella Guid, Banga II	February, 28	<1.1 MPN	<1.1 MPN	35	Passed	-
Alkaras, Parulan	February, 28	<1.1 MPN	<1.1 MPN	60	Passed	-

FEBRUARY						
Sampling Location	**Date**	**Results**				
		Total Coliform	**Therm tolerant Coliform**	**HPC**	**Remarks**	**Re-test**
Rodolfo Aguino, Bintog	February, 28	<1.1 MPN	<1.1 MPN	160	Passed	-
Michael Ventura, Culianin	February, 28	<1.1 MPN	<1.1 MPN	180	Passed	-
Celirina Agullar, San Jose	February, 28	<1.1 MPN	<1.1 MPN	200	Passed	-
Brgy. Hall Bulihan, Bulihan	February, 28	<1.1 MPN	<1.1 MPN	100	Passed	-
Glean Ubibid, Bagong Silang	February, 28	<1.1 MPN	<1.1 MPN	60	Passed	-
Kayabyab, La Mirada Subd.	February, 28	<1.1 MPN	<1.1 MPN	170	Passed	-
Jacob Kuldero, Banga I	February, 28	<1.1 MPN	<1.1 MPN	70	Passed	-
Sabino Lazana, Poblacion	February, 28	<1.1 MPN	<1.1 MPN	60	Passed	-
Remedios San Pedro, Lumang Bayan	February, 28	<1.1 MPN	<1.1 MPN	160	Passed	-
Sipat Brgy. Hall, Sipat	February, 28	<1.1 MPN	<1.1 MPN	220	Passed	-
Rhonnel Reyes, NHA	February, 28	<1.1 MPN	<1.1 MPN	35	Passed	-
Dampol Highschool, Dampol	February, 28	<1.1 MPN	<1.1 MPN	60	Passed	-
Rueda Health Center, Rueda	February, 28	<1.1 MPN	<1.1 MPN	180	Passed	-
Lagundin Brgy. Hall, Lagundi	February, 28	<1.1 MPN	<1.1 MPN	60	Passed	-
Sta. Monica Subd. Ibarra Villafuerte	February, 28	<1.1 MPN	<1.1 MPN	180	Passed	-
Mary Grace Subd. Rafael Isagunde	February, 28	<1.1 MPN	<1.1 MPN	60	Passed	-
Lalangan, Phil-Stte Guard House	February, 28	<1.1 MPN	<1.1 MPN	35	Passed	-
Agnaya Brgy. Hall, Agnaya	February, 28	<1.1 MPN	<1.1 MPN	60	Passed	-
Sta. Ines Bukid, Juliana Ensinas	February, 28	<1.1 MPN	<1.1 MPN	160	Passed	-

Limits:
Total Coliform <1.1 MPN/100mL, Thermotolerant Coliform <1.1 MPN/100mL, HPC<500 CFU/mL

3.2 Description of the Proposed Subproject

46. The proposed subproject comprised 3 packages.

Table 3-10: Summary of Information of Packages under WDDSP for PLAWD

PACKAGE NO.	PROJECT TITLE	COMPONENTS	LOCATION	STATUS
WDDSP-PLAWD-OCB-CW10a	Design and Construction of Plaridel Water Supply System	Pipelaying - 40.5 km	Various Locations	On-going construction, Tentative Completion is July 2024, Permits were partially secured.
		Storage Reservoir with booster pump - 1500 cubic meter	Brgy. Rueda, Plaridel	
		Generator Sets - for 3 existing Pump Stations	Parulan, Bulihan and Sitio Santiago Tabang	
WDDSP-PLAWD-OCB-CW10b	Design and Construction of Ground Reservoir	Storage Reservoir with booster pump - 1500 cubic meter	Brgy. Banga 1st, Plaridel	On-going construction, Tentative Completion is July 2023, Permits were secured.
WDDSP-PLAWD-OCB-CW10c	Design and Construction Plaridel Water District Office Building	Office Building 2 floors and 1 basement - 1626 square meters	Brgy. Bintog Plaridel	For Re-Bidding

47. Figure 3-4 shows the recommended improvements for PLAWD.

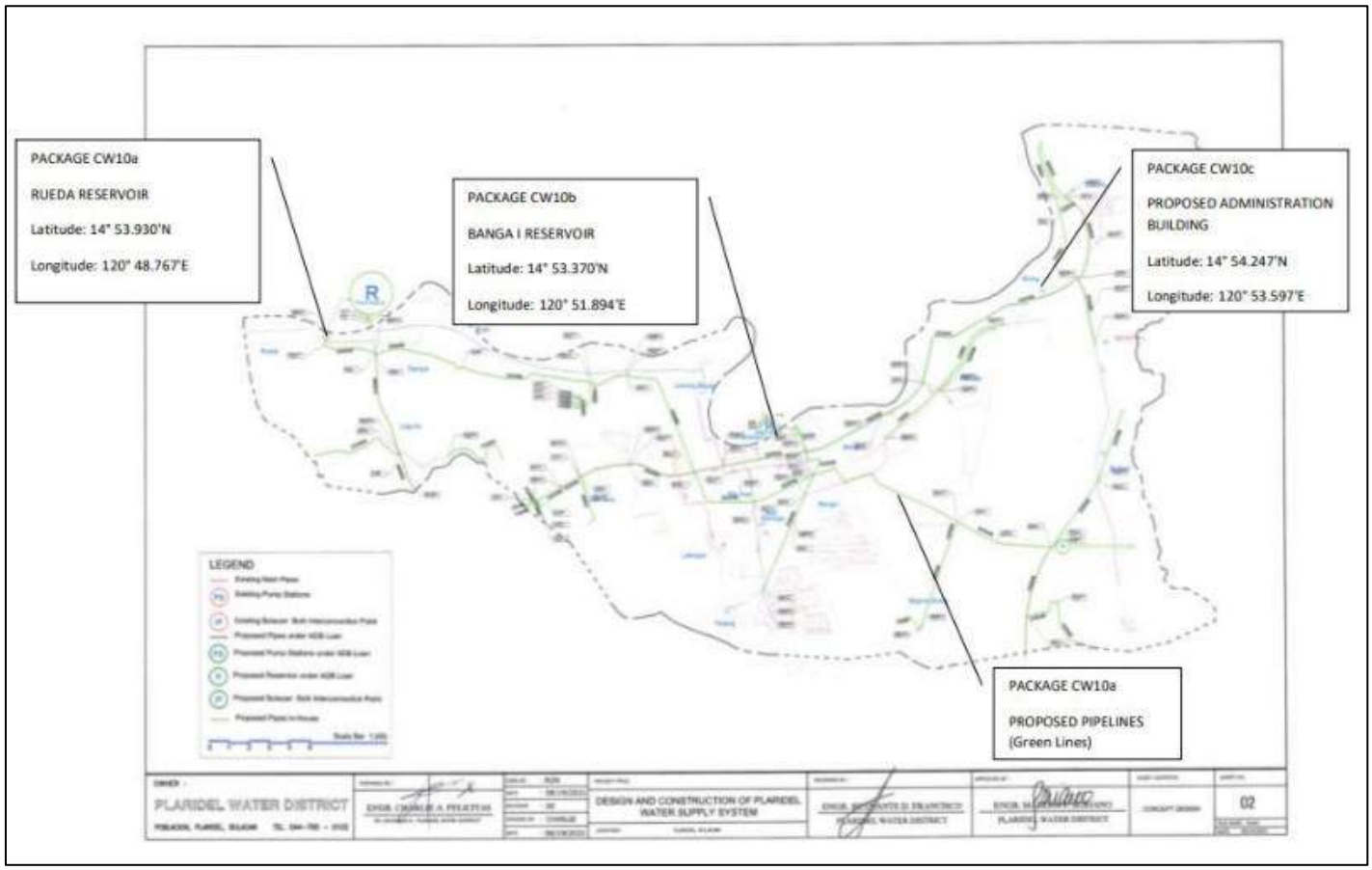

Figure 3-4 Recommended Improvement for PLAWD

3.2.1 Design and Construction of Plaridel Water Supply System (Contract No. WDDSP-PLAWD-OCB-CW10a (Package 1)

48. Package 1, awarded to M. E. Sicat Construction Inc. on 12 April 2021 aims to expand the water supply system coverage of the Plaridel Water District (PLAWD) and meet the water supply demand until 2030 through the construction of a storage facility (ground reservoir), installation of transmission and distribution pipelines, and procurement and installation of power generating sets. PLAWD's Water Supply Improvement Project includes: (i) construction of a storage facility with booster; (ii) pipelaying of transmission and distribution lines; and (iii) procurement of power generating sets.

49. **Storage Facilities with Booster**. The storage facility will be located in Barangay Rueda on the lot that is already owned by PLAWD. The 1,500 m3 storage facility (ground reservoir) will be constructed with a booster pumping station. The booster pumping station will be provided with appropriate electro-mechanical equipment (vertical multi-stage centrifugal pump and motor with variable frequency drive), complete with the necessary controls, cables, pumping assembly, other electrical components, power generating set, distribution transformers, and pump house with perimeter fence.

50. **Transmission and Distribution Pipelines.** A total of about 40.5 kilometers of transmission and distribution pipelines with sizes ranging from 75-500 mm uPVC and steel pipes will be installed in preparation for the infusion of additional supply from the Bulacan Bulk Water of Luzon Clean Water Development Corporation and to reinforce the existing distribution system to improve the pressure within the system. Pipelaying will be within the road right-of-way.

51. **Power Generating Sets**. Three (3) units of 60 kVA power generating sets will be purchased and installed in three (3) existing pumping stations of PLAWD that do not have a standby power generating set. The recipient barangays for three (3) power generating sets are Tabang (Sitio Santiago), Bulihan and Parulan. The generating sets are of close/silent type with enclosure.

3.2.1.1 Associated Project / Lot Facilities

a. Construction and Workers' Camp

52. The construction and workers' camp are located in Purok 4, Barangay Bintog, along General Alejo Santos Highway, with a total area of 1,250 m2. The area includes the fabrication area, aggregate, stockyard, Engineers' offices and quarters, clinic, workers' lay down area, canteen and isolation area.

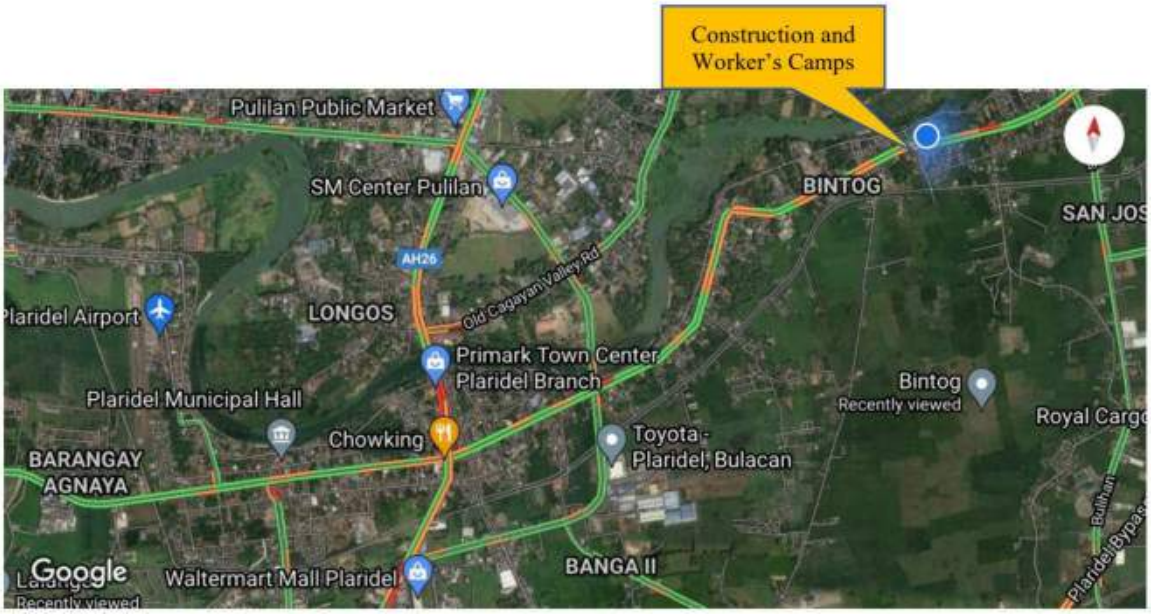

Figure 3-5 Location of Construction and Worker's Camp

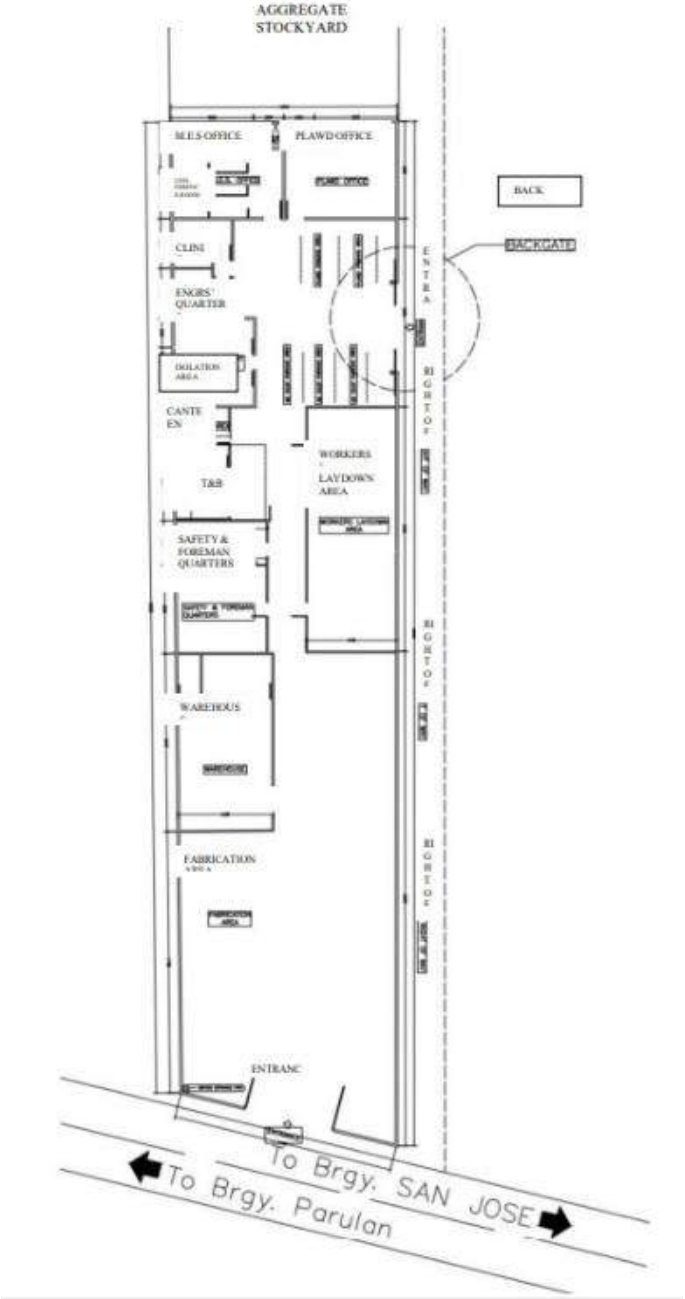

Figure 3-6 Layout of Construction and Workers' Camp

b. Material Sources and Storage Area

Figure 3-7 Stockyard for Delivered Aggregates

c. Workshop and Fabrication Yards

Figure 3-8 Workshop and Fabrication Yard

d. Hazardous Materials and Chemical Storage Areas

Figure 3-9 Fuels, Oils and Other Hazardous Materials Stored Outside the Warehouse

e. Wastes and Spoils Disposal Area

53. Construction wastes, such as scrap metals, wood and plastics, are temporarily stored on site until such time that they are hauled to the centralized disposal area in Guiguinto warehouse. Biodegradable solid wastes are collected in black garbage bags and hauled by garbage truck of Barangay Bintog every Wednesday and Thursday.

Figure 3-10 Wastes and Spoils Disposal Area

f. Ready-mix Concrete Delivered by Supplier

54. There are no crushing and batching plants on site dedicated for the project. Ready-mix concrete shall be delivered by the supplier, Jolly Concrete Mix, whose plant is located at the Jolly Industrial Park in Barangay Parulan.

3.2.1.2 Sensitive Receptors

55. The following were the identified sensitive receptors for the proposed pipelaying activities under CW10a (Package 1).

Table 3-11: Sensitive Receptors

Section	Sensitive Receptors
Barangay Culianin to Barangay Bintog	St. Paul the Apostle Parish Culianin Elementary School Parokya ng Nuestra Senora del Rosario The Primitive Baptist Plaridel
Barangay Bintog to Barangay Parulan	San Nicolas de Tolentino Chapel Bintog Elementary School Plaridel Bible Church Ancient Landmark Baptist Church Ekkesiasa Plaridel Church Bisitani San Clemente Church
Barangay Parulan to Barangay Banga 2nd (along General Alejo Santos Highway)	Parulan Elementary School Precious Soul in the Eyes of Jesus Church Iglesiani Cristo – Local ng Plaridel Church Banga High School The Pediatric Clinic
Barangay Banga 2nd to Banga 1st (along Plaridel – Pulilan Diversion Road	Turn to Jesus Church Santa Clara Catholic Chapel
Barangay Banga 1st to Barangay Tabang	Christian Cathedral Next Generation Technological College Bethel Baptist Church – Plaridel, Bulacan Plaridel County Hospital Victory Christian Church
Barangay Tabang	Tabang Elementary School San Roque Chapel JPI Senior High School – Plaridel Campus
Barangay Poblacion	Plaridel Central United Methodist Church La Consolacion University General Hospital St. James the Apostle Parish Church – Quingua Dr. Peralta Hospital Jesus is Lord Church
Barangay Dampol to Barangay Rueda	Dampol 1st National High School
Barangay Lagundi	Iglesiani Cristo – Lokal ng Lagundi Lagundi Chapel Lagundi Elementary School

Figure 3-11 Sensitive Receptors in Barangay Culianin to Barangay Bintog

Figure 3-12 Sensitive Receptors in Barangay Bintog to Barangay Parulan

Figure 3-13 Sensitive Receptors in Barangay Parulan to Barangay Banga 2nd

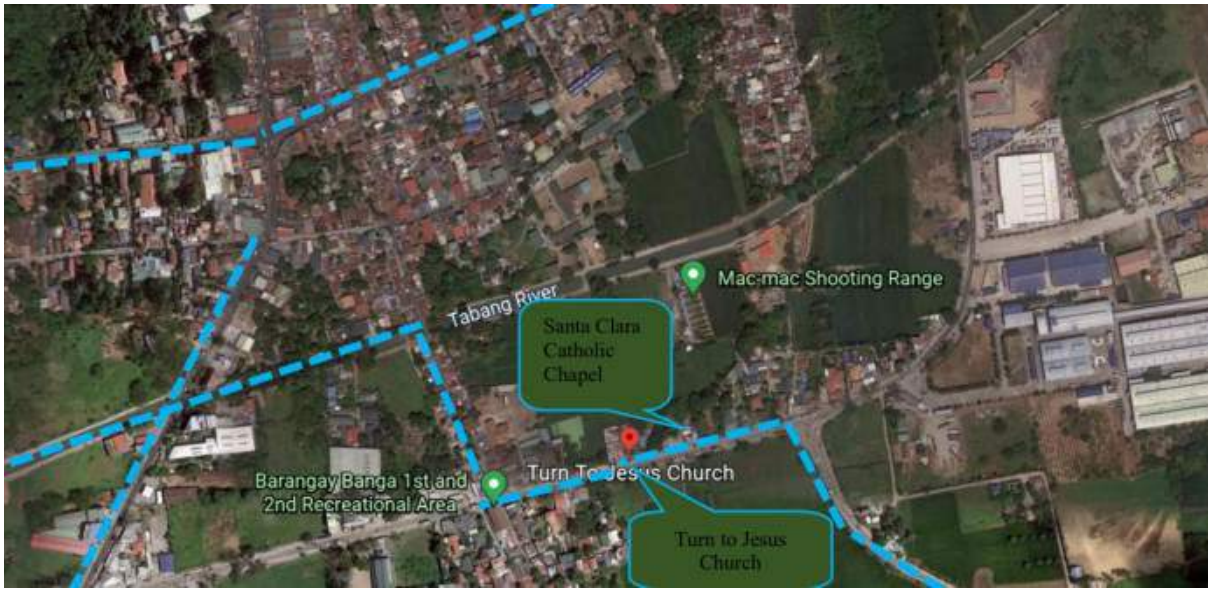

Figure 3-14 Barangay Banga 2nd to Barangay Banga 1st

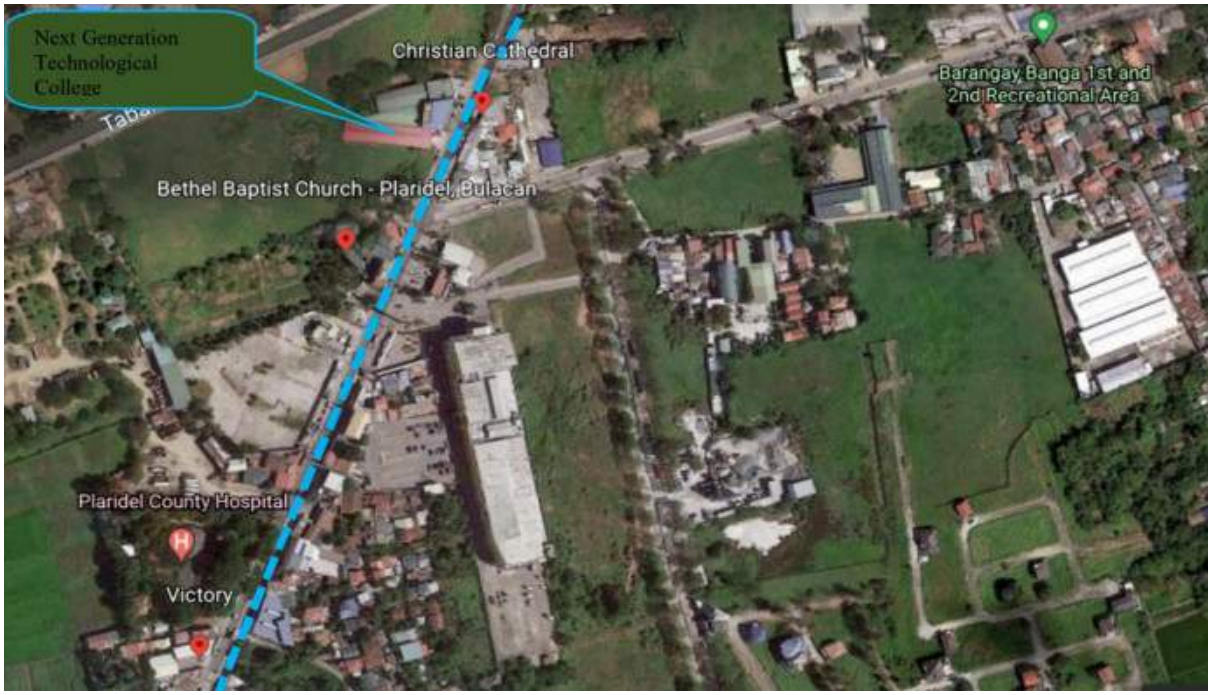

Figure 3-15 Sensitive Receptors in Barangay Banga 1st to Tabang

Figure 3-16 Sensitive Receptors in Barangay Tabang

Figure 3-17 Sensitive Receptors in Barangay Poblacion

Figure 3-18 Sensitive Receptors in Barangay Dampol to Barangay Rueda

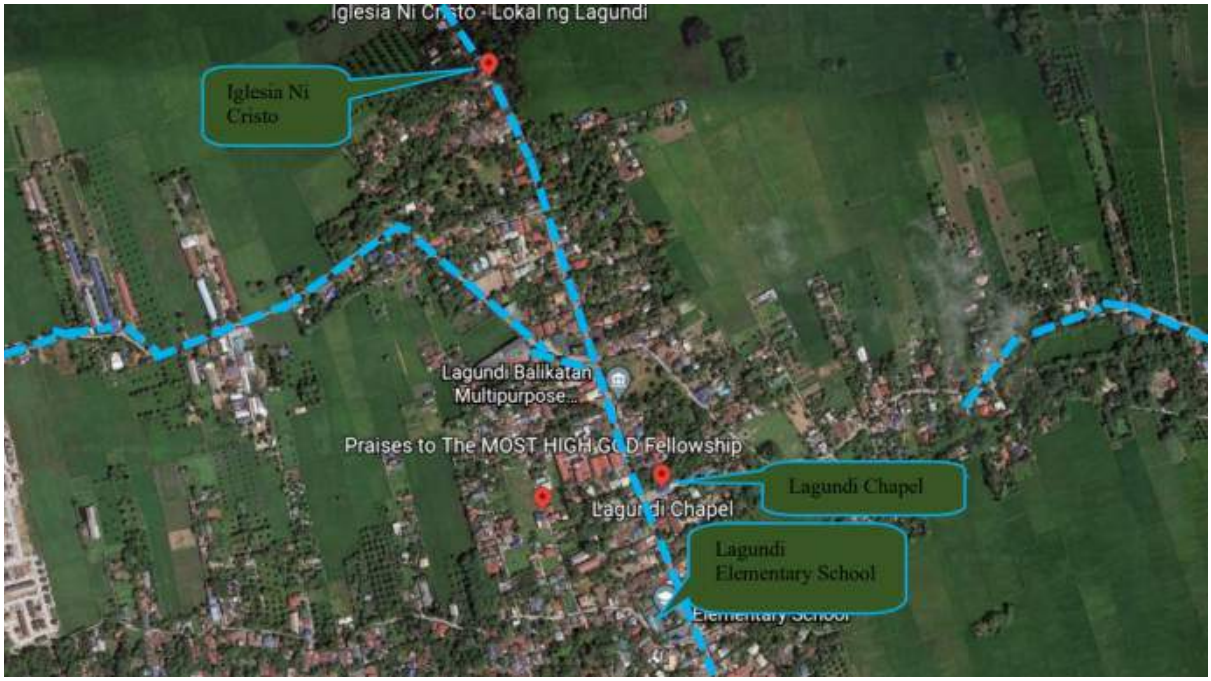

Figure 3-19 Sensitive Receptors in Barangay Lagundi

3.2.2 Design and Construction of Ground Reservoir (Contract No. WDDSP-PLAWD-OCB-CW10b (Package 3)

56. Package 3, which was awarded to CG Integra Corporation on 23 May 2022, comprised the design and construction of ground reservoir to be located in Barangay Banga 1st, Plaridel, Bulacan. The land area is 500 m2 Construction packages include:

(i) Site investigation reports;
(ii) Detailed design;
(iii) Works (structural computation / analysis, hydraulic analysis
(iv) Detailed construction drawings / plans and submission of as built drawings and
(v) Other related works in accordance with the Employer's Requirements.
(vi) Construction of concrete foundation
(vii) Installation of Glass Fused Steel Bolted Ground Reservoir and Pump House including related appurtenances, testing and commissioning
(viii) Supply and installation of electro-mechanical works including testing and commissioning requirements

3.2.2.1 Current Condition of the Site

57. The project site is an open and undeveloped land parcel being under construction phase. The site has been in filled with clean material and raised higher than surrounding land levels. The project site supports limited infrastructure, including utilities. There is limited biodiversity seen on the site however levels are increasing as CGIC introduce flora and landscape the area.

3.2.2.2 Identified Sensitive Receptors

58. There are no identified sensitive environmental receptors, either directly adjacent or near to the project location.

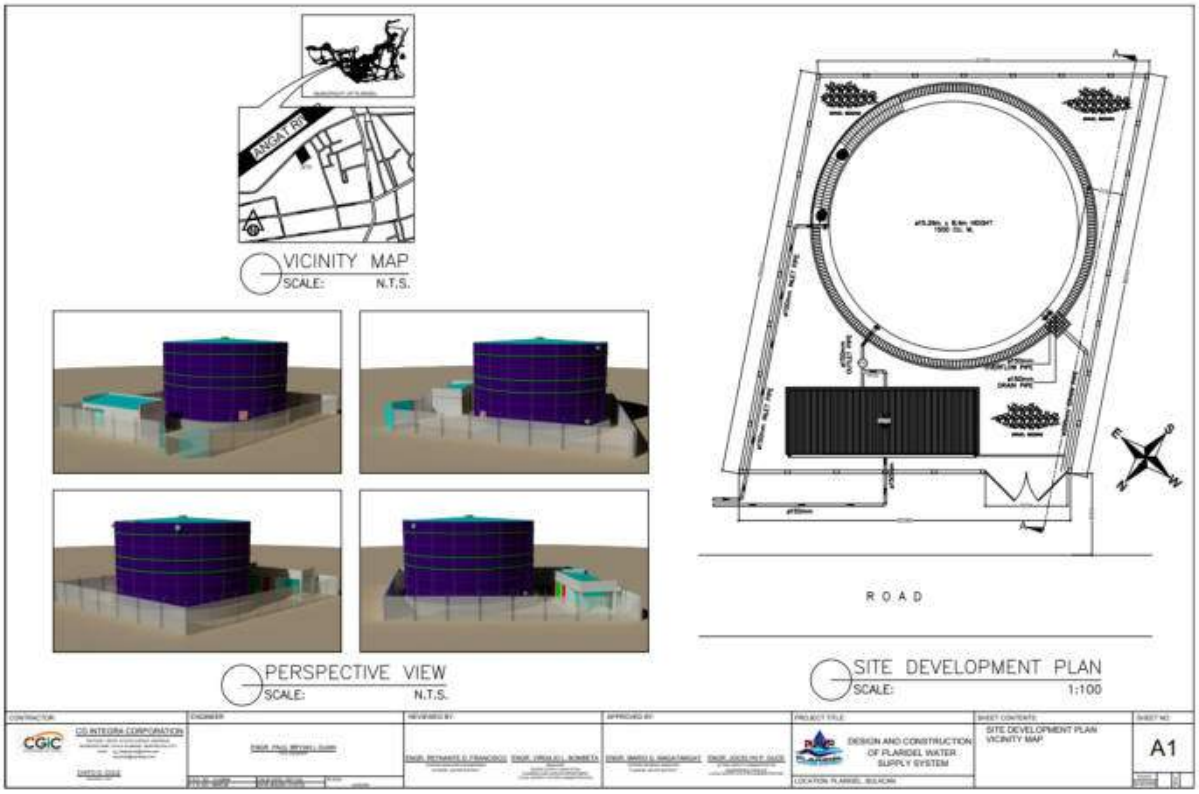

Figure 3-20 Site Development Plan of Ground Reservoir in Barangay Rueda

3.2.3 Design and Construction of Plaridel Water District Office Building Contract No. WDDSP-PLAWD-OCB-CW10c (Package 2)

59. Package 2, is a 3-storey building including warehouse and parking areas. The office layout shall be strategically planned based on their functionality, serving continuous flow of private and public transactions. The proposed office building is to be located in lot owned by PlaWD in Barangay Bintog, Plaridel, Bulacan along Gen. Alejo Highway. It is approximately 5 kilometers away from the municipality proper.

60. The required minimum areas of the building are as follows:

(a) Basement with Car Ramp, Warehouse/Storage Room and parking space - 606square meters;
(b) Ground Floor with elevated parking space– 510 square meters;
(c) Second Floor – 510 square meters;
(d) Perimeter Fence- 114 meters.

61. Site development and landscape design shall be environmentally-sensitive design, integrating natural areas into land development plans which allow ecosystem maintenance and sustainability.

62. Site development shall include sidewalk and loading/unloading bay for public utility vehicle (PUV).

63. Parking areas, and other ancillary spaces shall be considered in the site development plans. Perimeter fence with lighting shall likewise be provided. Loading and unloading areas shall be so designed to provide ease and smooth flow of traffic.

64. Landscape design shall utilize ornamental plants and trees to provide shade and reduce urban heat. Drip irrigation shall be provided for the vegetated areas. Existing trees that were cut-out shall be replace with appropriate suitable roots in parking space, strategically located to provide shade to cars.

3.2.3.1 Current Condition of the Site

65. The proposed project site is to be located in the existing Bintog Pump Station with lot area of 1,000 sqm. The facilities within this lot are pump house, storage room, electrical room, generator set and comfort room which shall be integrated in the proposed office building. The proposed office building is along Gen. Alejo Highway which at present has two lanes with an easement of 3 meters both sides for future expansion by the government (DPWH).

3.2.3.2 Identified Sensitive Receptors

66. There are no identified sensitive environmental receptors, either directly adjacent or near to the project location.

Figure 3-21 Project Site Location in Barangay Bintog

Figure 3-22 Concept Design Perspective View

Table 3-12: Total Project Estimate Cost (Php)

Cost Reference: 2018 LWUA In-Place Costs

ENGINEERING BASIC COST ITEMS		WD LOAN		WD EQUITY		TOTAL
A. POWER GENERATING SET		2,526,714.00				2,526,714.00
B. STORAGE FACILITIES WITH BOOSTER		23,360,997.00		23,360,997.00		46,721,994.00
C. TRANSMISSION/DISTRIBUTION PIPELINES		189,810,914.50		-		189,810,914.50
D, OFFICE BUILDING/MOTORPOOL/WAREHOUSE		51,030,000.00				51,030,000.00
E. DETAILED ENGINEERING DESIGN		8,702,688.68		-		8,702,688.68
SUB-TOTAL I	Php	275,431,314.18	Php	23,360,997.00	Php	298,792,311.18
PRICE AND PHYSICAL CONTINGENCIES, PPC		14,939,616.00		-		14,939,616.00
ENGINEERING STUDY, ES		6,274,639.00		-		6,274,639.00
CONSTRUCTION MONITORING, CM		3,137,319.00		-		3,137,319.00
TOTAL COST I	Php	299,782,888.18	Php	23,360,997.00	Php	323,143,885.18

NON-ENGINEERING BASIC COST ITEMS		WD LOAN		WD EQUITY		TOTAL
A. LOT ACQUISITION	Php	-	Php	5,571,700.00	Php	5,571,700.00
B. SERVICE VEHICLE		1,712,395.65		4,572,019.20		6,284,414.85
SUB-TOTAL II	Php	1,712,395.65	Php	10,143,719.20	Php	11,856,114.85
TOTAL PROJECT COST	**Php**	**301,495,284.00**	**Php**	**33,504,716.00**	**Php**	**335,000,000.00**

4 DESCRIPTION OF THE ENVIRONMENT

67. This section discusses the baseline conditions of the environment of the Municipality of Plaridel, where the proposed improvements for water supply subproject are located.

4.1 Physical Resources

68. **Geographical Location.** Plaridel is a landlocked municipality in the coastal province of Bulacan. The municipality is situated in the mid-western section of the province of Bulacan. It is bounded on the north by the municipality of Pulilan, on the northeast by the municipality of Bustos, on the east by the municipality of Pandi, on the southeast by the municipality of Balagtas, on the south by the municipality of Guiguinto, on the southwest by the City of Malolos and on the west by the municipality of Calumpit.

69. **Land Area**. Plaridel has a total land area of 3,244 hectares (ha) encompassing 19 barangays.

70. **Air Quality and Noise.** Bulacan-Pampanga-Bataan is officially designated by DENR as a regular "airshed" which is defined as areas with similar climate, meteorology and topology which affect the interchange and diffusion of pollutants in the atmosphere. The National Air Quality Status Report (2008-2015) provides data on air quality on a regional level. As of 2015, there were 93 air quality monitoring stations (manual and real-time) nationwide which were situated in highly urbanized cities and also rural areas in different regions of the country. These monitoring stations keep track of criteria air pollutants including total suspended particulates (TSP), particulate matter with dia of less than 10 microns (PM10), particulate matter with dia of less than 2.5 microns (PM2.5), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and ozone (O_3) following the National Ambient Air Quality Guideline Values (NAAQGV).

71. **Table 4-1** presents the measured annual mean values of air quality parameters in Region 3, specifically in Bulacan, from 2008-2015. From 2008-2014, one (1) monitoring station located in Saluysoy Stn. continuously measured the annual TSP while one (1) monitoring station located in Intercity Stn. measured the annual TSP from 2011-2012 and 2014-2015. Based on the measured TSP from 2008-2015, the air quality within Region 3 does not comply with the NAAQGV limits. The high TSP readings in Saluysoy Stn. is brought by open burning of solid waste, vehicular emissions, and presence of several legal and illegal smelting plants. On the other hand, Intercity Stn. is located in an industrial area composed of around 90 units/sets of multi-pass rice milling machines owned by about 60 operators.

72. Due to the high TSP readings, it was recommended by the DENR Air Quality Management Section to implement more stringent monitoring and penalty system by the local government to improve the air quality in the area.

Table 4-1:Air Quality Parameters Annual Mean Values in Region 3 (2008-2015)

Air Quality Parameter/ Station Location	NAAQGV Limit	2008	2009	2010	2011	2012	2013	2014	2015
Saluysoy Stn., Meycauayan, Bulacan									
TSP (µg/Ncm)	90 (annual)	106	124	61	21	14	6	41*	n.d.
Intercity Stn., Bocaue, Bulacan									
TSP (µg/Ncm)	90	n.d.	n.d.	n.d.	344	277	n.d.	482*	244

Air Quality Parameter/ Station Location	NAAQGV Limit	2008	2009	2010	2011	2012	2013	2014	2015
	(annual)								

Source: DENR-EMB,2015
Red font means failure to comply with NAAQGV Limit
n.d. means no data
**did not meet required capture rate*

73. As per DENR Air Quality Management Section, the National Air Quality Status Report (2015-2020) is currently being drafted.

74. In terms of application to the project, the noise level in general areas should be within applicable standards, which comprised internationally recognized standards such as IFC EHS Guidelines. The more stringent standards will be followed.

75. An Environmental Impact Assessment (EIA) Study was conducted by the Japan International Cooperation Agency (JICA) in 2017 for the Plaridel Bypass Road Project. The study presented baseline noise levels in the Municipality of Plaridel, specifically in Barangays Tiaong, Bulihan, Camachilihan, and Malamig. During daytime, noise levels range from 59.5 – 90.0 dbA that is beyond the NPCC noise guidelines which may be attributed to noises coming from residential areas as well as busy streets.

76. The IFC-EHS noise guideline values are presented in Table 4-2.

Table 4-2: IFC-EHS Noise Level Guidelines

Receptor	One Hour L_{Aeq}(dBA)	
	Daytime 07:00 – 22:00	Nighttime 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

77. **Climate.** The Municipality of Plaridel generally falls under Type I category of the Philippine Climate Corona Classification. Areas with this type of climate have distinct pronounce wet and dry seasons. The months of June to November are considered rainy season period with rainfalls ranging from 1,000 mm to more than 5,000 mm.

78. **Topography.** The land topography of Plaridel is mostly flat with a difference of elevation from 5 to 15 meters above mean sea level (mamsl). Although municipality comprises mostly of agricultural lands covering more than 60 percent of the total land area but because of its accessibility to the Metropolitan Manila area, Plaridel is fast becoming developed and highly-urbanized.

79. **Geology and Soils.** The geologic formation of Plaridel is Ancient Alluvium and Angat River is Recent Alluvium.

80. Plaridel lies on the alluvial sediment plain of the Angat River which makes it particularly fertile and well suited for farming with soil textures of fine sandy loam, Prensa silty clay loam, Quingua silty loam, and Bigaa clay loam (Municipality of Plaridel CLUP, 2012).

81. The geo-resistivity surveys were carried out by Aqua-Dyne Technological Service, Inc. in April 2013 for six (6) selected areas/barangays in the Municipality of Plaridel. These

areas/barangays were Poblacion-Jubilee Homes, Bagong Silang, Bulihan, Kagalakan Village, Lagundi, and Sta. Ines Bukid.

82. Previous geologic studies of the region identified three different types of Quaternary alluvial deposits. Two of these units occur in Plaridel. The sediments exposed along Angat River consist of medium to coarse grained sand with gravel, pebbles and silty clay to clay. They are normally less than 50 m thick.

83. Away from the present course of Angat River, older floodplain deposits occupy the generally flat land. They consist of coarse fragments such as cobbles and gravel. They are poorly consolidated and unsorted with a sandy to clayey matrix. Estimates of the thickness vary from 100 to 200 m.

84. Below the alluvial deposits lie the tuffaceous sedimentary rocks belonging to the Guadalupe Formation. This formation is composed of two units, namely: the Alat conglomerate and the Diliman Tuff. The Alat conglomerate has not been encountered in Plaridel. The tuff consists of fine-grained vitric tuff and volcanic breccias at the lower section but its upper section is composed of medium-grained tuffaceous sandstone. It is better sorted than the lower section and loosely cemented. Previous workers estimate the thickness of the Guadalupe Formation at 1,300 to 2,000 m.

85. Alluvium (from the Latin alluvius, from alluere, "to wash against") is loose, unconsolidated (not cemented together into a solid rock) soil or sediment that has been eroded, reshaped by water in some form, and redeposited in a non-marine setting. A general term for clay, silt, sand, gravel or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water. The recent alluvium is topped by well drained soils that remain moist through seepage and capillarity during the dry season; they are prime agricultural land. On average, surface soil nutrient content is highest in the alluvium, lowest in granite and intermediate in sedimentary soils.

86. **Water Resources.** Plaridel is a non-coastal area of Bulacan. It is surrounded with the rivers of Angat, Bulacan and Tabang River, both of which run through the town. The Angat River, otherwise known as Bulacan River, flows directly to Calumpit, Bulacan, meeting the Pampanga River. The Tabang River, a tributary with adjoining intersections dividing the middle of the present Poblacion of Plaridel, flows to the Manila Bay after passing through the towns of Guiguinto and Bulakan. The water of this river was called "tabáng" to refer to its fresh water.

4.2 Ecological Resources

87. The subproject's components are not located in environmentally sensitive and protected areas, and that there are no ecologically/environmentally critical areas, historical/cultural sites in or near the subproject sites.

4.3 Socioeconomic Resources

88. **Municipality Income and Expenditures.** According to the Bureau of Local Government Finance, the annual regular revenue of Plaridel for the fiscal year of 2016 was Php255,934,254.40. The income of Plaridel is generally derived from locally sourced

revenues, internal revenue allotment and other shares from national tax collection. Expenditures of the local government are divided among general administration, capital outlays and development/improvement projects.

89. **Land Use.** Plaridel total land area is 4,250 ha. The Existing Land Use consists of 1,510.65 ha for agricultural Land; 899.5 ha for industrial, commercial, and residential; 712.11 ha for idle land and open space; and 973.34 ha for creeks.

90. The existing urban land use total area is 1,611.65 hectares (ha), of which, 149.47 ha for commercial, 478.58 ha for residential, 197.17 ha for institutional, 74.32 ha for infrastructure/utilities; and 712.11 has. for idle land, vacant lot and open space.

91. **Commerce and Trade.** Plaridel, within the province of Bulacan, is classified as an "Agro-Industrial" municipality; its proximity to Metro Manila makes it a major rice and vegetable producer contributing to national as well as local food supply. Plaridel's resource and economic interconnectivity with the rest of Bulacan and Manila increases the municipality's reliance upon its physical assets and ecosystem services such as food supply.

92. The industrial estates and commercial establishments are mostly concentrated in areas like in Brgy. Banga II and Bulihan, such as the Grand Industrial Estate and Bulihan Industrial Park, respectively. While others were found along Plaridel By-Pass Road in Brgy. Bagong Silang. Commercial areas are mostly intermixed with residential areas but a bigger concentration of which could be found in Brgys. Banga I, Banga II, Poblacion and Tabang. Prominent malls and supermarkets can also be found in Plaridel like the Waltermart Mall, Puregold, Primark, Novo and SM Save More. These are the biggest commercial concessionaires of PLAWD. The most common business establishments in the barangay are sari-sari stores and carenderia or small restaurants.

93. **Transportation.** The municipality can be reached by land and it has several routes plying to and from the municipality daily. Land transportation can be availed of through passenger buses, jeepneys, private cars and vans. Within the municipality, one can take tricycles, jeepneys, multicabs and motorcycle for remote barangays.

94. The latest inventory of national bridges with length, type, and condition based on DPWH Bulacan 1st District Engineering Office is shown in **Table 4-3**.

Table 4-3: Inventory of Bridges by Bulacan 1st District Engineering Office (As of 27 Dec 2019)

No.	Bridge Name	Type	Condition	Length (m)
1	Baliuag Flyover	Steel	Fair	100.20
2	Gen. Alejo Santos Br.	Steel	Good	292.90
3	Irrigation Br.	Concrete	Fair	16.00
4	Baliwag-Candaba Br.	Concrete	Fair	150.00
5	Matungao Br.	Concrete	Good	62.00
6	Panginay Br.	Concrete	Fair	15.60
7	Cupang Br.	Concrete	Good	15.60
8	San Nicolas Br.	Concrete	Fair	15.60
9	Mambog Br.	Concrete	Fair	15.55
10	Atlag Br.	Concrete	Fair	21.00
11	Malolos Br.	Concrete	Good	10.00

No.	Bridge Name	Type	Condition	Length (m)
12	Catmon Br.	Concrete	Good	6.75
13	Nabuag Br.	Concrete	Good	63.50
14	Agnaya Br.	Concrete	Poor	12.60
15	Bocaue Flyover	Concrete	Good	204.20
16	Irrigation Br.	Concrete	Fair	16.50
17	Plaridel-Pulilan Br. (Old)	Steel	Fair	218.00
18	Cut-Cut Br. 2	Steel	Poor	22.00
19	Sto Cristo Br.	Steel	Fair	15.70
20	Tarcan Br.	Steel	Good	15.40
21	Tangos Br.1	Steel	Good	15.70
22	Tangos Br.2	Concrete	Good	10.80
23	Cut-Cut Br. 1	Concrete	Poor	29.00
24	Mucha Br.	Steel	Good	16.40
25	Culianin Br.	Concrete	Good	15.00
26	Cambaog Br.	Concrete	Fair	15.00
27	Talampas Br.	Concrete	Fair	15.00
28	Malolos Flyover	Steel	Fair	235.00
29	Tikay Br. (box culvert)	Concrete	Good	8.00
30	Dakila Br. (box culvert)	Concrete	Fair	6.00
31	Catmon Br.	Concrete	Fair	12.10
32	Labangan Br. 1	Concrete	Fair	101.10
33	Labangan Br. 7	Concrete	Good	127.20
34	Bocaue Br.	Concrete	Good	66.70
35	Ugong Br.	Concrete	Fair	12.60
36	Guiguinto Br.	Concrete	Good	64.00
37	Tabang Br.	Concrete	Fair	20.00
38	Bulihan Br.	Concrete	Good	13.10
39	Calumpit Br.	Concrete	Good	180.42
40	Balagtas Br.	Concrete	Good	51.20
41	Bunlo Br.	Concrete	Good	13.30
42	Labangan Br. 2	Concrete	Good	12.00
43	Labangan Br. 3	Concrete	Good	27.09
44	Labangan Br. 4	Concrete	Good	16.92
45	Labangan Br. 5	Concrete	Good	77.00
46	Labangan Br. 6	Concrete	Good	27.01
47	San Jose Br.1	Concrete	Good	35.83
48	Camachilihan Br.	Concrete	Good	34.48
49	San Jose Br.2	Concrete	Good	31.06
50	San Jose Br. 3	Concrete	Good	26.00
51	Malamig Br.1	Concrete	Good	34.30
52	Malamig Br. 2	Concrete	Good	41.03
53	Malamig Br.3	Concrete	Good	45.50
54	Irrigation Br.	Concrete	Fair	18.00
55	Plaridel-Pulilan Br. (New)	Concrete	Good	168.00
56	Tabon Br.	Concrete	Fair	8.00
57	Pungo Br.	Concrete	Fair	8.00
58	Bagbag Br.	Concrete	Good	120.35
59	Cut-Cut Br.	Concrete	Good	25.00
60	Soliban Br.	Concrete	Fair	38.95

Source: DPWH Bulacan 1st District Engineering Office (As of 27 December 2019)

95. **Power Sources and Transmission.** Electricity is supplied by the Manila Electric Company (MERALCO) for the entire populace of Plaridel Municipality covering 19 Barangays. Actually, MERALCO Plaridel Sector has an office located in Gov. Padilla Street in Barangay Agnaya, Plaridel, Bulacan.

96. **Agricultural Development.** The municipality's total land area covers 4,250 ha and out of that, 1,510 ha are used for agriculture, which is approximately 36% of the total land area. Plaridel has a history of agricultural production as a main source of livelihood for its population. Agricultural activities consist predominantly of rice production, both in terms of area coverage, volume, and value of production. Up until 2000, Plaridel was considered as primarily engaged in agriculture on the basis of its existing land use. However, it is becoming progressively more urban as its proximity to Manila has stimulated its population growth and land development.

97. **Tourism Facilities.** Filipinos are well-known to be courageous and freedom lovers. The people of Plaridel are no exception. The marker commemorates the historic Battle of Quingua (Plaridel at present) where the Filipinos triumphed over the American forces in their fight for freedom. Likewise, it also commemorates the death of Col. John Stotsenberg—a prominent figure of the Philippine-American war.

98. **Population and Community.** Plaridel is first class Municipality of the Province of Bulacan. It has a total land area of 3,244 ha encompassing 19 barangays. The population of Plaridel is around 107,805 according to the National Statistics Office (NSO) 2015 census with a population density of around 3,300 per km². Plaridel's population represents 3.27% of the total population of Bulacan Province and 0.96% of the total population of Central Luzon. Plaridel is composed of nineteen (19) barangays with population shown in **Table 4-4**.

Table 4-4:Summary of Population in the Project Area, 2015

	Name of Barangay	Total Population	Growth Rate (%)
1	Agnaya	2,585	2.4
2	Bagong Silang	3,322	3.1
3	Banga I	7,030	6.5
4	Banga II	9,036	8.4
5	Bintog	4,122	3.8
6	Bulihan	5,721	5.3
7	Culianin	4,130	3.8
8	Dampol	3,183	3.0
9	Lagundi	4,243	3.9
10	Lalangan	2,077	1.9
11	Lumang Bayan	5,361	5.0
12	Parulan	7,590	7.0
13	Poblacion	3,901	3.6
14	Rueda	1,803	1.7
15	San Jose	4,448	4.1
16	Sta. Ines	2,953	2.7
17	Sto. Nino	10,761	10
18	Sipat	5,856	5.4
19	Tabang	19,683	18.3
Total Population		107,805	

Source: Philippine Statistics Authority (PSA), 2015

99. **Public Health and Sanitation.** The Municipality of Plaridel and PLAWD is planning to have a septage treatment plant (STP) in the future. A meeting was held on 29 January 2020 at Municipal Hall of Plaridel together with CEST Consultants and discussed the plan of having STP based on the Supreme Court Mandamus issued regarding Manila Bay Clean-Up. The Consultants as part of their services will conduct a Feasibility Study for the Identification of Concept Designs for Sanitation Project, this is a project of LWUA that aims to develop feasibility studies that would lay out cost-effective and result-oriented sanitation project to selected Water Districts through the National Sewerage and Septage Management Program (NSSMP). Presently, the municipality has no sanitary sewer system.

100. The accessibility of each household to safe water and sanitary toilet facility is one determinant of the health condition of the population. All nineteen (19) barangays of the municipality are servicing safe water supply although some barangays were experiencing low water pressure during peak hours. On the other hand, based on Bulacan Provincial Development and Physical Framework Plan 2014, Plaridel has a total household (HH) of 23,877 with access to sanitary toilet or 96.38% out of 24,774 households. Likewise, a total of 897 HH without access to sanitary toilet or 3.62%.

101. Every household, industry and consumers must have access to safe water and sanitary toilet facilities. Thus, the objective of improved access to water and sanitation will promote healthier conditions of the citizens which in turn would constitute to increased productivity of the people, reducing the level of poverty and eventually lead to growth of the economy.

102. Basic health facilities in 2013, Plaridel has two (2) Rural Health Units (RHU) and nineteen (19) Barangay Health Stations (BHS). The municipality also had the Plaridel Infirmary, a Bulacan Medical Center Annex, four (4) private hospitals and fifteen (15) private medical clinics that cater to the healthcare needs of the populace.

103. The malnutrition in the municipality of Plaridel and province as a whole is relatively low for the past years. The poor health seeking behavior of some mothers attributed to maternal and infant death. The maternal mortality rate in 2008 have showed a significant increase at 0.70 which is considered to be the highest for the past seven years. On the other hand, infant mortality showed a decreasing trend over the years and the leadings cause is pneumonia.

104. **Solid Waste Management.** The issue on waste is directly related to human health. A clean environment is not only conducive to settlement but attracts economic investors to establish business and employment opportunities as well. Thus, solid waste management must be strictly monitored and implemented. According to Plaridel MENRO, as of April 2022, the municipality generates about 40 tons of solid waste per day. Out of the total 19 barangays, only 16 barangays were served by the municipal waste collection system.

105. **Current Dump Site.** The dump site is located in Barangay Parulan, about 1 km. away from the river and adjacent to an irrigation canal. The location of the dump site is not ideal and is considered destructive to the ecosystem. First, soil erosion will occur with the frequency of trips of dump trucks to and from the dump site. Second, surface runoffs from high points of the road move downwards to the river and will carry with it waste materials and leachate. Considering the hazards this dumpsite poses to the residents and the environment, the Municipal Government immediately identified a site in Barangay Bulihan where a Municipal Material Recovery Facility (MRF) is built and is now operational. Aside from hosting local waste, the 10,818 sq.m. MRF renders other functions like the production of biodegradable waste into

organic fertilizer and a demo farm where vegetables are grown using organic fertilizer. This will also be used as a demo site where people will be taught livelihood activities out of recyclable wastes. The existing dumpsite is now closed. Bamboo seedlings are planted to prevent soil erosion in the area and the focus is to establish MRF in every barangay and a Municipal MRF.

106. With the increasing generation of solid waste, the municipality shall take part not only in managing the collection, segregation and treatment but also in the campaign towards changing the mind-set and lifestyle of the people towards solid waste management. The Ecological Solid Waste Management Act of 2000 states that open dumpsites shall not be allowed within a city or municipality, and that the plan should make provisions for its closure within the period of its implementation.

107. **Literacy Rate.** The literacy rate in the municipality and the province as a whole exhibited a decreasing trend from 1990 to 2000 surveys. The 97.6 percent literacy rate in 1994 has decreased by almost 2 percentage points in 2000 (95.87). Thus, one out of 10 of the population basically cannot read and write. Although it remains to be above the average norm, the remarkable deterioration of the literacy rate should not be disregarded.

108. **Socio-economic Conditions.** The employment in Bulacan has been decreasing in the past years. This was due to rapid increase of the labor force against a low rate in the jobs generated. Majority of the jobs generated were in the non-agricultural sector which are the service and industry sector.

109. The annual average income of Bulakeño family was higher than the regional and national average by as much as 17 to 20 percent, respectively. It is also the second among the provinces in Central Luzon with high average income per family. These estimates by the National Statistics in 2000 indicate that the province of Bulacan is above the average in terms of the levels of living condition in the country.

110. The literacy rate exhibited a decreasing trend based on the past surveys. However, the latest survey at the rate of 95.87 for the province, it is ranked second in Central Luzon and higher than the national rate.

111. In terms of security, the province's average monthly crime rate at 2.7 in 2008 was considered to be the lowest for the past thirteen years. The said rate is lower than the regional and national rate at 4.89 and 6.28, respectively.

5 ANTICIPATED IMPACTS AND MITIGATION MEASURES

112. This section assesses the impacts of the proposed activities on various environmental components of the subproject site.

113. **Methodology.** Anticipated impacts to be considered were assessed through the following activities: (i) gathering of inputs from interested and affected parties through public consultation activities; (ii) desktop research of information relevant to the proposed project; (iii) site visits and professional assessment (CDTA ocular inspection conducted on January 8 and 10, 2020, and ADB consultants' site visit on 13 October 2023; and (iv) evaluation of proposed design and potential impacts. Categorization of the project and formulation of mitigation measures have been guided by ADB's REA Checklist for Water Supply (**Annex 1**) and SPS.

114. A comprehensive screening of environmental impacts is carried out through assessment of general parameters associated with water supply projects against the components of the proposed PLAWD subproject and the environment where the facilities will be constructed. A screening checklist was adopted using previous ADB IEE Reports which was developed using various sources such as DENR checklists, ADB's REA Checklist, and World Bank Environmental Source Book. Some items of the checklist may not be applicable to this particular subproject, however, they are still included to indicate its relevance in the screening process.

115. **Impact Assessment.** The assessment is made on the following phases of the subproject: (i) pre-construction, (ii) construction, and (iii) operation and maintenance. Results of the environmental impacts screening are summarized in
116. **Table *5-1*** which shows the impact types and magnitudes for both positive and negative impacts without the mitigating measures and the resulting situations when mitigating measures will be implemented. Discussions of each issue are presented in the succeeding sections. For ease of identification, a summary of the environmental impacts that should be included in the Environmental Management Plan (EMP) is presented at the end of this section (see **Table 5-4**).

117. Due to the subproject's relatively long operational life, decommissioning or closure in the near or medium term (e.g., 25-50 years) is not envisaged. Furthermore, environmental impacts arising from decommissioning of the proposed PLAWD facilities are deemed to be minimal such as: (i) residual waste cleanup is not a major concern since the facilities are not industrial manufacturing plants with potential problems for toxic and hazardous wastes, and (ii)solid wastes from decommissioning is also not a major concern since the structures are mostly made of reinforced concrete and the solid wastes are mostly recyclable materials such as broken concrete materials, reinforcing steel bars used in the structures, structural steel, roofing materials, electrical wires, etc. In the event that decommissioning becomes an option, the appropriate action plan will be drawn up in accordance with the regulatory requirements of the Philippine Government.

Table 5-1: Summary of Environmental Impacts Screening

Environmental Impacts and Risks	Without mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Encroachment to environmentally sensitive areas	n.a.	n.a.
Impacts and risks to biodiversity conservation	n.a.	n.a.
Encroachment to historical areas and cultural areas	n.a.	n.a.

Environmental Impacts and Risks	Without mitigation	With Mitigation
Potential competing use of water resource	n.a.	n.a.
Potential nuisance and problems to the public	● -	Δ
Interruption of other utility services	●-	Δ
Loss of assets (IR concerns)	n.a.	n.a.
Noncompliance to national and local environmental regulations	● -	Δ
CONSTRUCTION PHASE		
Modification of construction site topography	Δ -	Δ
Displacement of rare or endangered species	n.a.	n.a.
Soil erosion and sediments of construction sites	● -	Δ
Nuisance/ public inconvenience in pipelaying	● -	Δ
Noise from construction equipment	● -	Δ
Local air pollution due to construction activities	● -	Δ
Oil and other hazardous materials releases	Δ -	Δ
Vehicular traffic congestion and public access	● -	Δ
Hazards to public due to construction activities	● -	Δ
Pollution and health risk due to workers camp	● -	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● -	Δ
Occupational / Construction health and safety	● -	Δ
OPERATION AND MAINTENANCE PHASE		
Health hazard due to delivery of poor water quality	● -	Δ
Pollution from increased generation of sewage and sullage	● -	Δ
Noise and air pollution of pumping stations	Δ -	Δ
Ground subsidence due to over-pumping	n.a.	n.a.
Waste generation of filter beds (backwash)	n.a.	n.a.
Pumping stations operational risk and safety	n.a.	n.a.
Water treatment facility operational risk and safety	n.a.	n.a.
Increase employment opportunities	Δ +	Δ +
Future scarcity of water and conflict in water uses due to climate change	n.a.	n.a.
Occupational health and safety	● -	Δ

Legend: n.a. = not applicable; Δ = insignificant; ●= significant; + = positive; - = negative

118. **Table *5-2*** presents the summary of government environmental compliance documents needed by the sub-project before commencement of construction works, during construction and during operation.

Table 5-2: Summary of Government Environmental Compliance Documents for Water Supply Subproject

Stage of Development	Regulatory Permit	Issuing Agency	Applicable Legislation
Pre- construction	ECC	EMB Regional Office	PD 1586 and its implementing rules and regulations
Construction	Permit to Cut Trees	DENR - Regional Office	PD 705
	Clearing/Fencing/ Excavation Permit	LGU	LGU Ordinance
Operation	Permit to Operate Source Emission	EMB Regional Office	RA 8749and its implementing rules and regulations

Stage of Development	Regulatory Permit	Issuing Agency	Applicable Legislation
	Installation(Generator)		
	Compliance with DOH for Philippine National Standards for Drinking Water (PNSDW) 2017		DOH AO 2007-0012

5.1 Design/ Pre-Construction Phase Considerations

119. **Encroachments.** PLAWD subproject's components will not be located in areas that are environmentally sensitive and areas with historical and cultural importance. The proposed sites for source development are along residential and commercial areas while the proposed route of the pipelines is along the road right-of-way.

120. There are no known archaeological and cultural assets in these proposed sites. Nevertheless, precautions will be taken to avoid potential damage to any archaeological and cultural assets by inclusion of provisions in tender and construction documents requiring the contractors to immediately stop excavation activities and promptly inform the authorities if archaeological and cultural assets are discovered. Under the Cultural Properties Preservation Act (Presidential Decree No. 374) in the event that excavators shall strike upon any buried cultural property, suspension of excavation is inevitable, and it shall be reported immediately upon occurrence of the event to the Director of the National Museum and shall then take appropriate actions with regards to the matter. The suspension can only be lifted by the Director of the National Museum. Accordingly, in case of archeological, historical, cultural chance finds, in order to avoid damage to cultural properties, the following steps should be observed: (i) detailed design of all civil works will be located away from all cultural/ archeological/historical properties; (ii) procedures for chance finds of valued relics and cultural values will be stipulated in the contract with contractors in order to avoid damaging such valuable properties; (iii) site supervisors will be on the watch for chance finds; (iii) upon a chance find, all work will be stopped immediately, find will be left untouched, and notify PLAWD who in turn will notify the National Museum; (iv) work at the find site will remain suspended until the National Museum allows work to resume.

121. Below are the details on the locations of the 3 packages:

(i) Design and construction of Plaridel Water Supply System (pipelaying and reservoir) - Package CW10a: Ground reservoir is proposed in Brgy Rueda, Plaridel. The lot is owned by PLAWD with TCT No. T-189078. Pipelines will be installed along national and municipal roads right of way and permits will be secured from concerned government agencies.
(ii) Design and construction of ground reservoir - Package CW10b: Ground reservoir is proposed in Brgy Banga 1st and the lot is owned by PLAWD with TCT No. 039-2018000274.
(iii) Design and construction of Office building – Package CW10c: Office building is proposed in Brgy Bintog and the lot is owned by PLAWD with TCT no. T-14126

122. The summary of locations of pipelines under CW10a is presented below.

DED Package No. Under CW10a	Pipeline Locations	Barangay
Package 2	500mmø Steel Pipe along Plaridel Access Road, Plaridel Pulilan Diversion Road, Banga 1 Street, and NIA Irrigation Road (From Plaridel Bypass Road to Tabang Road)	Bulihan Parulan Banga 1st Banga 2nd Tabang
Package 3	300mmø PVC along NIA Irrigation Road (From Tabang Road to Lugam Road) 200mmø PVC along Kanto Sipat (From NIA Irrigation Road To P. Reyes Street)	Santa Ines Agnaya Lumang Bayan Sipat Dampol

123. **Compliance with national and local environmental regulations.** PLAWD and all its contractors shall comply with all national and local environmental regulations.

124. **Impacts and Risks to Biodiversity Conservation.** There are no identified impacts and risks to biodiversity conservation since the PLAWD subproject's components will not be located in areas that are environmentally sensitive. The sites are not in undisturbed landscapes and over the years the ecological changes due to human activities in the area have resulted to the present residential and commercial landscapes.

125. **Competing Use of Water Resource.** Issues on competing use of water resources are not expected since PLAWD's water supply subproject covers installation of ground reservoir and pipelines, not source development.

126. **Nuisance and Problems to the Public.** Potential nuisances and problems coming from the public during construction can be avoided and immediately addressed through consultation and information dissemination to potentially affected people during detailed design and pre-construction phase. Tender documents shall include provisions addressing potential nuisances and problems from the nearby community during construction including environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (v) public safety and convenience. In addition, prior to construction works, the contractor shall coordinate with respective offices in acquiring required clearances with regard to electricity, telephone lines, and other utilities/structures that may be affected by construction activities. These shall all be reflected in the construction contracts.

127. **Interruption of other utility services.** Some existing utility services could be temporarily interrupted during construction especially co-located utility lines and may cause inconvenience to the public.

128. **Loss of Assets.** The proposed project will not entail any involuntary resettlement and there are no adverse impacts on surrounding structures since the location of proposed project components were already acquired by PLAWD.

129. **Climate Change Resilience.** While the project aims to improve resilience to climate change by upgrading and/or expanding the existing water system, the system itself may be vulnerable to climate change effects. In particular, raw water supplies (i.e. groundwater) may be exhausted and/or heavy soil (and other phenomena) that impact the delivery system's structural integrity. This can be mitigated by conducting a suitable study to determine the availability (or abundance) of raw water, especially under extremely dry weather conditions. Similarly, the thorough engineering design (DED) will ensure the choice of suitable piping delivery materials to minimize possible ground heave effects (and other related phenomena).

130. PLAWD will update its Water Safety Plan (WSP) to include the risks brought about by climate change and how to mitigate them. With regard to water supply augmentation, a Memorandum of Understanding (MOU) was executed among the Metropolitan Waterworks and Sewerage System (MWSS), the Local Water Utilities Administration (LWUA), and the Provincial Government of Bulacan (PGB) in 1992, expanding the MWSS Service Area and thereby allowing the supply of bulk water to the province of Bulacan. The Bulacan Bulk Water Supply Project (BBWSP) of MWSS aims to supply high-quality treated bulk water to underserved areas in the province of Bulacan, allowing the local water districts to meet the increasing demand of their consumers, expand their current service area coverage, and increase the number of households served. Thus, for this project, additional water will be supplied by the concessionaire of MWSS BBWSP, Luzon Clean Water Development Corporation (LCWDC), which is committed to providing the required water demand. (See **Annex 8**- Certification of Water Supply from Bulk Supplier LCWDC)

131. As a climate change resilience measure, PLAWD posts IEC material on water-saving tips on its Facebook page which it also plays in videos in its Customer Service Lounge. (See **Annex 9** - IEC material

132. Likewise, relevant engineering specifications are implemented to tackle certain natural hazards (e.g. flood, earthquake). The construction parameters applicable to the identified level of risk will be taken into account in all civil works. Disaster risk mitigation measures will include, among other things, sufficient structural foundation elevation to account for projected or estimated flood depths (i.e. 50-year return period for catchment areas less than 40 km^2, and 100-year return period for catchment areas more than 40 km^2); avoid areas of known seismic risks (e.g. fault lines) as component locations; and ensure structural design complies with applicable standards / codes (*i.e.* 2015 National Structural Code of the Philippines (NSCP)and the latest edition of the American Water Works Association (AWWA). During the DED stage, these measures will be examined in detail.

5.2 Construction Phase Environmental Impacts

133. Prior to the commencement of construction activities, the civil works contractor is required to submit a Contractor's Environmental Management Plan (CEMP) which is a refinement of PLAWD subproject's EMP. The proposed mitigation in the initial EMP may be further modified or enhanced in the CEMP to make it more site-specific. The CEMP requirements are further discussed under the Environmental Management Plan (EMP) section.

134. **Site Preparation.** Installation of ground reservoirs and pipe laying will not involve modification of the construction site topography. Water supply pipelines will follow as much as possible the existing site contour. This issue is therefore considered not significant.

135. During vegetation clearing, there are a total number of 18 trees affected. The tree-cutting permit for the 8 trees in Brgy Rueda has been secured already. Upon issuance of the tree-cutting permit, a billboard containing the permit details was posted in the vicinity. Chainsaws used in tree-cutting were all DENR-accredited. The 8 trees were cut on January 21, 2022.Upon issuance of the tree-cutting permit, a billboard containing the permit details was posted in the vicinity.

136. Chainsaws used in tree-cutting were all DENR-accredited.

Table 5-3: Trees Affected during Site Preparation

Project component/ Location	Trees affected	Diameter
Office building/ Brgy. Bintog	6 mango trees	25-60 cm
	1 mahogany tree	60 cm
Storage facility/ Brgy. Rueda	4 hawaiian trees	20-23 sm
	3 santol trees	42-50 cm
	2 calamansi trees	26-44 cm
	1 avocado tree	18 cm
	1 caimito tree	15 cm
Total	**18**	

137. **Mitigation.** Prior to any clearing operations, a tree inventory following the guidelines and requirements of the DENR will be conducted as part of the application for a tree cutting permit. The project effects shall be mitigated, directly or indirectly, through planting of the corresponding number of seedlings as prescribed by the tree cutting permit. In addition, the Project-affected trees qualified for earth-balling shall be properly transplanted to minimize the biomass removal and attenuate the GHG emissions.

138. **Soil Erosion and Sediment from Construction Sites.** During rainy seasons, exposed soil at the construction site can easily be eroded and carried to the natural drainage system if preventive measures are not established.

139. **Mitigation.** In preventing erosion, surface runoff must be controlled using structural erosion prevention and sediment control practices which will divert the storm water flows away from the exposed areas and ensuring that diversion will not be detrimental to adjacent areas, prevent sediments from moving offsite, and reduce the erosive forces of runoff waters. These measures must be established by the contractor: (i) interceptor dikes, (ii) pipe slope drains,(iii) straw bale barriers, (iv) sediment traps, and (v) temporary sediment basins. Whenever possible, total exposed area shall be minimized. Structural sheet piles, combination of shoring jacks and phenolic boards will be provided on excavation where soils are unstable. Discharge water from dewatering pumps will be directly disposed to nearby drainage and creeks. Excess soils from excavation will be hauled out to stockpile area on the same day.

140. **Pollution of Water Resources**. Dumping of construction materials and solid wastes in water bodies will affect water quality and the flow regime.

141. **Mitigation.** Dumping of earth, stones and solid wastes in water bodies will be avoided by contractors. Excess excavated materials that will not be used in the project will be disposed in designated dumpsites or given to interested parties. For this project, the interested parties are the barangays that used the excavated materials as backfill for their materials recovery facility (MRF) and for their residents in low-lying areas. Approximately 3 to 6 m^3 of excavated materials

were received by each of the beneficiary barangays: Agnaya, Sto. Nino, Lagundi, Dampol, Sipat, Sta. Ines, Lumangbayan, Poblacion, Banga 1st, Banga 2nd, Parulan, Bintog, San Jose, Bulihan, and Bagong Silang.

142. **Nuisance/Public Inconvenience during Digging/Excavation and Pipelaying Activities.** The impacts of digging/excavation and pipelaying activities include noise, restricted access, traffic congestion and damage to existing utility lines, mostly household service connections.

143. The prolonged period of water supply service interruptions during pipelaying works may result to public inconvenience. Dumping of construction materials and solid wastes in water bodies will also cause nuisance to the public aside from affecting water quality and the flow regime. Digging activities will also cause inconvenience and may restrict public access to subproject areas.

144. **Mitigation.**The contractor will not do evening works to mitigate noise in residential areas. For traffic congestion mitigation, the contractor shall prepare Traffic Management Plan and coordinate it with the barangay officials and will not do evening works in industrial areas. To mitigate restricted access, the contractor shall provide path walks and steel plates for open excavation. Damage to existing service connections can be remedied with couplers, a large quantity of which is stored by the contractor and readily available in its warehouse.

145. The contractor shall be required to perform the following: (i) installation or replacement of pipes within the shortest time possible to minimize water supply cut-off periods and/or use of night time schedules, as well as announcement of water supply interruptions two (2) to three (3) days prior to actual cut-off, and; (ii) avoid dumping of earth, stones, and solid wastes in water bodies to avoid adverse impact on water quality and flow regime.

146. Restriction of access to the site must be done through a combination of institutional and administrative controls, including fencing, signage, and communication of risks to the local community.

147. **Construction Noise.** Potential sources of noise may come from vehicles and construction equipment, which can generate noise of 80 dB(A) from a distance of 30 m while loud noise from sources such as blasting are not anticipated. Residential structures are identified as receptors during the construction of ground reservoirs, and pipelaying.

148. **Mitigation.** For noise impact that cannot be mitigated, exposure of receptors (refer to receptor's table in Baseline Chapter) can be lessened by scheduling construction during daytime only. In areas near residential areas or noise sensitive sites, noisy equipment shall not be operated during nighttime to early morning (22:00H – 06:00H). The use of noise suppressors (mufflers) in equipment and vehicles is also recommended. Workers using noisy equipment shall be provided with earplugs as well. Timely consultation with affected community will be done.

149. Ambient baseline noise levels will be established at designated strategic locations with sensitive receptors. In case baseline noise levels already exceed the guideline values, IFC-EHS allows a maximum 3 dB(A) increase in noise levels as a result of project activities. Mitigation measures may be adjusted in the CEMP based on the baseline noise levels.

150. **Local Air Pollution Due to Construction Activities.** Piles of sand, gravel and waste materials that would be generated during trenching, earthworks, and soil preparation activities can contribute to the total suspended particles in the air. Machineries and heavy equipment used in the construction will also account for vehicular emissions during construction. Without any mitigating measures, dust generation could be significant during dry periods.

151. **Mitigation.** Machineries and heavy equipment used in the construction must be regularly maintained and operated and must comply with the requirements of the Clean Air Act regarding vehicle emissions. Piles of sand, gravel and waste materials that would be generated during site clearing should be watered frequently to prevent dust particles from affecting nearby areas. Covers for open stockpiles shall be required to prevent dust generation due to the wind current. Vehicles transporting loose construction materials such as sand, gravel, spoils, and the like shall be provided with tarpaulin cover as well.

152. **Oil and other hazardous materials releases.** Aside from the use of fuel, oil, and grease for heavy equipment and vehicles during construction works, the use of paints and solvents may be expected as well. Impacts relating to accidental release of these materials are considered to be insignificant since expected quantities will be relatively small.

153. **Mitigation.** As part of good construction practice, the contractors will be required to conduct an awareness program for all workers regarding the prevention and management of spills and proper disposal of used containers. Fuel and oil shall be stored in a designated secured area provided with an impermeable liner to prevent the accidental spills from seeping into the ground. Used containers shall be properly disposed of.

154. **Vehicular Traffic Congestion and Public Access.** Traffic flow will be disrupted if routes for delivery of construction materials and temporary blockages in heavily travelled highways and narrow streets are not planned and coordinated. Potential traffic congestion is expected due to construction activities since pipe-laying and interconnection activities are located near major roads or intersections.

155. **Mitigation.** A traffic management plan shall be included in the CEMP**.** It shall include traffic diversion schemes that should be properly coordinated with the LGU and the local office in charge of traffic management. Prior to implementation of the traffic re-routing plan, the public must be informed in advance. The method of informing the public would be left to the discretion of the proponent. Options include posting notices in public places, in local newspapers, through local radio and television programs or through public address system. Billboards placed in strategic locations will also serve the purpose. It is recommended to place appropriate and sufficient signage at strategic locations to forewarn the public of the expected traffic problem and to suggest alternative routes that they may take. During this period, traffic aides must be assigned to manage the traffic.

156. **Hazards to Public Due to Construction Activities.** Inconvenience to the general public which may result to accidents is one of anticipated impacts during construction activities. Pipelaying along the roads as well as movement of construction vehicles and excavations would pose some hazards to the driving public. There is also risk of people falling down in open trenches since pipelaying trenches are normally left uncovered until pipeline testing is completed.

157. **Mitigation.** PLAWD and the contractor should ensure that sufficient and appropriate safety warning devices, safety signs, safety nets or safety guards and cover for open ditches must be implemented at strategic locations to ensure the safety of the people. PLAWD may also consult the provincial and local government units to delineate the public safety zone or measurable distance prohibiting public entry and other possible forms of encroachment during construction operations. Alternate access will be provided as necessary and applicable.

158. **Pollution and Health Risk due to Workers Camp.** During the construction period, workers are expected to erect temporary workers' camps. Due to run-off of from sanitary sewage, wastewater and solid wastes brought by workforce, potential pollution may occur as a result of improper waste disposal.

159. **Mitigation.** The construction contractor shall prepare a solid waste disposal plan which shall be included in the CEMP. The construction contractor shall be required to carry out the following: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sewage at the camps' surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps to avoid carrying away any contaminants. The contractor shall be required to use temporary diversion drains, catch drains, and silt-traps at these camps. Guidelines and standards for the workers' camp will be in accordance with the guidelines and standards of IFC's Guidance on Workers' Accommodation (i.e., siting, minimum housing standards, minimum accommodation sizes, sanitation facilities, provision of eating and resting areas, health and safety within workers' accommodation).

160. **Improper Closure of Construction Sites.** Generation of solid wastes (e.g. used wood materials, steel works cuttings, paint and solvents containers, used oil from equipment, unused aggregates, etc.) after construction activities may cause aesthetic problems and potential contamination of the surrounding environment.

161. **Mitigation.** The project site shall not be abandoned in disorderly condition but instead restored for functional use. Following the completion of the construction, the PLAWD shall deactivate the project offices, and the construction yard including unserviceable vehicles and equipment. Wastes arising from the abandonment must be taken care of the contractor.

162. **Increase Employment Opportunities at Work Sites.** Construction activities require a considerable number of workers. The impact would be beneficial and significant to people since employment opportunities in the area will increase.

163. **Enhancement.** A robust "local first" hiring policy will be designed and implemented by the contractor in coordination with local officials and community leaders especially at the barangay and municipal levels. No preference in terms of gender during the hiring process will be observed.

164. **Health Risk to Public Due to the Pandemic.** The pandemic caused by COVID-19 has resulted to an unprecedented global health crisis and devastating impact on several sectors of human lives and economies. With or without the project, the public will be at risk due to the pandemic.

165. **Mitigation.** PLAWD and the contractors should ensure that the COVID-19 health and safety protocols are followed, particularly the use of face masks, social distancing, and frequent washing of hands especially when working in areas very near the residences or workplaces,

where the greatest number of persons may be affected. Health and safety protocols to be implemented in work sites will be consistent with the rules and regulations of the LGU.

166. **Occupational/Construction Health and Safety.** A construction site is among the workplaces commonly associated with potentially high-risk activities, wherein the presence of a hazard or potential hazard may affect workers' safety and/or health. There is a high level of exposure to safety and health hazards, and the probability of a major accident resulting in disability, death, or major illness is likely to occur if no preventive or control measures are in place. Clear understanding of the EMP, by the Contractor, is paramount to avoid enhancement of potentially adverse impacts in the project area.

167. **Mitigation.** After selection of the Contractor, the PMU (and its PIC) will meet the Contractor's EHS responsible staff prior to contract commencement and on-site to explain and confirm understanding of the EMP conditions including the required plans and mitigation measures e.g. COVID-19 prevention, health and safety, emergency response. Workers are protected from occupational health and safety hazards through engineering and administrative controls, and personal protective equipment (PPE). During concrete breaking and concrete cutting on pavement, the workers will be provided with earplugs/earmuffs, dust masks, safety glasses/goggles, and anti-vibration gloves to prevent the effects of noise, dust, and vibration of equipment. Administrative controls during concrete breaking are by alternating workers throughout the day if working with the tool for 8 hours to protect workers from debris/sparks, by switching on vibro control of the concrete breaker every 15-20 minutes for heavy vibration, and keeping the backhoe trigger at proper footing and balance at all times for ergonomic/awkward positions. During excavation, fall of workers/materials and trench collapse will be prevented by keeping the spoil 1 meter away from the edge, providing proper access and egress every 30 meters, and erecting hard barricades with signages, Collision of vehicles on site with workers and machinery can be prevented by providing proper signage at entry/exit points, hazard lights to be turned on while the vehicle is moving, and assigning spotters/riggers to assist drivers in maneuvering vehicles. (See **Annex 10** on Risk Assessment prepared by Package CW10a Contractor for other hazards with corresponding risk controls).

5.3 Operation Phase Environmental Impacts

168. **Health Hazard Due to Delivery of Poor Water Quality.** Delivery of water with poor quality to distribution system is a health risk to the consumers. Threats of contamination due to presence of bacteria, viruses, protozoa, or chemicals are usually present in raw water sources up to the service connections, thus, post-treatment contamination is still anticipated as the water is transported to the consumer and considered to be a significant impact.

169. **Mitigation.** PLAWD shall ensure that the potable water consistently passes the requirements of the Philippine National Standards for Drinking Water (PNSDW) of 2017. To achieve this, implementation of the water safety plan with regular water quality monitoring shall be undertaken.

170. A water safety plan shall enable PLAWD to (i) prevent contamination of its water sources, (ii) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets, and (iii) prevent recontamination during storage, distribution and handling of drinking water.

171. For controlling microbial contamination, gas chlorine disinfection will ensure that water will be chlorinated and adequate residual disinfection will be maintained. The standards for chlorine residual of the 2017 PSDW are: (i) 0.3 mg/l minimum for detection at the farthest point of the distribution system and (ii) 1.5 mg/l maximum for detection at the farthest point of the distribution system.

172. **Pollution from Increased Generation of Sewage and Sullage.** Since majority of the water supply are used for domestic purposes, increasing the water supply to the service area will also increase the generation of sewage and sullage. This wastewater will contribute to pollution of the surrounding areas if not addressed properly and impact would be significant.

173. **Mitigation.** Sewage and sullage will be discharged to the individual septic tanks system of the water consumers. The septic tank system will: (i) treat the wastewater and reduce the pollution potential and (ii) reduce the public's exposure to untreated domestic wastewater. This will help in avoiding disease transmission. Adequate management of septic tanks through periodic desludging must be promoted by the local government unit and the water district.

174. **Noise and Air Pollution of Pumping Stations.** Pump systems including electric motors will be housed in buildings that provide noise attenuation. The pumping station will also run on electricity to be supplied by the local power companies. Hence, no increased noise level and air pollution during operation phase. On the other hand, during occasional brownout events, a diesel-fueled electricity generator set will be used. In this case, PLAWD shall secure a Permit to Operate (PTO) from DENR to ensure compliance with the Clean Air Act. There are no anticipated operational activities that will cause dust generation. Mitigating measures are therefore not necessary for noise and air pollution.

175. **Ground Subsidence Due to Over-pumping.** The subproject does not include construction of deep well/s, therefore, over-pumping is not expected.

176. **Pumping Stations and Water Treatment Operational Risk and Safety.** The subproject does not include construction of pumping stations and water treatment facility.

177. **Increase Employment Opportunities.** Operation and maintenance activities require a considerable number of workers. The impact would be beneficial to people since employment opportunities in the area will increase. However, since the additional water supply facilities are not labor intensive, the expected number of additional workers will be small and the impact is considered less significant.

178. **Potential Conflict on Water Uses.** Water demand is expected to increase as a result of population growth which may eventually create conflict on different water uses.

179. **Mitigation.** PLAWD is expected to adopt an integrated water resources management within the watershed to improve the allocation and management of scarce water resources in the context of climate change. An agreement with DENR and the local government for the assignment of a watershed area to the WD will be worked out. The agreement will include the active participation of the municipality and watershed barangays. Meanwhile, the WD will continue to implement its tree planting program in coordination with the barangays.

180. After careful and thorough assessment of impacts and risk screening, this proposed subproject is expected to have an overall beneficial net effect on the water supply system of the

WD because it will improve the water resiliency in the Province of Bulacan. In addition, the additional service coverage area will provide a clean water supply to more people.

181. **Health and Safety of Workers During Operation and Maintenance Phase of the Project.** Although as stated earlier the subproject does not include the construction of pumping stations and water treatment facility, it will still utilize the gas chlorinating facility in the existing pumping stations to treat the water prior to distribution. Thus, there is still the risk of operators being exposed to chlorine.

182. **Mitigation.** PLAWD will ensure that there are emergency eyewash and shower and copies of chlorine safety data sheets in each pumping station and that all the operators are provided with full-face chemical cartridge respirators. Under PLAWD's GAD program, for disease prevention, vaccinations (flu, anti-tetanus, anti-rabies, Hepa-antigen, etc.) will be provided to all its staff.

183. **Table 5-4** lists the environmental impacts and risks that requires mitigation and shall be carried to the EMP Section.

Table 5-4: Environmental Impacts and Risks for Inclusion in EMP

Environmental Impacts and Risks	Without mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Potential nuisance and problems to the public	● -	Δ
Non-compliance with national and local environmental regulations	● -	Δ
CONSTRUCTION PHASE		
Displacement of rare or endangered species	n.a.	n.a.
Soil erosion and sediments of construction sites	● -	Δ
Nuisance/ public inconvenience in pipe laying	● -	Δ
Noise from construction equipment	● -	Δ
Local air pollution due to construction activities	● -	Δ
Vehicular traffic congestion and public access	● -	Δ
Hazards to public due to construction activities	● -	Δ
Pollution and health risk due to workers camp	● -	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● -	Δ
Health risks to public due to pandemic	● -	Δ
Health risks of working (to workers') during pandemic	● -	Δ
Construction/occupational health and safety	● -	Δ
OPERATION AND MAINTENANCE PHASE		
Health hazard due to delivery of poor water quality	● -	Δ
Pollution from increased generation of sewage and sullage	● -	Δ
Health and safety of workers	● -	Δ

Legend: n.a. = not applicable; Δ = insignificant; ●= significant; + = positive; - = negative

184. The subproject is unlikely to cause significant adverse impacts. There are no impacts that are significant or complex in nature, or that needs an in-depth study to assess the impact. The potential adverse impacts that are associated with design, construction, and O&M can be mitigated to acceptable levels with the recommended mitigation measures.

6 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

185. The public participation process included (i) identifying interested and affected parties (stakeholders); (ii) informing and providing the stakeholders with sufficient background and technical information regarding the proposed development; (iii) creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments, and concerns) with regard to the proposed development; (iv) giving the stakeholders feedback on process findings and recommendations; and (v) ensuring compliance to process requirements with regards to the environmental and related legislation.

186. The following methodologies have been used for carrying out public consultation:

(i) Public forums through organized public consultations with residents of the barangays where the sub-project will be established.
(ii) Walk-through informal group consultations.
(iii) The environmental concerns and suggestions made by the participants were listed, and discussed, and suggestions accordingly incorporated in the EMP.

187. PLAWD has undertaken various activities concerning information disclosure, public consultation, and public participation for the proposed PLAWD subproject. These were done to achieve a meaningful stakeholders' consultation and ensure success. During the planning phase, information regarding the proposed sub-project was disclosed to the public.

188. **Key informant interviews.** Key informant interviews and focus group discussions (FGDs) with Sangguniang Bayan of Plaridel and PLAWD officials and staff was held on October 2019 to request for cooperation and gather information and recommendations relative to the needs of the community particularly on water supply system. On 13 October 2023, ADB consultants conducted site visit on completed and partially completed subproject components and interviewed several residents that were affected by the pipelaying activities. Overall, they were satisfied with the improved water supply provided by WDDSP, although they have experienced inconveniences during construction period, which include traffic congestion, dust, and noise. Some residents with small food business also suffered from loss of income because of restriction of customers' access to their stalls during construction.

189. **Public consultations.** PLAWD conducted a public consultation/hearing on 29 November 2019 participated by a total of 105 participants/representatives from various institutions/organizations. Presentations on the proposed water supply improvement project and the proposed tariff adjustment/increase on water consumptions of the concessionaires were presented and discussed. Stakeholders/participants were encouraged and requested to raise their views on social and environmental issues to the topics presented. Stakeholders expressed their support for the PLAWD subprojects.

190. Participants in the public consultation/hearing conducted were asked pre-formulated questions to solicit their perception about the proposed sub-project. All the participants expressed general acceptance of the proposed water supply sub-project. The November 29, 2019 Public Hearing was conducted primarily to present the proposed water rate adjustment, thus most of the comments/feedback were on tariff rates. The public consultation proceeding was attached as **Annex 6.**

191. **Future Consultation and Disclosure**. This updated Initial Environment Examination (IEE) and other relevant documents will be made available at public locations in the municipality and disclosed on the ADB website. The consultation process will be continued once the contractors resume the subproject implementation to ensure stakeholders participation in project execution, as well as to implement a comprehensive information, education, and communication plan.

192. Consultations and information disclosure activities done during the detailed design and construction phase are as follows:

(i) Courtesy call/Kick-off/Pre-Construction meeting via Zoom was held on September 7, 2021.
(ii) A perception survey was conducted from November to December 2021. All barangays, especially households near the project area were given questionnaires. There were 147 respondents. About 47% are male and 53 are female. Of the 62 respondents who stated that they were already aware of the Project, they were asked how they knew about the PLAWD Water Supply Improvement. Some 42.9% said they heard the Project from government and barangay officials followed by officials from PLAWD with 37.4% and news from friends, relatives, and neighbors with 25.3%. (See **Annex 11** for questionnaire)
(iii) IEC flyers have been distributed by PLAWD through its Customer Service Desk since January 6, 2022 up to present. (See **Annex 12** for copy of IEC flyer)
(iv) Videos on PLAWD projects are being played on the LED screen at the Customer Service lounge from January 6, 2022 up to present.

193. Stakeholders' consultations shall be continued throughout the duration of the construction phase. PLAWD shall keep records of environmental and social complaints, received during consultations, field visits, informal discussions, and/or formal letters, together with the subsequent follow-up and resolutions of issues.

194. The summary of the activities conducted is presented in **Table 6-1** while the issues and concerns raised is summarized in **Table 6-2**

Table 6-1: Summary of Activities Conducted

Date	Activity	Number of Attendees	Location	Topics Discussed
29 November 2019	Public Hearing	99 persons	Bulwagang Santiago Apostol, Saint James the Apostle Parish Poblacion, Plaridel, Bulacan	Proposed Plaridel Water District (PLAWD), Proposed water rates and Issues and concerns regarding the proposed project
September 7, 2021	Courtesy Call/Kick-off Meeting/ Pre-Construction Meeting	21 persons	Via Zoom	Project Contract Package CW10a (Design and Construction of Plaridel Water Supply System)
November to December 2021	Perception Survey	147 respondents from all	Questionnaire distribution to all 19 barangays	Respondent's awareness of the PLAWD Project

Date	Activity	Number of Attendees	Location	Topics Discussed
		barangays		
January 6, 2022 - Present	Distribution of IEC flyers	Approx. 11,500 persons were given flyers	PLAWD Customer Service Desk	Contract Package CW10a (Design and Construction of Plaridel Water Supply System)
January 6, 2022 - Present	Playing of project videos on LED screen	Approx. 11,500 persons watched the videos	PLAWD Customer Service Lounge	All on-going projects (local and ADB-funded)

Table 6-2: Summary of Issues and Concerns Raised

Activity	Group Represented / Representative	Issues / Concerns Raised	Proponent's Response
Public Hearing	Ms. Efipania Perex from Brgy. Dampol	Raising of the current minimum rate of the water district to its constituents.	The increase of rate is necessary to match with the increasing prices of commodities, and to give its constituents the best service as well.
	Kagawad Reimerio Ravago and Engr. Reynante from Brgy. Parulan	Possibility of the PLAWD to be privatized and the road diggings that were still not yet repaired.	Privatization of the district is not part of the agenda of the PLAWD, and privatization only happens when the district cannot meet the concessionaires' needs. With regards to the restoration of previous works, it is included in the proposed program for the PLAWD.
	Antonio Manuel from Brgy. Bulihan	Possible adjustment of the implementation of the proposed increased rate on his account, considering that the last rate increase occurred in 2001, and he only connected to the water service of the district in 2017.	The proposed rate increase will apply to all the accounts, regardless of the date they connected to the service.
	(unnamed)	If the water meter maintenance fee of Php 20.00 will be a lifetime charge.	If the water district can absorb the fee after the water rate increase and after further study with regards to the possible malfunction of water meters every five (5) years, there is a possibility that the water maintenance fee will be removed.
	Ruben Maglingkod from La Mirada Subdivision	In accordance with existing legislation, there should be three (3) hearings to be conducted, if so, is the public hearing being conducted the final public hearing to be conducted? In addition, what is the required percentage of the	In accordance with public hearing guidelines, the notification of concessionaires at least 15 days prior, and the posting of posters at least seven (7) days were done prior to the scheduled hearing. The majority of the population of Plaridel is not a requirement to be able to proceed with the public hearing.

Activity	Group Represented / Representative	Issues / Concerns Raised	Proponent's Response
		population of Plaridel before a public hearing can be conducted, and is the number of attendees during the current public hearing enough?	In addition, there are no other scheduled public hearing for PLAWD. The public hearing conducted is valid for five (5) years, and is the water rate is not approved within that duration, the conducted public hearing shall be considered expired.
		Areas where the Angat Dam supplies its water, and the possibility of the PLWD of getting its supply of water from it.	The PLAWD receives a minimum contracted volume of two (2) million liters of water daily from the Bulacan Bulk, wherein Meycauayan, Bocaue, and Marilao are connected and where they receive their daily water as well.
	Emily Mariano from Brgy. Lumangbayan	Will the increase of the water rate help in improving the dirty water received, most especially during 4:00am to 5:00am every morning?	The dirty water, including other problems such as low pressure, are caused by many factors including damaged pipelines, illegal connection, set-up of booster pumps, and the lack of check valves on water meters.
	Councilor Myra Navarro from Brgy. Sta. Ines	The possible decrease of the proposed increase rate, in order to help the poor concessionaires of the PLAWD as well as its possible privatization.	The PLAWD is a government-owned and controlled corporation. The beneficiaries of the local government unit (LGU) and the higher government agencies are the citizens and the small projects. The low-income groups are protected in the proposed increased proposed rate, as the minimum water rate should not exceed 5% of their monthly average income. Further, the privatization of the PLAWD is not part of the proposed agendas, and shall only occur it the districts ops for it or does not have the necessary funds to sustain it.
	Kagawad Reimero Ravago of Brgy. Parulan	In favor of the Php 124.00 rate increase.	

195. A copy of the minutes of the meeting is presented in the **Annex 6**.

7 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

196. The EMP addresses the need for mitigation and management measures for the PLAWD subproject. This includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement and reporting requirements. The EMP also contains information on: (i) reporting requirements; and (ii) costs required for its implementation. Institutional set-up is presented in the implementation arrangement and discusses the roles during implementation and the required monitoring. It also

outlines the requirements and responsibilities during pre-construction, construction, and operation phases. The EMP shall be included in the contract documents to guarantee an environmentally responsible procurement. Tender documents and construction contracts shall include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience, , (viii) community health and safety, (ix) occupational/construction health and safety, (x) health risk to the public due to the pandemic, and (xi) health risk of working under the pandemic.

7.1 Environmental Mitigation

197. **Table 7-1** presents the information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures. Details of mitigating measures are already discussed in **Section 5**where the need for mitigation of each impacts was determined in the screening process.

Table 7-1: Environmental Mitigation Plan

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility for Implementation/ Supervision
PRE-CONSTRUCTION PHASE					
Excavation requirements	Excavation requirements	• Provision in tender documents that will require construction activities to be stopped immediately upon discovery of any archaeological and cultural relics and promptly reporting to the National Museum • Contractor must secure excavation permit prior to civil works (see Annex 13)	Pipeline trenches, civil works excavations	Part of detailed design cost	Design Consultants/ LWUA Project Management Unit (PMU)
Social and community concerns	Potential nuisance and concerns from the public	• Consultation with the affected communities regarding the expected impacts and proposed mitigation measures of the project • Provisions in the tender documents addressing the potential nuisances such as noise, air and water pollution and concerns from the public during construction phase	Pipelines routes, ground reservoirs, and new office	Part of detailed design cost	PLAWD Project Implementation Unit (PIU), Design Consultants/ LWUA PMU
	Damage to or disruption of other utility services	• Prior to excavation, contractor shall coordinate with utility companies concerned; During excavation, utility companies concerned, mainly internet providers, assign full-time personnel (whom they call “bantay	Pipelines routes,	Part of detailed design cost	PLAWD Project Implementation Unit (PIU), Design Consultants/ LWUA PMU

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility for Implementation/ Supervision
		kable") to oversee civil works.			
Preparation of detailed engineering design	Natural hazards, such as earthquake and flood	• Structural integrity of the water supply system shall conform with the requirements of the 2015 National Structural Code of the Philippines (NSCP) and the latest edition of the American Water Works Association (AWWA) Standards for wells, pipes, valves, and fittings • Projection of flood level using 50-year return period for catchment areas less than 40 km^2, and 100-year return period for catchment areas more than 40 km^2	All structural components	Part of detailed design cost	Design Consultants/ LWUA PMU
	Project-related complaints	• Establishment of a grievance redress mechanism (GRM).	PLAWD Office	Included in PLAWD Budget	PLAWD PIU, PMU/ Supervision Consultant, LWUA
Site preparation	Tree cutting (if applicable)	• Assess the project area and pipe alignment and check if there are trees need to be cut. Establish ownership and avoid cutting trees of ecological importance. • Identify the number of affected trees, apply for a tree cutting permit from the DENR and comply with all government requirements.	Office building in Brgy. Bintog and Storage facility in Brgy. Rueda	Included in construction contract cost.	Contractor/ PLAWD PIU, PMU, Supervision Consultant, LWUA, DENR
	Improper EMP implementation	• The Contractor shall assign an Environmental, Health, and Safety (EHS) Officer who shall ensure the proper implementation of the EMP and EMoP and will lead in the preparation of the CEMP. • A contractor's environmental management plan (CEMP) shall be prepared and cleared by PMU, PIU and ADB prior to start of construction. The CEMP will update the EMP to make it more site-specific and include detailed management plans such as traffic management plan, spoils and wastes management plan, community and occupational health and safety plan, etc.	All project sites	Included in construction contract cost.	Contractor/ PLAWD PIU, PMU, Supervision Consultant, LWUA

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility for Implementation/ Supervision
	Non-compliance with government requirements	• All applicable government permits such as ECC/CNC, water permit, permit to operate, etc. shall be secured prior to start of construction.	All project sites	Included in construction contract cost.	Contractor PLAWD PIU/ PMU, Supervision Consultant, LWUA
Baseline survey	Ambient noise level	• Baseline measurement of ambient noise shall be conducted and will be incorporated in the CEMP • If baseline noise levels already exceed the IFC-EHS guideline values, a maximum 3dB(A)increase in noise levels as a result of project activities shall be allowed. Mitigation • measures should be implemented to ensure this	Identified sites with sensitive receptors	Included in construction contract cost.	Contractor/ PLAWDPIU, PMU, Supervision Consultant, LWUA
CONSTRUCTION PHASE					
Pipelaying and other civil works	Soil erosion and sediments from construction sites during rainy periods	• Minimize total exposed area • Use of structural erosion prevention and sediment control practices which may include: interceptor dikes, pipe slope drains, straw bale barriers, sediment traps, and temporary sediment basins	Pipelines routes, ground reservoirs, and new office	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
	Nuisance / inconvenience to the public	• Minimize water supply cut-off periods and /or use of nighttime schedules, as well as announcement of water supply interruptions 2-3 days prior to actual cut-off • Avoid dumping of earth, stones, and solid wastes in water bodies	Pipelines routes	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
	Nuisance from noise of construction equipment and vehicles	• All heavy equipment and machineries shall be fitted with noise dampening devices that are in good condition. • Inform workers to minimize their activities to avoid disturbing the nearby communities. Avoid operating noisy equipment during nighttime (22:00 – 06:00) • Vehicle horn signals will be kept at a low volume, if necessary.	Pipelines routes, ground reservoirs, and new office	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
	Air pollution due to construction	• Water spraying for dust control • Construction materials with	Pipelines routes, ground	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility for Implementation/ Supervision
	activities	potential for significant dust generation shall be covered • Tarpaulin cover for trucks transporting loose construction materials • Avoid smoke belching equipment	reservoirs, and new office		Consultants
	Traffic congestion and hindrance to access	• Traffic diversion schemes and other traffic management plans should be properly coordinated with the LGU and the local office in charge of traffic management and consulted with the stakeholders. • Prior to implementation of the traffic re-routing plan, the public must be informed in advance.	Pipelines routes	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
	Pollution, accident, and health risks to workers	• All domestic wastes will be disposed of in accordance with the construction and operations waste management procedures. • Provision of sanitary or portable toilets to laborers • Implementing a solid waste management plan • Provision of surface runoffs control such as temporary diversion drains, catch drains, and silt-traps • Provision of personal protective equipment (PPE) to workers and requiring them to use PPE appropriate to their work • Conduct HSE training to workers, including HIV and STD awareness	Workers camp; construction sites	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
	Hazard to public due to construction activities	• Implement road safety plan and safety measures including warning signs to alert people of hazards around the construction sites, barricades, and night lamps for open trenches in pipelaying	Pipelines routes, ground reservoirs, and new office	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
	Increase employment opportunities	• A robust “local first” hiring policy will be designed and be implemented in coordination with local officials and community leaders especially at the barangay and municipal	Pipelines routes, and ground reservoirs	No cost	Contractor/ PLAWD PIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility for Implementation/ Supervision
		levels. • At least 50% hiring of unskilled labor from local residents will be implemented as per RA 6685. • No preference in terms of gender during the hiring process will be observed. • Adopt a just compensation scheme to avoid future labor and management conflicts.			
Workers' camp site	Pollution and health risks due to workers' camp	• Construction contractor shall be required to carry out the following: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sewage at the camps' surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps to avoid carrying away any contaminants • Contractor shall be required to use temporary diversion drains, catch drains, and silt-traps at these camps. • Guidelines and standards for the workers' camp will be in accordance to the guidelines and standards of IFC's Guidance on Workers' Accommodation (i.e., siting, minimum housing standards, minimum accommodation sizes, sanitation facilities, provision of eating and resting areas, health and safety within workers' accommodation). •	Workers camp site	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
	Accident and health risks to workers and community	• Provision of personal protective equipment (PPE) to workers and requiring them to use PPE appropriate to their work • Conduct HSE training to workers, including COVID-19, HIV, and STD awareness • Ensure that COVID-19 health and safety protocols are strictly followed by the workers and community especially the passers-by	Workers camp; construction sites	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility for Implementation/ Supervision
		• Construction health and safety measures will be complied with according to the Department of Labor and Employment Occupational Health and Safety Standards. •			
Rehabilitation and closure of construction sites	Improper closure of construction sites	• Removal and proper disposal of all construction wastes and implement surface restoration	Pipelines routes, ground reservoirs, and new office	Incorporated in construction contract	Contractor/ PLAWD PIU, Supervision Consultants
OPERATION PHASE					
Water production	Health hazard due to delivery of poor water quality	• Water disinfection using chlorine • Water safety plan implementation • Regular water quality monitoring in compliance with the 2017 Philippine National Standards for Drinking Water (PNSDW)	Pipelines routes, and ground reservoirs	Part of operation & maintenance costs	PLAWD / LWUA
Water consumption	Pollution from increased generation of sewage and sullage	• Use of individual septic tanks system of water consumers • Maintenance /desludging of septic tanks to be encouraged or enforced by LGU	Subproject water supply service area	Cost of water consumers	Water consumer/ LGU
Abstraction of ground water	Scarcity of water supply and conflict in water uses	• Integrated water resources management of a watershed will be initiated by PLAWD through a MOA with DENR.	Watershed area of Bulacan province	Part of operation cost	PLAWD / LWUA
Operation and maintenance of project	Hazards and risks to health and safety of workers	• Provision of chlorine safety data sheet and emergency shower and eyewash at pump stations • Provision of full-face chemical cartridge respirator for pump operators • Provision of vaccines to all staff (flu, anti-tetanus, anti-rabies, Hepa-antigen, etc.) •	Pump stations and reservoir sites Office	Part of operation cost	PLAWD / LWUA

198. Although details of the required mitigating measures are already discussed in the screening for impacts, the following items are discussed further to highlight their importance: (i) tender documents and construction contracts, (ii) contractor's environmental management plan, (iii) construction site management plan, (iv) water safety plan, (v) source protection study and wellhead protection plan, and (vi) unanticipated environmental impacts.

199. **Tender Documents and Construction Contracts.** The tender and bid documents included the contract document and the following annexes:

- Annex 1 Draft Initial Environmental Examination;
- Annex 2 Gender Action Plan;
- Annex 3 Due Diligence Report for Resettlement;
- Annex 4 Construction Guidelines for Project Implementation during the period of Public Health Emergency was discussed during the Pre-bid conference conducted on November 13, 2020.

200. After awarding the project to the winning bidder, a Courtesy Call/Kick-Off/Pre-Construction Meeting via Zoom with Plaridel LGU, other concerned government agencies and the contractor for Package CW10a was held on September 7, 2021 to discuss all issues and concerns about the Project Contract Package CW10a.

201. **Contractor's EMP (CEMP).** The CEMP shall be prepared by the civil works contractor prior to start of construction and needs to be approved by PLAWD's PIU. This is a refinement of the PLAWD subproject's EMP with details on staff, resources, implementation schedules, monitoring procedures and specific measures and procedures on how the contractor will implement the EMP during construction and allocate a budget. This will be the basis for monitoring the environmental performance of the contractor by the PMU, PLAWD PIU, construction supervision consultants, and other monitoring parties. Moreover, the construction supervision consultant will be able to manage the specific items expected from the contractor regarding environmental safeguards. With the CEMP, PLAWD can easily verify the associated environmental requirements each time the contractor will request approval for works schedules.

202. The CEMP shall include the conduct of baseline environmental assessment within the project areas including ambient noise level, water quality, and other environmental resources that could be affected by the project.

203. The CEMP shall provide details on specific items related to the environmental aspects during construction. It shall include specifications on requirements for dust control, erosion and sediment control, avoidance of casual standing water, management of solid wastes, workers' camp sanitation, pollution from oil, grease, fuel spills, and other materials due to the operation of construction machineries, safety and traffic management, avoidance of inconveniences to the public, air and noise pollution control. It shall also include guidance on the proper design of the construction zone, careful management of stockpiles, vegetation, topsoil, and vehicles and machinery.

204. See **Annex 5** for sample CEMP outline.

205. **Water Safety Plan.** Preparation of a water safety plan is advocated by WHO for ensuring the delivery of safe drinking water to the consumers using a comprehensive risk assessment and risk management approach that covers the process of sourcing water supply up to the distribution to consumers. Similarly, PLAWD shall manage the environmental risk to its water supply system in a broader scale. A water safety plan shall enable PLAWD to (i) prevent contamination of its water sources, (ii) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets, and (iii) prevent recontamination during storage, distribution and handling of drinking water. It is an approach that will clearly show the desire of the PLAWD in applying best practices in ensuring delivery of potable water to its consumers.

206. **Source Protection Study.** Preparation of the source water assessment and wellhead protection study will be included in the water safety plan as the source protection study. A source water assessment evaluates the susceptibility of a water supply source to potential contaminants that could adversely affect the quality of water supply source identified which will then be used to prepare the well head protection plan. Wellhead protection prevents drinking water from becoming polluted by managing potential sources of contamination in the area with influence to the groundwater that supplies to the well. The wellhead protection plan includes designating the protection area or capture zone. A wellhead protection plan is particularly important for PLAWD since its groundwater sources are within or near built-up areas and the risk of contamination of these sources is high.

207. **Unanticipated Environmental Impacts.** In case of occurrence of significant unanticipated environmental impacts during project implementation, PLAWD shall prepare a supplementary environmental assessment and EMP to assess the potential impacts and outline mitigation measures and resources to address those impacts.

7.2 Environmental Monitoring

208. **Table 7-2** presents the information on: (i) aspects or parameter to be monitored, (ii) location where monitoring is applicable, (iii) means of monitoring, (iv)frequency of monitoring, (v) responsibility of compliance monitoring, and (vi) cost of monitoring. The contractors are required to submit monthly self-monitoring reports. The PMU shall prepare quarterly environmental monitoring reports to be submitted to LWUA management detailing the status of mitigating measure implementation.

Table 7-2: Environmental Monitoring Plan

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Specific provision in tender documents on archeological/ cultural relics	Pipeline trenches, civil works excavations	Verify draft and final documents	Twice – draft and final documents	Design consultants	LWUA PMU	Part of project management in detailed design (minimal cost)
Consultation meetings with the community	Pipelines routes, ground reservoirs, and new office	Verify meetings documentation	After completion of meetings	PLAWD, Design consultants	LWUA PMU	Part of project management in detailed design (minimal cost)
Specific provisions in tender documents on nuisance & concerns from the public	Pipelines routes, ground reservoirs, and new office	Verify draft and final documents	Twice – draft and final documents	PLAWD, Design consultants	LWUA PMU	Part of project management in detailed design (minimal cost)
CEMP Requirement	Pipeline routes, ground reservoirs	Verify submittal of contractors	Once prior to construction activities	Contractors	PLAWD PIU	Part of project management in detailed design

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
	and new office					
Baseline environmental quality assessment	DENR-identified sampling stations	Ambient air (PM10), Noise, Ambient water	Once prior to civil works	Design Consultants/ Contractor	PLAWD PIU	Part of project management in detailed design
Applicable government permits and clearances (ECC, others)	Entire project	Check for pemits/clearances or application status	(All government permits should be secured prior to start of construction)	PLAWD, Design Consultants, Contractor	LWUA PMU	Part of project cost
CONSTRUCTION PHASE						
Total area to be exposed; run off flowing into disturbed sites	Pipelines routes, ground reservoirs, and new office	Visual inspection of sites; plans verification	Daily during rainy periods	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Water supply interruptions	Pipelines routes	Work schedules verification	Daily	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Materials and solid wastes dumped in water bodies	Pipelines routes	Visual inspection of sites	Daily	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Noise levels to comply with IFC-EHS noise guideline values.	Pipelines routes, ground reservoirs, and new office	Use of sound level meter	Daily	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Dust, cover of stockpiles, smoke belching vehicle and equipment	Pipelines routes, ground reservoirs, and new office	Visual inspection of sites	Daily	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Road closure	Pipelines	Traffic plans	Weekly	Contractor	Construction	Part of

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
and traffic rerouting; materials stockpiles; road restoration	routes	verification			supervision consultants, PLAWD PIU	consultant's construction supervision contract; minimal cost to PLAWD PIU
Sanitary toilets, garbage bins, runoff controls	Workers camps	Visual inspection of camps	Once before start of construction and once monthly	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Road safety plan; sign, barricades and night lamps	Pipelines routes, ground reservoirs, and new office	Visual inspection of sites	Daily	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Construction wastes	Pipelines routes, ground reservoirs, and new office	Visual inspection of sites	Once before final stage of demobilization	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Number of local labor employed	Pipelines routes, ground reservoirs, and new office	Verification of contractor's records	Once a month	Contractor	PLAWD PIU	No cost
Occupational/ construction health and safety	Pipeline routes, ground reservoirs and new office; Workers' camp	Verification of contractor's records/reports	Monthly	Contractors	Construction supervision consultants. PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
Community health and safety	Pipeline routes, ground reservoirs and new office	Verification of contractor's records/reports on public complaints	Monthly	Contractors	Construction supervision consultants. PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
COVID-19 health and safety protocols	Pipeline routes,	Verification of contractor's health and safety	Monthly	Contractors	Construction supervision	Part of consultant's construction

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
	ground reservoirs and new office; Workers' camp	records			consultants. PLAWD PIU	supervision contract; minimal cost to PLAWD PIU
OPERATION PHASE						
E. Coli bacteria; PNSDW physical & chemical parameters	Pipelines, and ground reservoirs	Water sampling and laboratory test	Monthly for bacteria; annual for physical & chemical	PLAWD	LWUA	Part of PLAWD's operation cost
Septic tank of water consumers	Subproject water supply service area	Visual inspection of sites	Once a year	Water consumer	LGU	Minimal cost
Occupational health and safety of workers during the operation and maintenance of the project	Ground reservoirs; pump stations	Medical examination, Verification of workers' health/medical records	Once a year	PLAWD	LWUA	Part of PLAWD's operation cost

209. **Project Performance Monitoring.** Project performance monitoring presents the desired outcomes as measurable events by providing parameters or aspects that can be monitored and verified (**Table 7-3**).For preconstruction phase, the EMP requirements need to be incorporated in construction contracts to achieve an environmentally responsible procurement as a desired outcome. Construction phase desired outcomes include effective management of environmental impacts and reduce risk to public. For the operation phase, PLAWD's water supply system must meet the drinking water standards (2017 PNSDW) for physical, chemical, and bacteriological parameters.

Table 7-3: Project Performance Monitoring

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Frequency	Implementation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Environmentally responsive detailed design	EMP requirements incorporated in detailed design	Verify detailed design documents; EMP requirements reflected in tender documents	Twice – (i) draft detailed design documents and (ii) prior to approval of final documents	PLAWD, Design consultants	LWUA PMU	Minimal cost
Environmentally responsible procurement	EMP requirements incorporated in construction contracts	Verify construction contract documents	Prior to finalization of construction contract documents	PLAWD PIU	LWUA PMU	Minimal cost
CONSTRUCTION PHASE						
Effective management of environmental	Number of public complaints on	Verification of contractor's records;	Once a month	Contractor	Construction supervision consultants,	Part of consultant's construction

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Frequency	Implementation	Compliance Monitoring	Monitoring Cost
impacts during construction	construction activities	PLAWD's coordination with local officials			PLAWD PIU	supervision contract; minimal cost to PLAWD PIU
Reduce risk to public during construction	Number of accidents involving construction activities	Verification of contractor's records; PLAWD coordination with local officials	Once a month	Contractor	Construction supervision consultants, PLAWD PIU	Part of consultant's construction supervision contract; minimal cost to PLAWD PIU
OPERATION PHASE						
Conformance of Water quality to drinking water standards	Required drinking water quality parameters (bacteria count, color, Ph, turbidity, dissolved solids, hardness, alkalinity, manganese, iron, fluoride, chloride, sulfates, magnesium, calcium, carbonates, and bicarbonates)	Water sampling and laboratory test	Monthly for bacteria; annual for physical & chemical	PLAWD	LWUA	Part of PLAWD's operation cost

A. Implementation Arrangement

210. This subsection presents the: (i) institutional set-up, (ii) implementation schedule, (iii) required clearances and permits, and (iv) capability building.

211. **Institutional Setup.** For this subproject, LWUA will serve as the executing agency, while PLAWD will be the implementing agency. LWUA has overall responsibility for project coordination, implementation, and liaison with ADB and other government offices. A Project Management Unit (PMU) to be created by LWUA will be responsible for coordinating the implementation at the national level. A PMU staff shall be designated as the Environment Officer for the project. Before the commencement of the subproject, a team of consultants will assist LWUA's PMU and PLAWD to ensure smooth implementation and secure required documents. PLAWD will be responsible for the procurement of goods, works, and services. During construction and operation phase of the subproject, PLAWD will oversee the implementation of the subproject. PLAWD shall create a Project Implementation Unit (PIU)for the day-to-day management of the project and will work closely with LWUA's PMU.WDGRC will handle the grievance redress mechanism and promptly address the public's complaints about

environmental performance of the subproject. Below is the implementation arrangement for the project.

Ref	Name	Gender	Position	Phone	Email
Executing Agency: Local Water Utilities Administration Project Management Unit					
1.	Juanito M. Pagulayan Jr.	Male	Project Manager	0917 887 9840	jaypee2805@gmail.com
2.	Arturo B. Fernando	Male	Assistant Project Manager	0999 370 7439	artfernando@yahoo.com
3.	Benjamin P. de Guzman Jr.	Male	Focal Person for Construction Supervision	0919 063 6089	jojo_eros@yahoo.com
4.	Lorelei Buenafe	Female	Focal Person for Finance	0917 553 6285	leib414@yahoo.com
5.	Luz D. Dela Torre	Female	Focal Person for Gender	0947 9946431	ldtorre2@yahoo.com
6.	Ma. Josephine D. Candaroma	Female	Focal Person for Procurement	0917 7960596	joycecandaroma@gmail.com
7.	Myrna C. Ramos	Female	Focal Person for Environmental Safeguards	0917 8804024	myrna.cruzramos@gmail.com
8.	ReyzellGatan	Female	Focal Person for Social Safeguards	0917 3191575	reyzellegatan@gmail.com
Implementing Agency: Plaridel Water District Project Implementation Unit[1]					
9.	Charlie A. Felicitas	Male	Project Manager	09959609343	cafelicitas.plawd@gmail.com
10.	Alvin S. Chinchuntic	Male	Project Inspector	09959609344	achinchuntic.plawd@gmail.com
11.	Cecilia L. Pasagui	Female	Focal Person for Finance	09664804218	cherom60@yahoo.com
12.	Dan Angelo L. Madariaga	Male	Focal Person for Gender	09955143731	sonnycaparas1012@yahoo.com
13.	Angelo M. Delos Santos	Male	Focal Person for Procurement	09664804211	plawd87@yahoo.com
14.	Alvin S. Chinchuntic	Male	Focal Person for Environmental Safeguards	09959609344	achinchuntic.plawd@gmail.com
15.	Alberto Mendoza	Male	Focal Person for Social Safeguards	09162395770	aamendoza.plawd@gmail.com

212. ADB will assess status of EMP implementation and over-all environmental performance of the Project by reviewing environmental monitoring reports submitted by LWUA and conducting site visits to validate conditions onsite. Corrective actions will be agreed with LWUA, PLAWD and the contractor to address deficiencies in EMP implementation or inadequacy of mitigation measures. ADB will disclose on its web site semi-annual environmental monitoring reports submitted by LWUA.

213. **Environmental Corrective Action Plan.** Should the mitigation measures indicated in the CEMP and EMP are observed to be inadequate during subproject implementation, the construction supervision consultants and PIU shall propose a corrective action plan to address this inadequacy and ensure compliance.

214. **Environmental Monitoring Reports.** During the construction period, the contractor shall submit to the PIU a monthly environmental self-monitoring report to be submitted to PIU, construction supervision consultants, and PMU. The PIU together with the construction supervision consultants, shall also conduct at least monthly site inspection to monitor EMP implementation and validate the contractor's environmental monitoring reports. Monthly reports of these monitoring activities shall be submitted to PLAWD and the PMU. The PMU shall collate all the monthly data and prepare semi-annual environmental monitoring reports (SEMR) which shall be submitted by LWUA to ADB.SEMRs are due on 31 July for the first semestral report and on 31 January of the following year for the second semestral report. ADB will publicly disclose the SEMRs on its web site.

215. **Implementation Schedule.**The PLAWD subproject Contract Package CW10a started on July 11, 2021 and was supposed to be completed within the first quarter of 2023. However, because of its time suspension for 151 days from February 1 to July 1, 2023 due to the delay in the release of DPWH permit, completion of design work, and delivery of steel pipes, the project duration was extended to December 31, 2023. On the other hand, Contract Package CW10b started on August 8, 2022 and is to be completed this July 31, 2023. PLAWD shall ensure that construction contract provisions related to the EMP shall be included in the tendering stage.

216. Contract Packages CW10a and CW10b are both design and build, and to date, their design services are 100% complete. As of January 31, 2023, the cumulative percentage of accomplishment of Package CW10a Contractor is 57.54%. For Package CW10b Contractor, the cumulative percentage of accomplishment is 15.53% as of May 31, 2023.

217. **Clearances and Permits.** Under Philippine regulations, PLAWD shall apply for an Environmental Compliance Certificate (ECC) from the EMB Region XII for the proposed augmentation of the existing water supply system and Water Permit from the NWRB. Securing the ECC from EMB Region XII will cost PhP 5,055.00 while applying for Water Permit from NWRB will cost PhP 7,200.00. Both permits will be secured prior to implementation of the subproject. Tree cutting permits will be secured from EMB Region XII by the contractor, if trees have to be cut.

218. The PLAWD is currently on the process of completing all the documentary requirements for the acquisition of the ECC, thus, online ECC application is not yet initiated. Construction will not be started until the ECC has been obtained.

219. **Capability Building.** Capacity building activities for LWUA, the project management unit (PMU) and PLAWD on ADB processes such as environmental and social safeguards, gender

mainstreaming, procurement, disbursement and financial management will be provided under the WDDSP. Other trainings necessary for an efficient implementation of the subproject will be identified and added in the future.

220. **Environmental Cost.** The indicative overall cost for the implementation of the EMP is shown in **Table 7-4**. **EMP Cost.** The implementation of the Environmental Management Plan (EMP) would entail cost as shown in the impact mitigation costs under Table 7-1 Environmental Mitigation Plan, in the monitoring costs under Table 7-2 Environmental Monitoring Plan, and monitoring costs under Table 7-3 Project Performance Monitoring. **Table 7-4** shows the EMP cost of activities/items under the pre-construction and construction phases amounting to Php 5,691,762.20.

Table 7-4: Cost for EMP Implementation

No	Activity / Item	Cost, PHp
1	Baseline environmental quality assessment (Noise level, Ambient air (PM10), Ambient water)	140,000.00
2	ECC application fee, excavation permit fee, tree-cutting permit fee, chainsaw registration fee, cost of saplings required by DENR-CENRO, Registration of HW Generator, Discharge Permit for septic tank, Permit to Operate for the 3 gensets	2,655,762.20
3	Billboard containing tree-cutting permit details	9,000.00
4	Billboard containing ECC details	2,000.00
5	Structural sheet piles, combination of shoring jacks and phenolic boards	800,000.00
6	Personal protective equipment (earmuffs/earplugs, dust masks, safety glasses/goggles, anti-vibration gloves)	1,300,000.00*
7	Warning signs, barricades, night lamps for open trenches in pipelaying	450,000.00
8	Steel plates and path walks	250,000.00
9	Couplers in case existing service connections will be damaged	85,000.00
Total		**5,691,762.20**

8 GRIEVANCE REDRESS MECHANISM

221. Like the other water districts, PLAWD will utilize its existing consumer complaints system and expand it to also manage subproject-related complaints. Thus, said consumer complaints system will function as grievance redress mechanism (GRM) for the subproject as well. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the subproject. The complaints are received through phone calls, Facebook page, and personal appearance of complainants to PLAWD's office, and are consolidated by the PLAWD's Social Safeguards Focal Person who properly coordinates them with the contractors. The feedback form can be downloaded from Plaridel Water District

Official Website (https://plaridelwaterdistrict.ph). A sample PLAWD feedback form is attached as **Annex 4**.

222. The project has a functioning GRM, however, there is noWater District Grievance Redress Committee(WDGRC). So far, there was no grievance coming from the workers within the project sites. Any public complaints with regard to the construction/project activities are coordinated with and properly addressed by the contractors.

223. PLAWD shall appoint a Social Development and Safeguards Officer (Safeguards Officer) in the Project Implementation Unit (PIU) and will establish WDGRC to be chaired by the Water District-General Manager. Members shall include the following: (i) the contractor's highest official at the site such as the Construction Manager or the Construction Superintendent, (ii) barangay officials, (iii) concerned NGOs, and (iv) women's organizations. Creation of the WDGRC and its operation shall be included in appropriate sections of the civil works contract. Expeditious resolution of complaints during construction is important since activities are sometimes continuous and can easily change the landscapes within a week. For the quick filing of complaints, the WDGRC shall prepare a form to be used for the filing of grievances/complaints. The use of form will also facilitate the filing of complaints by illiterate persons.

224. The steps to be followed in filing complaints and the procedures for redress are the following: (i) complainant shall provide the background and file the complaint verbally or in writing to WDGRC. The WDGRC secretary shall assist the complainant in filling-up the complaint form; (ii) within 2 working days, the WD-PIU head contractor's representative, and complainant shall discuss if the complaint can be resolved without calling for a WDGRC meeting; (iii) if the complaint cannot be resolved by the WD-PIU head and contractor's representative, a WDGRC meeting shall be called with the complainant to resolve the complaint within 5 working days; (iv) if the complaint cannot be resolved, the complainant shall raise the issue to the Barangay officials where Barangay rules and regulations are followed for the amicable settlement of disputes at the Barangay level without judicial recourse; and(v) if the complaint cannot be resolve at the Barangay level, the complainant shall seek recourse with the courts. If the complaints are based on violations of the ECC terms and conditions, the complainant has an option to also bring the issue to DENR EMB Regional Office. **Figure 8-1** shows the grievance redress process.

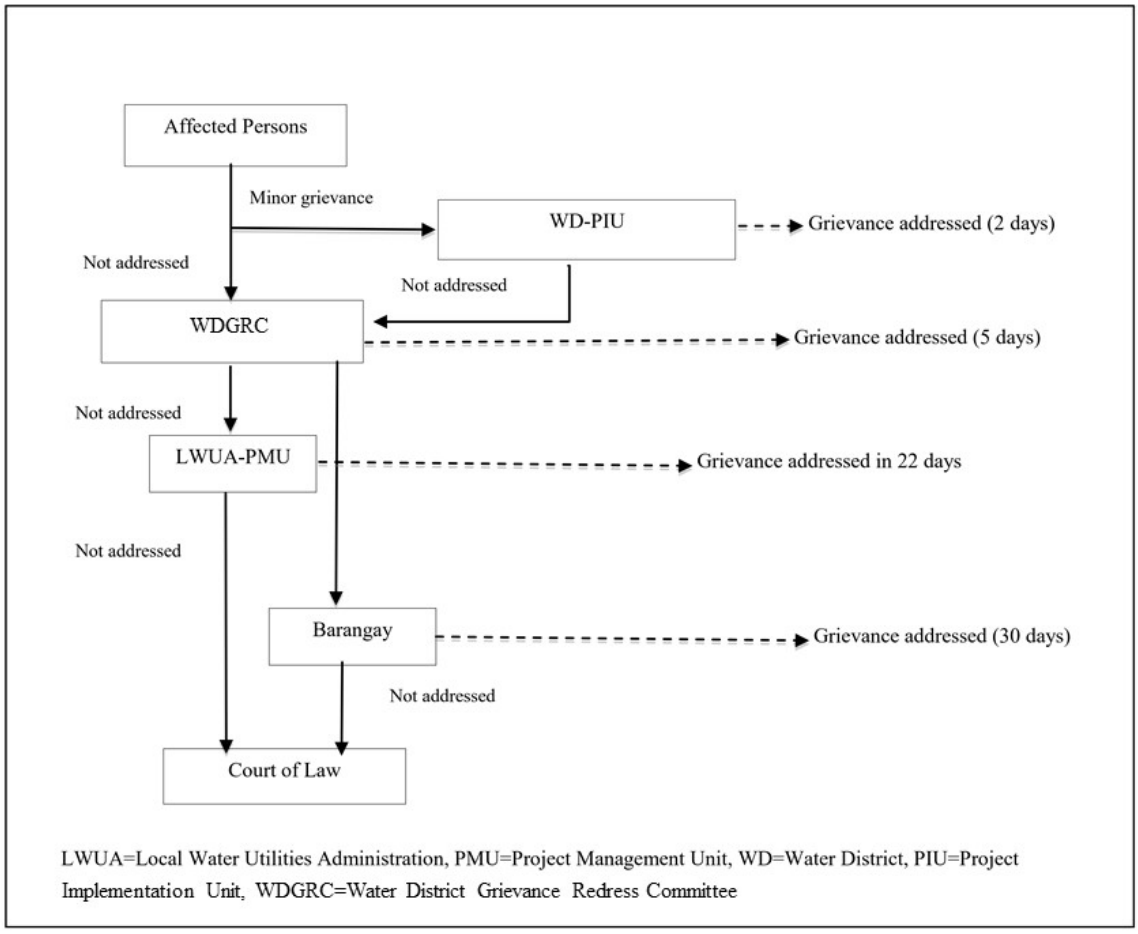

Figure 8-1: Proposed Grievance Redress Process

225. **Recordkeeping.** Records will be kept by the PLAWD-PIU of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were in effect, and final outcome.

226. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by PLAWD.

227. **EMP Cost.** The implementation of the Environmental Management Plan (EMP) would entail cost as shown in the impact mitigation costs under Table 7-1 Environmental Mitigation Plan, in the monitoring costs under Table 7-2 Environmental Monitoring Plan, and monitoring costs under Table 7-3 Project Performance Monitoring. **Table 7-4** shows the EMP cost of activities/items under the pre-construction and construction phases amounting to Php 5,691,762.20.

228. **Complaints to the Department of Environment and Natural Resources.** Complaints about environmental performance of projects issued an Environmental Certificate of Compliance (ECC) can also be brought to the attention of DENR-EMB. The process of handling such complaints is described in the Revised Procedural Manual (2007) for the IRR of PD 1586. The steps that DENR-EMB may follow in handling complaints are: (i) DENR-EMB shall verify if the

complaint is actionable under PD.1586, (ii) within 72 hours from receipt of a complaint DENR-EMB will send the proponent a Notice of Alleged Violation (NAV) and requests for an official reply as to why the proponent should not be penalized, (iii) DENR-EMB may conduct field validation, site inspection and verification or other activities to assess or validate the complaint. The proponent is allowed to respond within seven days. Proponent's failure to respond to the NAV and further notices will force DENR-EMB to take legal actions. DENR may issue a Cease and Desist Order (CDO) to project proponents which shall be effective immediately based on: (i) violations under the PEISS, and (ii) situations that present grave or irreparable damage to the environment. PD 1586 also allows DENR to suspend or cancel the proponent's ECC if the terms and conditions have been violated.

9 CONCLUSION AND RECOMMENDATIONS

229. PLAWD's water supply subproject will benefit the general public by contributing to the long-term improvement in the water supply system of the project coverage area and providing safe drinking water to residents and commercial establishments in the municipality. The potential adverse environmental impacts are primarily associated with the construction period, which can be minimized through mitigating measures and environmentally sound engineering and construction practices.

230. Under the Philippine law, since the subproject is categorized under Category B, securing of ECC may be carried out through online application (which may still be subject to the EMB regional office). It is also environment category B under ADB SPS requiring the preparation of this IEE Report.

231. With the implementation of the mitigation measures as proposed in the EMP, the subproject is not expected to cause irreversible adverse environment impacts. Also, the water supply subproject can be implemented in an environmentally acceptable manner without the need for further environmental assessment study, except for the conduct of a public consultations for compliance and further input. Should there be any significant change in the project scope, an updated or a new IEE will be prepared.

232. The proposed PLAWD subproject is hereby recommended for implementation with the following requirements to be strictly followed: (i) Tendering process shall ensure environmentally responsible procurement by requiring the inclusion of EMP provisions in the bidding and construction contract documents; (ii) Contractor's submittal of a CEMP which shall be included in the construction contract; (iii) Contract provisions on creation and operation of the WDGRC shall be included in construction contracts; (iv) LWUA, with its regulatory function, shall ensure that capability building for PLAWD shall be pursued; and (v) PLAWD shall continue the process of public consultation and information disclosure during detailed design and construction phases.

10 REFERENCES

Asian Development Bank. (2014). *Philippines: Water District Development Sector Project*. Local Water Utilities Administration, of the Asian Development Bank.

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ANNEX 1–ACCOMPLISHED REA

WATER SUPPLY
Page 1 of 4

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (SDES) for endorsement by the Director, SDES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Water District Development Sector Project
Plaridel Water Supply System Improvement/ Expansion Project

Sector Division:

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
• Densely populated?		✓	
• Heavy with development activities?		✓	
• Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site		✓	
• Protected Area		✓	
• Wetland		✓	
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	
• Special area for protecting biodiversity		✓	
• Bay		✓	
B. Potential Environmental Impacts Will the Project cause…			

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Page 2 of 4

Screening Questions	Yes	No	Remarks
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		✓	
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	
▪ hazard of land subsidence caused by excessive ground water pumping?		✓	
▪ social conflicts arising from displacement of communities ?		✓	
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		✓	
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	✓		Regulated water quality monitoring
▪ delivery of unsafe water to distribution system?	✓		Regulated water quality monitoring
▪ inadequate protection of intake works or wells, leading to pollution of water supply?		✓	
▪ over pumping of ground water, leading to salinization and ground subsidence?		✓	
▪ excessive algal growth in storage reservoir?	✓		Regular cleaning of storage reservoir
▪ increase in production of sewage beyond capabilities of community facilities?		✓	
▪ inadequate disposal of sludge from water treatment plants?		✓	
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		✓	
▪ impairments associated with transmission lines and access roads?	✓		Will be restored to normal condition
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		✓	
▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		✓	
▪ dislocation or involuntary resettlement of people?		✓	
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	
▪ noise and dust from construction activities?	✓		Construction Methodology

WATER SUPPLY
Page 3 of 4

Screening Questions	Yes	No	Remarks
▪ increased road traffic due to interference of construction activities?	✓		Construction Methodology
▪ continuing soil erosion/silt runoff from construction operations?	✓		Construction Methodology
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		✓	
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		✓	
▪ accidental leakage of chlorine gas?		✓	
▪ excessive abstraction of water affecting downstream water users?		✓	
▪ competing uses of water?		✓	
▪ increased sewage flow due to increased water supply	✓		Septage and Sewerage Management Program
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		✓	
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	✓		Local hiring
▪ social conflicts if workers from other regions or countries are hired?		✓	
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?	✓		Construction Methodology
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		Construction Methodology

WATER SUPPLY
Page 4 of 4

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: LOAN 3389/GRANT 0477-PHI:
WATER DISTRICT DEVELOPMENT SECTOR PROJECT (WDDSP)
Plaridel Water Supply System Improvement/ Expansion Project
Sector:
Subsector:
Division/Department:

Screening Questions		Score	Remarks[1]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): **LOW**
Other Comments: _____

Prepared by: (SGD) ENGR. CHARLIE FELICITAS
Designation/Agency: SENIOR ENGINEER / PLARIDEL WATER DISTRICT
Date: 11/28/2019

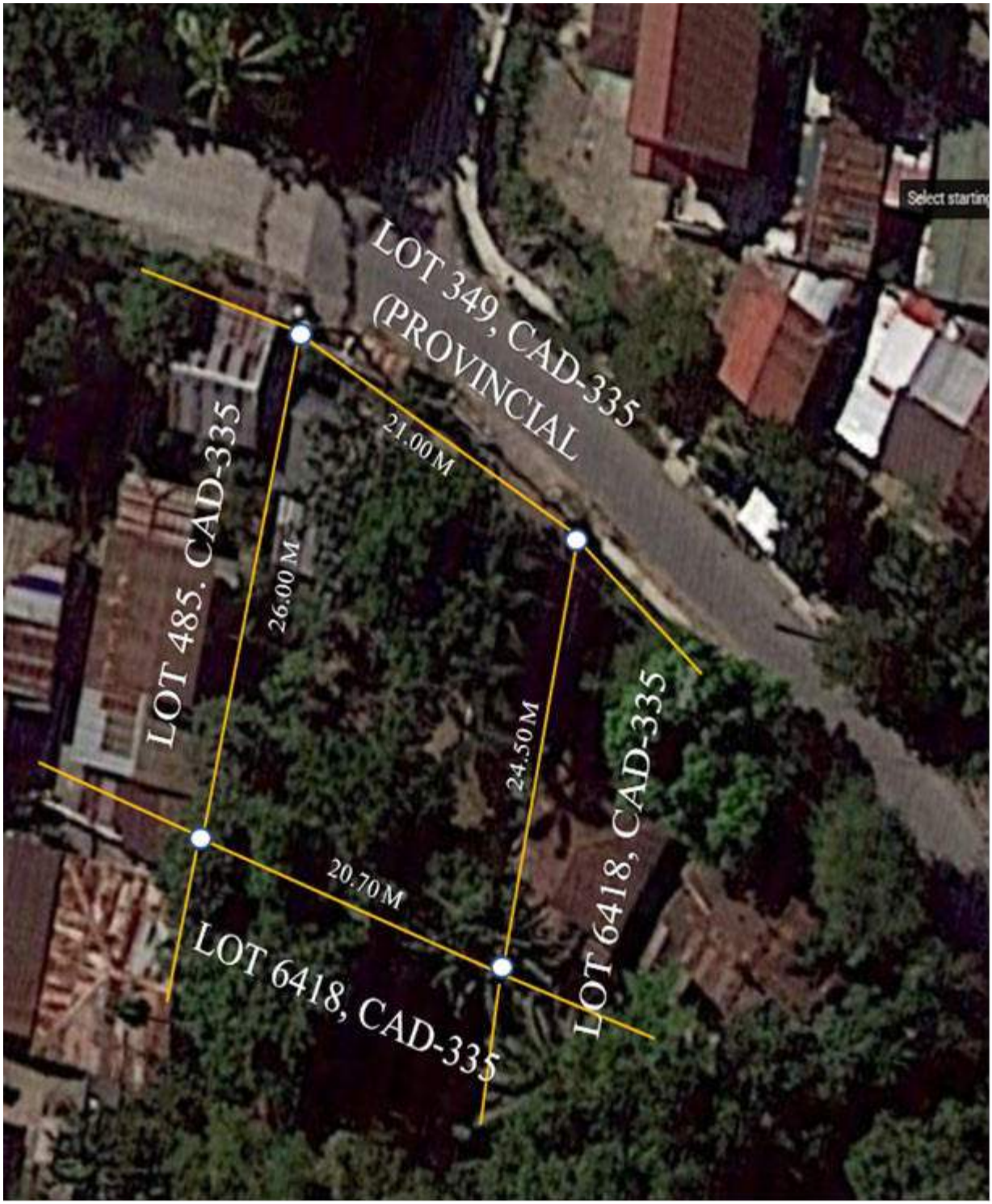
[1] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

ANNEX 2– LOCATION OF THE SUBPROJECT SITE

1.) BINTOG PUMP STATION(Proposed Location of PLAWD Office Building)

LOT 3074A AREA = 1000 SQ. M
LOT 1 = 86 SQ.M.
LOT 2 = 54 SQ.M.
LOT 3 = 50 SQ.M.

2.) RUEDA PUMP STATION (Proposed Concrete Ground Reservoir)
LOT AREA = 500 SQ. M
BASED ON ACTUAL MEASUREMENT OF RUEDA

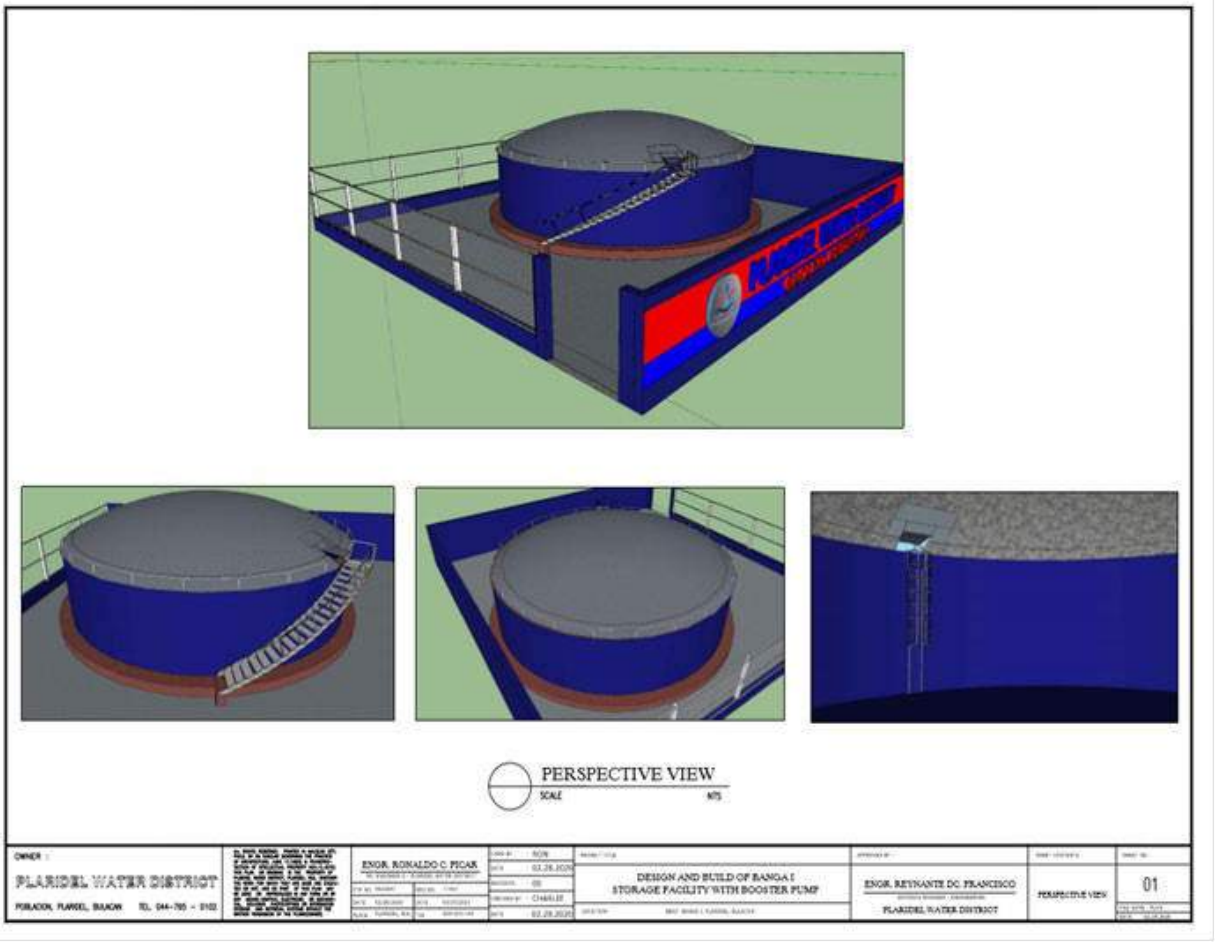


3.) BANGA 1ST RESERVOIR (Proposed Concrete Ground Reservoir)

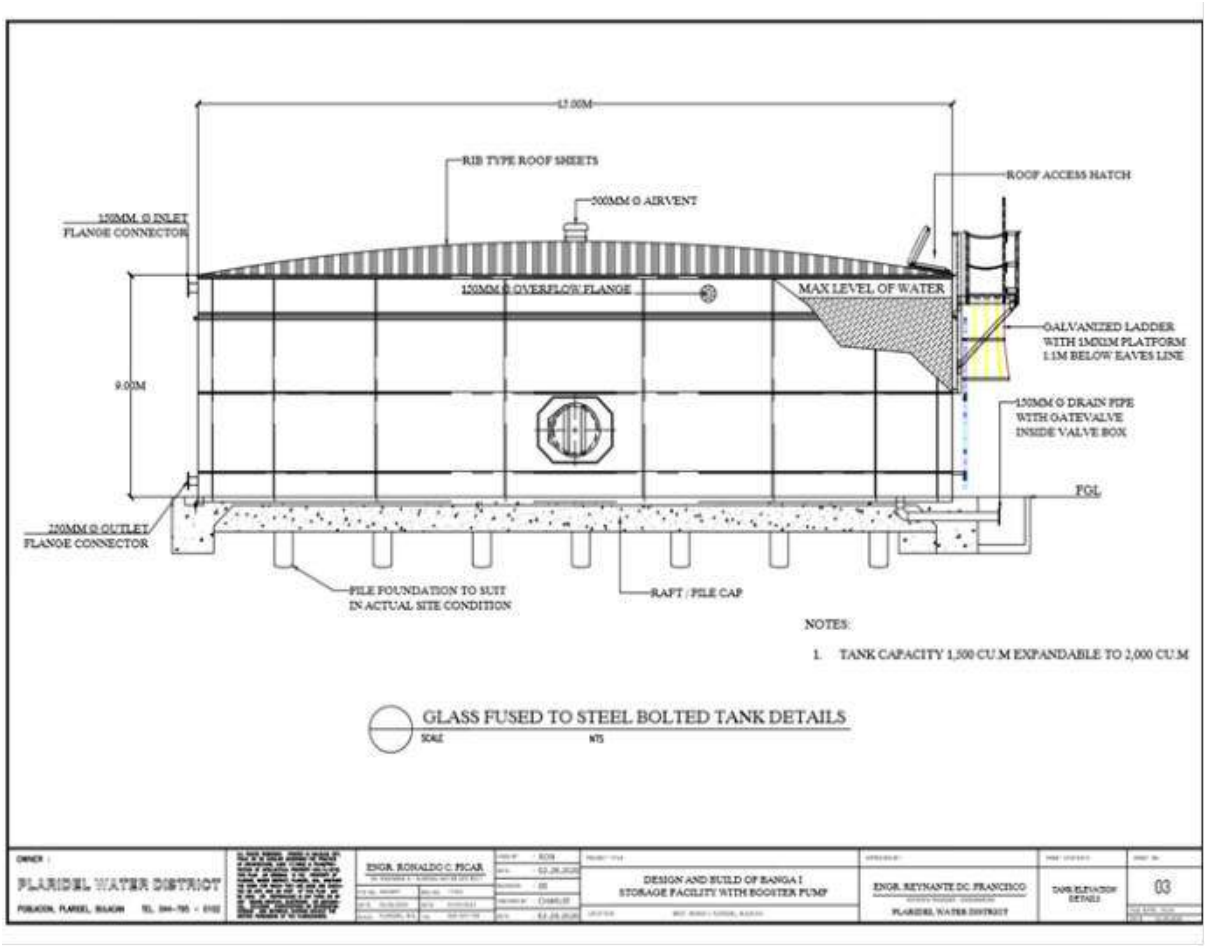
LOT AREA = 500 SQ. M

ANNEX 3- PLAWD STORAGE FACILITY DESIGN

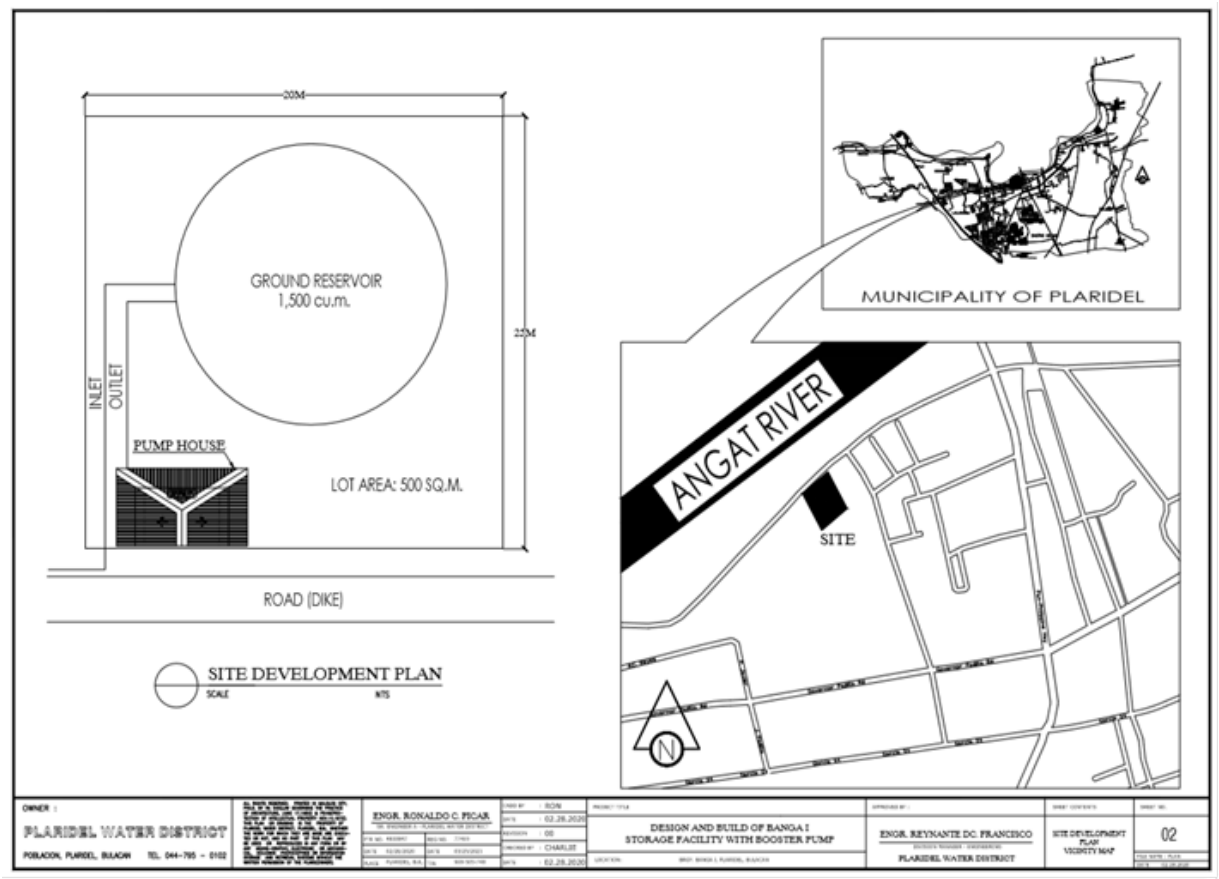
1.) Reservoir Perspective View



2.) Tank Details



3.) Site Development Plan



ANNEX 4–SAMPLEGRIEVANCE REDRESS FORM

The_____Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date	**Place of Registration**

Contact Information/Personal Details					
Name		**Gender**	* Male * Female	**Age**	
Home Address					
Place					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where, and how) of your grievance below: If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of Official registering grievance)	
Mode of communication: Note/Lett er E-mail Verbal/Telephonic	
Reviewed by: (Names/Positions of Officials Reviewing Grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

ANNEX 5– SAMPLE CONTRACTOR'S ENVIRONMENTAL MONITORING PLAN (CEMP) OUTLINE

I. Brief Project and Contract Package/Lot Description
Note: include construction activities and map/s

II. Brief Description and Purpose of Contractor's Environmental Management Plan (CEMP)
Note: include applicable laws

III. Associated Project/Lot Facilities and Sensitive Receptors – description and location
Note: include photos

a) Construction and Workers' Camps
b) Material Sources and Storage Areas – quarries, borrow pits, water
c) Workshop and Fabrication Yards
d) Hazardous Materials and Chemical Storage Areas – fuel, oil, bitumen, chemical additives
e) Wastes and Spoils Disposal Areas – construction wastes, domestic wastes, hazardous waste
f) Crushing and Batching Plants – asphalt and concrete
g) Bridges and Bypass Roads
h) Sensitive Receptors – schools, hospitals, religious institutions

IV. Construction Impacts and Mitigation Measures; Institutional Arrangements and Timing for EMP Implementation – refer to the EMP table in the IEE and contract documents as basis and indicate the mitigation measures that will be implemented for the contract package for the following):

a) Soils and Material – topsoil, soil erosion, reclaimed pavement and spoils, slope stability
b) Quarry and Borrow Sites – degradation of borrow sites
c) Water Resources – operation of quarries on river banks, siltation, spills from asphalt plants/trucks, bridge activities
d) Air, Noise and Vibration – emissions, dust, noise from construction vehicles and equipment, crushing, asphalt and cement mixing plants, construction activities
e) Waste and Hazardous Materials – solid wastes, hazardous and chemical wastes, sewage
f) Flora and Fauna
g) Construction Camps, Storage Depots
h) Local Roads – traffic management, access, congestion, road safety
i) Community – safety, disruption, access
j) Workers' Safety, Health and Sanitation – includes HIV/AIDS STD

V. Environmental Baseline Measurements and Sampling – location of sampling sites, methodology, results (if not available yet, to be included in first SEMR for the lot)
Note: include photos

VI. Environmental Monitoring Program (EmoP) – schedule of inspection, parameters to be checked and methodology, checklist for EMP Compliance Monitoring, inspection monitoring form

VII. Public Consultation, if necessary; Training

VIII. Grievance Redress Mechanism (GRM) (See Annex 4) – detailed procedure for resolving complaints

IX. Annexes

a) copies of all relevant permits (batching plants, disposal sites, tree-cutting, quarries, ECCs, etc.)
b) baseline sampling laboratory results (original copies)

Note: The CEMP should be straightforward and concise. It need not be a lengthy document.

ANNEX 6–PUBLIC CONSULTATION PROCEEDINGS

1.) Attendance Sheets

Annex 6

Form no: QMS 02
March 2017
Rev. 01

PLARIDEL WATER DISTRICT

A.C. Reyes St., Poblacion, Plaridel, Bulacan 3004
Tel. Nos. (044) 795-0102 / 795-1613; Fax No. (044) 760-0229
Email Address: plaridel_water_district1987@yahoo.com
Website: plaridelwaterdistrict.ph

ATTENDANCE OF PLAWD EMPLOYEES

For: **PUBLIC HEARING FOR WATER RATES ADJUSTMENT**

Date/Time: **November 29, 2019 / 10:00AM**

Venue: **Bulwagan ni Santiago Apostol, St. James the Apostle Parish**

No.	Name	Signature
1	Maybel M. Cruz	[signature]
2	ROBERT M. BUENAVENTURA	[signature]
3	MARC JOHN REGIE GALICIA	[signature]
4	Harold T. Fabian	[signature]
5	Emil C. Teodoro	[signature]
6	ARNEL B. SANTOS	[signature]
7	Alvin Guevarra	[signature]
8	DENNIS D. SANTOS	[signature]
9	Manuel Boy R. Tengco	[signature]
10	Rosario Clowel	[signature]
11	BRYAN L. SERRANO	[signature]
12	Paul R. Vinluan	[signature]
13	Lorraine R. Juguilon	[signature]
14	Krizanne T. Mauricio	[signature]
15	Jojit S. Pagulayan	[signature]
16	Lizandro Santos	[signature]
17	RONALDO N. BULAON	[signature]
18	Sonny Cabanas	[signature]
19	MARIETA H. ENCARNADO	[signature]
20	RON RIVERO	[signature]

Annex 6

Form no: QMS 12
March 2017
Rev. 01

PLARIDEL WATER DISTRICT

A.C. Reyes St., Poblacion, Plaridel, Bulacan 3004
Tel. Nos. (044) 795-0102 / 795-1613; Fax No. (044) 760-0229
Email Address: plaridel_water_district1987@yahoo.com
Website: plaridelwaterdistrict.ph

ATTENDANCE OF PLAWD EMPLOYEES

For: **PUBLIC HEARING FOR WATER RATES ADJUSTMENT**

Date/Time: **November 29, 2019 / 10:00AM**

Venue: **Bulwagan ni Santiago Apostol, St. James the Apostle Parish**

No.	Name	Signature
21	EDGARDO N. DE LEON	[signature]
22	JOSELITO S. SAMSON	[signature]
23	Elias G. Vinta	[signature]
24	RICHARD B. CATUIZA	[signature]
25	WARREN MENDOZA	[signature]
26	Noimee E. Cruz	[signature]
27	C. PASAGUI	[signature]
28	ESMERALDO L. VILORIA	[signature]
29	RONALD FRANCISCO	[signature]
30	CHARLIE FRANCISCO	[signature]
31	B. Gata	[signature]
32	A. Ramos	[signature]
33	Amien Amoyo	[signature]
34	Nancy E. dela Cruz	[signature]
35		
36		
37		
38		
39		
40		

Annex 6

Form no: QMS 02
March 2017
Rev. 01

PLAWD PLARIDEL WATER DISTRICT

PLARIDEL WATER DISTRICT

A.C. Reyes St., Poblacion, Plaridel, Bulacan 3004
Tel. Nos. (044) 795-0102 / 795-1613; Fax No. (044) 760-0229
Email Address: plaridel_water_district1987@yahoo.com
Website: plaridelwaterdistrict.ph

ATTENDANCE

For: **PUBLIC HEARING FOR WATER RATES ADJUSTMENT**

Date/Time: **November 29,2019 / 10:00 am**

Venue: **Bulwagan ni Santiago Apostol, St. James the Apostle Parish**

No.	Name	Address	Contact No.	Signature
1	ANTONIO MANUEL	0767 [illegible]	0961 [illegible] 950	[illegible]
2	GIGI S. SERAFICO	[illegible]	0929 [illegible]	[illegible]
3	SANTY Q. BERMUDA	CONCEPCION W.D	0917 143 [illegible]	[illegible]
4	GLORIA S. DUNGO	—do—		[illegible]
5	Rosalina M. [illegible]	0759 Bintog Pla. Bul.	09194090715	[illegible]
6	Maria Grace Agustin	600 Purok-6 Dampol Pla.	09173935489	[illegible]
7	Nora D. Evangelista	Bintog Plaridel, Bul		[illegible]
8	manuel G Yumol	Paeda [illegible]		[illegible]
9	Rosalina T. Malabarbas	0266 Lumang Bayan		[illegible]
10	ACELA LAVIÑA	PH 2 BLK 149 LOT 7 CULIANIN LUMINA PLARIDEL	0916 7 48 [illegible]	[illegible]
11	Danilo Jr. R. Gatuz	Tabang, Plaridel	0909 8724684	[illegible]
12	Ronnie B. Largado	Calumpit, Bulacan	0925 301134	[illegible]
13	[illegible] G. Bernardo	San Jose Plaridel Bul.		[illegible]
14	Christy Baldonado	Bustos WD		[illegible]
15	Jefferson Garcia	Tabang Plaridel	0923-926-9669	[illegible]
16	Cielo Marie T. Mauricio	Bintog, Plaridel, Bulacan		[illegible]
17	Jerick Marcelo	Banga 2nd Pla. Bul	0916 6843758	[illegible]
18	Rubin A. Aguila	Corazon Vista Pla. Bulacan	0926 9189575	[illegible]
19	Nonita G. [illegible]	sto nino	0918 529937	[illegible]
20	[illegible] prado	sto nino		

Annex 6

Form no: QMS 02
March 2017
Rev. 01

PLARIDEL WATER DISTRICT

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No.	Name	Address	Contact No.	Signature
1	Dolores D. Angeles	Calangan	09422232870	[signature]
2	Emely M. Maraver	Lumangbayan	09755922308	[signature]
3	Florentina S. Colgado	Concepcion Tarlac	045-923 N9	[signature]
4	Carmelita A. Tavera	Looban Tabang		[signature]
5	[illegible] Lopena	Poblacion	0916450480	[signature]
6	HILDA A. MARCELO	POBLACION	09164195049	[signature]
7	Ronil Manglicmot	Banga 1st		[signature]
8	Vanny Mangay-ayan	L. Bayan	0995 434 1642	[signature]
9	IBARRA P. VILLAVERDE	STO. NINO	09358619676	[signature]
10	EDGARDO VALENCIA	MA. LOURDES	0932210179	[signature]
11	LINA M. LEONZON	Poblacion	794-0414	[signature]
12	Kevin Lorenz Jimenez	Pulilan	09050436244	[signature]
13	Phil EUSEBIO	SIPAT	0997414085	[signature]
14	Paolo Buenaventura	Lumang bayan	0905-862-7021	[signature]
15	SEGUNDO ANGELES	BANGA 2ND	09975009266	[signature]
16	CONRADO DE GUZMAN	POBLACION	0922-4199095	[signature]
17	Concepcion D. Ong	Banga I		[signature]
18	Antonia C. Gatuz	Tabang		[signature]
19	[illegible] C. [illegible]	Lumang Bayan	09959609920	[signature]
20	Hilario Ribunaco	Rocka Village	09753783384	[signature]

Annex 6

Form no: QMS 02
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Venue: **Bulwagan ni Santiago Apostol, St. James the Apostle Parish**

No.	Name	Address	Contact No.	Signature
1	Kgwd. Relmerio Ravago	Parulan	0998 247 2861	[signature]
2	Ana Lonzano	771 Banga Ist pla.		[signature]
3	Fortunato Silverio	166 Sipat	0939621[illegible]	[signature]
4	GENARO C. YUSI	CPN, TARLAC		[signature]
5	BERNIE PAMINTUAN	CPN.		[signature]
6	Rosalia R. Carnizo	Bintog	0917159[illegible]	R R Carnizo
7	SALVADOR BUEN	PARULAN	0999350[illegible]	[signature]
8	Ena Maricel T. Manuel	Bintog	09278386236	[signature]
9	Jose R Lopez	Sn Jose	[illegible]	[signature]
10	Ricardo B. Felipe	Rocka Complex	0921[illegible]	[signature]
11	HENRY B PINGOL	6337 ROSAL ROCKA COM	0905[illegible]	[signature]
12	Epifania Perez	Dampol, Plaridel, Bulacan	09563809825	[signature]
13	JOHN PAUL CONCEPCION	Rueda, Plaridel, Bulacan	0936178[illegible]	[signature]
14	Jonalyn M. Lunzaga	0246 lumang Bayan		[signature]
15	CORAZON S CUEVO	Lumangbayan	0923 143 7155	CS Cuevo
16	ORLANDO F CANDIDA	BANGA 2ND		[signature]
17	Maria Concepcion C Gafie	Tabang, Plaridel	09232824020	[signature]
18	BRIAN GALANG	DOÑA CRISPINA	09991785993	[signature]
19	NESTOR C-CRUZ	BUSTOS WD	[illegible]	[signature]
20	JOYCE CASIS	Lalbundi Plr. Bul	0926 [illegible]	[signature]

Form no: QMS 02
March 2017
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No.	Name	Address	Contact No.	Signature
1	CESAR B. BONIFACIO	TABANG, PLARIDEL		
2	JAYPEE MANUEL	AGNAYA, PLA. BUL		
3	Concepcion Cabay	Casa Vista		
4	Marita L. Torillo	Rinfog, Plaridel, Bul	09222558499	
5	Arnold C. Ramonal	San Jose Pla, Bul		
6	Maria Emma Cimoran	Norka Vill. Tabang Plaridel		
7	EDILBERTO V. PORRAS	TABANG		
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PLARIDEL WATER DISTRICT

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No.	Name	Address	Contact No.	Signature
1	Segundina De Guzman	Sipat III Pla Bul	09120107616	
2	Yolanda de Jesus	Lumang Bayan	09519855798	
3	ROY KIM GARCIA	BARRIO 2ND PLARIDEL		
4	MYRA R. NAVARRO	STA. INES -	09239122529	
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2.) Minutes of the Meeting

Friday, 29th November 2019, 10:00 am
Bulwagang Santiago Apostol, Saint James the Apostle Parish
Poblacion, Plaridel, Bulacan

I. Present

Ms. Nancy C. Dela Cruz, Chairperson of the Board of Directors
Ms. Amira Arroyo, Board Member
Engr. Bede Gata, 6th Member of the Board of Directors
Engr. Esmeraldo L. Viloria, Interim General Manager
PLAWD Officers & Staff Members
Ms. Gigi Serafica, LWUA Representative
Observers from Calumpit, Bustos and Concepcion Water Districts
Concessionaires (see attached files)

II. Registration

The Public Hearing was called to order at 10:15 am.

III. Opening Prayer

Mr. Sonny Caparas of the Admin and Finance Division led the opening prayer.

IV. Pambansang Awit

Singing of the National Anthem with the aid of Audio media.

V. Welcome Remarks

Chairperson Nancy C. Dela Cruz opened the event with a welcoming remark. Chairperson Dela Cruz acknowledged the presence of our concessionaires, LWUA representative, the Board of Directors, and representatives from other WDs.

VI. Overview of the Water District

IGM Esmeraldo L. Viloria presented a powerpoint of an overview of the Plaridel Water District (PLAWD).

VII. Presentation of Proposed LWUA-ADB Project

Manager Reynante Francisco of the Engineering Division presented a powerpoint of the proposed LWUA-ADB Project.

The presentation covered the following topics:

1. Common complaints to PLAWD and its causes
2. Major issues and concerns faced by PLAWD
3. Existing and proposed actions
4. Overview of the LWUA-ADB Project
    - The Project aims to provide major rehabilitation and improvement to PLAWD's water supply system
    - The loanable amount is Php301,495,284.00, payable for 18 years at 4% per annum
    - 4 production wells, treatment facilities, power back-up system
    - 2 water storage facilities with booster pumps
    - 28 km transmission and distribution pipelines
    - Lots acquisition, PLAWD office building, warehouse, motor pool, and service vehicles
5. Breakdown Cost of the Project
6. Other essential projects and programs

VIII. Proposed Water Rates

Manager Marifaye H. Ersando of the Commercial Division presented a powerpoint of the proposed water rate adjustment.

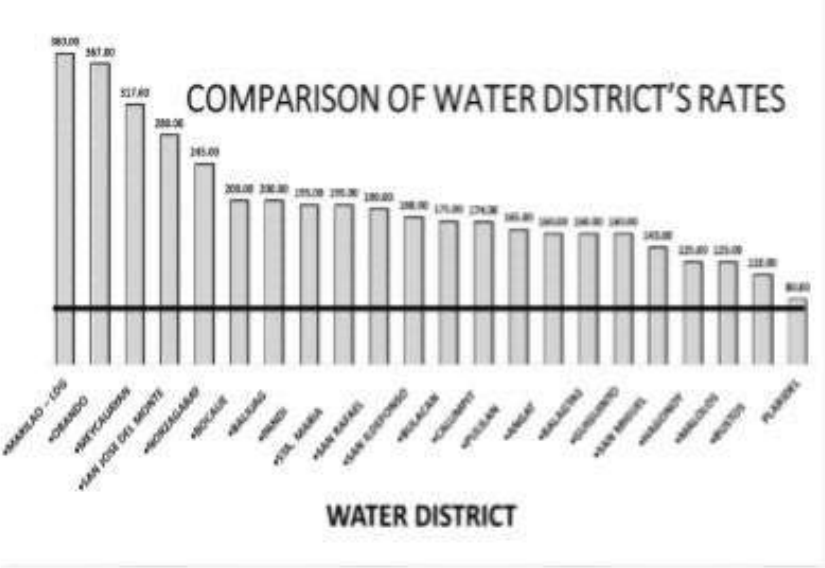
The presentation covered the following topics:

1. Existing and Proposed Water Rates Series

Existing & Proposed Water Adjustments

	Minimum Charge	11-20 cu.m.	21-30 cu.m.	31-40 cu.m.	41-50 cu.m.	51-up cu.m.
2001	80.00	8.50	9.50	10.60	11.80	13.10
2020	124.00	13.20	14.75	16.45	18.30	20.30
2022	170.00	18.10	20.25	22.55	25.10	28.00

2. Comparison of WDs Rates



3. Comparison of 2001 & 2019 Prices

Comparison

10 cu m. = 50 drums = 124.00 pesos

1 cu m. = 5 drums = 12.40 pesos

1 drum = 2.48 pesos

Comparison	Year 2001	Vs.	Year 2019
 Minimum Wages	Php 228.50		Php 408.00
 Cigarette per pack	Php 45.00		Php 120.00
 Goto	Php 10.00		Php 30.00

4. Comparison of Water Rates vs "Vices"

5. Automatic cost adjustments based on formula approved by LWUA BOT Res. No. 109 series of 2014

a. Power Cost Adjustment
This formula is applied when water is pumped using electricity.

$$PCA = \left[\left[\frac{PCa}{1+EF}\right] - PCb\right] (Ba/Bb)$$

Where:

PCA = Power-Cost Adjustment in P/cu.m.
PCa = Current Power Cost per cu.m.
PCb = Base Power Cost per cu.m.
Ba = Total Water Currently Billed in cu.m.
Bb = Total Water Produced in cu.m.
EF = Escalation factor (inflation rate as provided by NEDA per LWUA BOT Res. No. 105 Series of 1998)

b. Fuel-Cost Adjustment
This formula is applied when water is pumped using fuel.

$$FCA = \left[\left[\frac{FCa}{1+EF}\right] - FCb\right] (Ba/Bb)$$

Where:

FCA = Fuel-Cost Adjustment in P/cu.m.
PCa = Current Fuel Cost per cu.m.
PCb = Base Fuel Cost per cu.m.
Ba = Total Water Currently Billed in cu.m.
Bb = Total Water Produced in cu.m.
EF = Escalation factor (inflation rate as provided by NEDA per LWUA BOT Res. No. 105 Series of 1998)

6. Water Meter Maintenance Fee

   By virtue of Board Resolution No. 81, Series of 2017, the district imposed a Php20.00 water meter maintenance fee to all concessionaires effective July 1, 2017.

IX. Open Forum

The open forum started immediately after the presentations were completed. The open forum was facilitated by Mr. Edgardo De Leon of the Commercial Division. The rules of the public hearing before questions, queries, comments, or suggestions were emphasized that those who ask questions or make comments must introduce himself/herself first by stating their name and location for proper identification.

Summary of the issues and concerns raised during the open forum are as follows:

1. Ms. Efipania Perez, Brgy. Dampol

   Q: With the current minimum rate of Php80.00, the district was able to pay its debt. Why is it still necessary to raise the rate? There is also the additional Php20.00 water meter maintenance fee, how long do we have to pay for it? With the rate increase next year, and another increase in the succeeding years, isn't it possible that the water district will become private?

   A: (IGM Viloria) The water district did not have any rate increase since 2001. With the minimum rate of Php80.00 from 2001 until 2019, what is the status of the water district? Compared to other water districts in Bulacan, the Php124.00 rate is still the lowest rate. Since 2001, commodities had gradually increased prices. With this, we can say that the rate increase is reasonable. The district may have survived with the Php80.00 rate for a long time, but the service suffered.

2. Kagawad Reimerio Ravago, Brgy. Parulan

   Q: If in case the district will not be able to survive, is there a possibility of privatization? For Engr. Reynante, there are many new installations, road diggings that are not being repaired.
   A: (IGM Viloria) With regards to privatization, privatization is not on the PLAWD's agenda. Privatization only happens if the district cannot meet the concessionaires' needs.

A: (DM Francisco) As we have seen in recent months, the work of our staff is not in line with the standards. So far, the district's program includes standardizing the work according to the DPWH's specifications. If you looked at what we did in Isabel Village, Tabang, a few months ago, the concrete we put in was not damaged. The district's program also included the repair of the previous works that have not been restored yet.

3. Antonio Manuel, Brgy. Bulihan

Q: As mentioned, the last rate increase was in 2001, my service was connected in 2017, is it possible to adjust the implementation of the proposed rate increase on my account?

A: (IGM Viloria) The proposed rate increase is applicable to all accounts regardless of when the service was connected.

4. Q: Is the water meter maintenance fee of Php20.00 a lifetime charge?

A: (IGM Viloria) There is a cycle that every 5 years, the water meter will be replaced if necessary. In 2016, the collection of water meter maintenance fee was implemented to ensure that every 5 years, the water meters are calibrated to test if it is still functioning properly. According to our study, there are water meters that malfunctions after 5 years. With the water meter maintenance fee, once a water meter is found defective, it will be replaced with a new one. If the water district can absorb the fee after the water rate increase and after further study, it is possible that the water meter maintenance fee will be removed. In the meantime, the Php20.00 water maintenance fee will still be included in the water bill.

5. Ruben Maglingkod, La Mirada Subdivision

Q: This is a rush public hearing, is this the final public hearing? According to legalization, we need to have 3 hearings. How many percents of the population in Plaridel is required before a public hearing can be conducted? Is the number of attendees sufficient to carry out the hearing?

A: (IGM Viloria) In accordance with public hearing guidelines, we notified all concessionaires at least 15 days prior to this hearing schedule. Posters were also be posted in barangays at least 7 days before the hearing. More than 15 days before the hearing, all concessionaires were notified to attend the public hearing through their water bill. Also, our meter readers have a notification letter about the hearing that concessionaire signed after they receive their water bills. It is not required that the majority of the Plaridel's population should be present before a hearing can proceed.

There are no other scheduled public hearings. This hearing is valid for 5 years. If the water rate is not approved within 5 years, this hearing will expire.

Q: Where does Angat Dam supply their water? Why is it that water districts in Bulacan could not get water from Angat Dam? Is it not possible to ask for a water supply line from Angat Dam? How come Maynilad is able to get supply from Angat Dam?

A: (IGM Viloria) PLAWD receives a minimum contracted volume of 2 million liters of water daily from Bulacan Bulk that is connected to Angat Dam. We buy water from Bulacan Bulk at Php9.52/cu. m. despite our minimum water rate of Php8.00/cu.m. The Bulacan Bulk project started in 1992 with a signed agreement with MWSS, water districts, and other government agencies to tap to Angat Dam and supply water to Bulakeños. This project was only completed this year. Obando, Meycauayan, Bocaue, Marilao, including Plaridel Water District, are currently receiving water supply from Bulacan Bulk. The project will expand through Pulilan up to San Miguel.

6. Emily Mariano, Brgy. Lumangbayan

Q: Why is the water supply so dirty especially every morning from 4:00 am to 5:00 am? Does increasing the water rate will help get rid of dirty water?

A: (DM Francisco) PLAWD had been receiving complaints not just about dirty water but also about low pressure. According to our study, low pressure, dirty, and smelly water are caused by many factors including damaged pipelines, illegal connections, set-up of booster pumps, and lack of check valves on water meters.

7. Councilor Myra Navarro, Brgy. Sta. Ines

Q: There are many poor Plaridelians and the sudden increase in water rate is too much, can this be lowered? Wouldn't this sudden increase caused PLAWD to become Maynilad? If we do not have funds for our projects, we can seek help from the Capitol, the Governor, and even from President Duterte. It is a big problem if the funds will be taken from small citizens.

A: (Mr. De Leon, Commercial Division) PLAWD is a Government-Owned and Controlled Corporation. The Local Government and other higher Government Agencies' beneficiaries are the citizens and small projects.

A: (IGM Viloria) As mentioned and answered earlier, a water district will only be subject to privatization if the district opts for it or it does not have funds. Privatization is not on the PLAWD agenda. Low-income groups are protected because the minimum water rate should not exceed 5% of their monthly average income.

8. Kagawad Reimero Ravago, Brgy. Parulan

C: For now, let us focus on the Php124.00 first and not on the Php170.00. We are all in favor of the Php124.00 rate increase.

X. Closing

The Public Hearing adjourned at 1:23 pm.

Prepared by:

LIZANDRO SANTOS
Secretary C, Office of the BOD

Certified Correct:

ESMERALDO L. VILORIA
Interim General Manager

PLARIDEL WATER DISTRICT
A.C. Reyes St., Poblacion, Plaridel, Bulacan 3004
Tel. Nos. (044) 795-0102 / 795-1613; Fax No. (044) 760-0229
Email Address: plaridel_water_district1987@yahoo.com
Website: plaridelwaterdistrict.ph

Form No.: QMS 53
July 2021
Rev. 00

PLARIDEL WATER DISTRICT
FEEDBACK FORM
(PANANAW O PUNA)

Please let us know how we served you.
Ipaalam po ninyo sa amin kung paano naming kayo napaglingkuran.

You may use this form for compliments, complaints or suggestions.
Maaari po ninyong gamitin ito sa papuri, reklamo o mungkahi.

Simply check the corresponding box.
Mangyaring lagyan po lamang ng tsek ang kahong naaayon.

☐ Compliment *Papuri* ☐ Complaint *Reklamo* ☐ Suggestion *Mungkahi*

Person(s)/Unit/Office concerned or involved :
(Mga) tao/pangkat/tanggapan na may kinalaman sa papuri, reklamo o mungkahi.:

Facts or details surrounding the incident:
Kaganapan o detalyeng bumabalot sa pangyayari:

(Please use additional sheet/s if necessary.)
(Mangyaring gumamit ng karagdagang papel kung kinakailangan.)

Recommendation(s)/Suggestion(s)/Desired Action from our office.
Rekomendasyong/Mungkahi/Nais ng aksiyon sa aming tanggapan.

(Please use additional sheet/s if necessary.)
(Mangyaring gumamit ng karagdagang papel kung kinakailangan.)

Name : *Pangalan:*	Office/Agency : *Tanggapan/Ahensya :*
Address : *Tirahan :*	E-mail Address (if any): Contact Number(s) (if any): *Telepono*
Signature: *Lagda*	Date: *Petsa*

Copy furnished : GM
Division Concerned
Employee Concerned

ANNEX 7 – CHLORINE SAFETY DATA SHEET

Safety Data Sheet CHLORINE

MVC-MSDS-C-001P
Issue Date : 11/17/16
Rev. Code : 04
Page 1 of 5

I. PRODUCT AND COMPANY IDENTIFICATION

Product Name	Liquid Chlorine
Recommended use of the chemical and restrictions on use	Used in water treatment and disinfection; as bleaching agent, particularly for paper and textiles; in the manufacture of bleaching powder and chemicals such as PVC, chlorinated hydrocarbons, ethylene glycol, glycerine and tetraethyl lead. Chlorine is 2.5 times heavier than air. It is not an explosive or flammable gas, but reacts violently with oils, solvents, grease, ammonia, acetone, etc.
Manufacturer	**Mabuhay Vinyl Corporation** 3rd Floor Philamlife, 126 L.P. Leviste St. Salcedo Village, Makati City For Assistance Call : (02) 817-8971 to 79 loc 214; Direct line (02) 817-1800
Iligan Plant	Assumption Heights, Iligan City Tel: (063) 221-9466, 221-1190
Batangas Depot	BBTI Compound, Bauan, Batangas Tel. (043) 980-5889
Cebu Depot	Ceriza St., Cuamo, Mandaue City Tel: (032) 344-5259, 345-0839
Davao Depot	Bunawan, Davao City Tel: (082) 236-0015

II. HAZARDS IDENTIFICATION

Symbols

Signal Word: DANGER!

Hazard statements:
H280: Contains gas under pressure; may explode if heated.
H270: May cause or intensify fire; oxidiser.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H330: Fatal if inhaled.
H335: May cause respiratory irritation.
H400: Very toxic to aquatic life.
H314: Causes severe skin burns and eye damage.
H370: Causes damage to the respiratory and nervous systems.

Precautionary statements:

Prevention
P220: Keep/Store away from clothing/combustible materials.
P244: Keep reduction valves free from grease and oil.
P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
P264: Wash thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P284: Wear respiratory protection.
P271: Use only outdoors or in a well- ventilated area.
P273: Avoid release to the environment.

Response:
P370+P376: In case of fire: Stop leak if safe to do so.
P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: If eye irritation persists: Get medical advice/ attention.
P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P363: Wash contaminated clothing before reuse.
P310: Immediately call a POISON CENTER or doctor/physician.
P312: Call a POISON CENTER or doctor/physician if you feel unwell.
P320: Specific treatment is urgent (see MSDS).
P391 Collect spillage.

Storage:
P403: Store in a well ventilated place.
P410: Protect from sunlight.
P233: Keep container tightly closed.
P405: Store locked up.

Disposal:
P501: Dispose of contents/container in accordance with applicable local, regional, national, and/or international regulations.

III. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Identity	Chlorine
Trade Names/ Synonyms	Liquid chlorine, liquefied chlorine gas, chlorine gas, chlor, molecular chlorine, diatomic chlorine
CAS Number	7782-50-5
Minimum Percentage	99.5%

Safety Data Sheet CHLORINE

MVC-MSDS-C-001P
Issue Date : 11/17/16
Rev. Code : 04
Page 2 of 5

IV. FIRST AID MEASURES

Description of first-aid measures: In all instances, seek immediate medical attention. Show this safety data sheet to the physician in attendance.

In case of frostbite place the frostbitten part in warm water. Do not use hot water! If warm water is not available wrap the affected parts gently in blankets. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

Inhalation: Remove to fresh air. Give artificial respiration if not breathing, preferably mouth-to-mouth. If breathing is difficult, administer oxygen. Keep the affected person warm at rest. In mild cases, give milk to relieve throat irritation.

Ingestion: Not a likely route of exposure.

Skin contact: Wash with plenty of soap and water while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Destroy contaminated shoes. Do not apply greases unless ordered by a physician.

Eye contact: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. Do not attempt chemical neutralization of any kind.

Most important symptoms/effects, both acute and delayed: Toxic and irritating, with inhalation as the major potential route of exposure. May cause severe irritation of mucous membranes of the nose, throat and respiratory tract followed by severe coughing, burning, chest pain, vomiting, headache, anxiety and feeling of suffocation. Severe breathing difficulties may occur which may be delayed in onset. Severe exposure may lead to chemical pneumonitis and pulmonary edema and may be fatal. Repeated or prolonged exposure may result in reduced pulmonary capacity and dental erosion.

Skin contact with liquid chlorine may cause serious burns, blistering and tissue destruction. Chlorine vapors can cause irritation, burning and blisters. Contact with rapidly expanding gas poses a frostbite hazard.

Indication of any immediate medical attention and special treatment needed: No known antidote. Treatment for inhalation is symptomatic and supportive. Keep patient at rest until respiratory symptoms subside. Sedation for apprehension or restlessness may be considered as well as diuretics and antibiotics to alleviate edema and protect against secondary infection. Administer oxygen under exhalation pressure not exceeding 4 cm water for 15 minutes each hour until symptoms subside (except in presence of impending or existing cardiovascular failure). Steroid therapy, if given early, has been reported effective in preventing pulmonary edema. It is recommended that anyone exposed to chlorine gas by inhalation obtain a chest x-ray to check for pulmonary edema.

First Aid Facilities: Eye wash station, safety shower and normal washroom facilities.

V. FIRE FIGHTING MEASURES

Extinguishing media
Suitable extinguishing media: Water spray, fog or foam. For large fires, flood with fine water spray. Use water to keep fire - exposed containers cool and continue until well after fire is out.
Unsuitable extinguishing media: Do not use carbon dioxide or halogenated extinguishing agents.

Special hazards arising from the substance or mixture: Although non-flammable, chlorine is a strong oxidizer and may react to cause fire and/or explosion upon contact with turpentine, ether, ammonia, hydrocarbons, certain metal hydrides, carbides, nitrides, oxides, sulfides, phosphides, easily oxidized materials, organic materials or other flammables. It forms corrosive Hydrogen Chloride on contact with water. Chlorine gas is heavier than air and will collect in low-lying areas.

Special protective actions for firefighters: Self-contained breathing equipment, eye protection and full protective clothing are required. Move container from fire area if it can be done without risk. Stay away from the ends of tanks. Keep unnecessary people away, isolate hazard area and deny entry. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuation radius: 800 meters (1/2 mile). Do not allow contaminated extinguishing water to enter the soil, groundwater or surface waters.

VI. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Evacuate all unprotected personnel. Put on protective equipment (see Section 8). Avoid direct contact with skin, eyes and clothing. Ensure adequate ventilation/exhaust extraction. Avoid low-lying areas. Work upwind if possible.

Environmental precautions: Avoid entry of product into drains, sewers, surface/ground water system or soil. Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.

Methods and material for containment and cleaning up: When possible, move leaking or damaged cylinders outdoors or to an isolated location. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air and repair the leak or allow the cylinder to empty through a reducing agent such as caustic soda, soda ash, or hydrated lime solutions. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state. Chlorine vapors are heavier than air, and pockets of chlorine are likely to be trapped in low lying areas. Use water fog to dampen a chlorine cloud and reduce vapors. Do not spray water directly on the leak or chlorine container. Liquid or solid residues must be disposed of in accordance with all applicable regulations.

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VII. HANDLING AND STORAGE

Precautions for safe handling: Use protective equipment (see Section 8). Provide adequate ventilation. Avoid inhalation of vapors and skin and eye contact. Change contaminated or soaked clothing immediately. Wash hands after handling.
Provide special training to workers handling chlorine. Regularly test and inspect piping and containment used for chlorine service. Liquid levels should be less than 85% of tank or cylinder capacity.
Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinders movement. Protect cylinders and containers from physical damage. Keep containers tightly closed when not in use. Chlorine emergency equipment should be available near the point of use.
Keep away from foodstuffs, drinks and tobacco.
Keep away from incompatible products.

Conditions for safe storage, including any incompatibilities
Store chlorine containers and cylinders below 45°C in cool, dry, well ventilated areas of non-combustible construction away from sunlight, precipitation, heavily trafficked areas and emergency exit. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. *Full and empty cylinders should be segregated.* Full cylinders should not be stored for more than six months. Liquid levels should be less than 85 % of container or cylinder capacity.
Non suitable packaging material: Acetal , aluminum, brass, Bronze, carbon steel, cast iron, chrome, CPVC, epoxy, LDPE, natural rubber, neoprene, nitrile, nylon, polyether-ether ketone(PEEK) , polypropylene, polyurethane, PPS, PVC, silicone, titanium
Keep away from heat, sparks, open flames and incompatible substances (see Section X).

VIII. EXPOSURE CONTROLS AND PROTECTION

Control parameters

ACGIH	0.5 ppm TWA 1 ppm STEL
Europe	0.5 ppm STEL; 1.5 mg/m3 STEL
OSHA (Final)	1 ppm Ceiling; 3 mg/m3 Ceiling
OSHA (Vacated)	0.5 ppm TWA; 1.5 mg/m3 TWA 1 ppm STEL; 3 mg/m3 STEL
NIOSH	0.5 ppm Ceiling (15 min); 1.45 mg/m3 Ceiling (15 min)
Philippines	3 mg/m3 (TWA) OEL 1 ppm (TWA) OEL

Appropriate engineering controls: A system of local and / or general exhaust is recommended to keep employee exposure as low as possible. Use enclosed, isolated processing and handling whenever possible.

Personal protective equipment
Maintain eye wash fountain and quick-drench facilities in work area. Final choice of appropriate protection will vary according to methods of handling, engineering controls and risk assessments undertaken.
Respiratory protection NIOSH-approved full- or half -face piece (with goggles) respiratory protective equipment
Up to 5 ppm
Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern
Any supplied-air respirator
Up to 10 ppm:
Any supplied-air respirator operated in a continuous-flow mode
Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern
Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern
Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any self-contained breathing apparatus with a full facepiece
Any supplied-air respirator with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus
Hand protection: PVC, rubber or neoprene gloves
Eye / face protection: splash-proof safety goggles with side shields or face shield
Skin protection: Appropriate impermeable protective clothing (made of Viton, butyl rubber, Teflon, chlorinated polyethylene material) to protect against possible skin contact. When responding to accidental release of unknown concentrations, wear one-piece, total encapsulating suit of Butyl coated nylon or equivalent.

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IX. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Greenish-yellow to amber gas
Odor	Irritating, pungent odor
Odor threshold	0.2ppm
pH	Not applicable
Freezing point	-101°C
Boiling point range	-34°C
Flash point	Not applicable
Evaporation rate	Not applicable
Flammability	Non flammable
Flammability/explosive limits	Not applicable
Vapor pressure	5168 mm Hg at 21°C
Vapor density	2.49 (air = 1.0)
Relative density(water = 1)	1.41 at 20°C (liquid)
Solubility(in water)	14.6gpl at 0°C; 6.9gpl at 20°C
Partition coefficient: n-octanol/water	Not available
Auto-ignition temperature	Not applicable
Decomposition temperature	Not available
Viscosity	14 Pa.s at 20°C

X. STABILITY AND REACTIVITY

Reactivity: May react violently with combustible materials. Reacts with water to form corrosive acids. May react violently with alkalis. With water causes rapid corrosion of some metals. May react violently with reducing agents. Violently oxidizes organic material.

Stability: Stable under recommended storage conditions.

Possibility of hazardous reactions or polymerization: Will not polymerize. Reacts violently with a variety of substances over a broad range of conditions including reducing agents and combustible materials.

Conditions to avoid: Heat, sparks, sunlight, moisture and incompatible substances.

Incompatible materials: Hydrocarbons, combustible materials, bases, acids, metals, metal salts, carbides, oxides, phosphides, nitrides, sulfides, reducing agents, oxidizing materials, halogens, halo carbons, amines, ammonia, arsenic, calcium, iodine, ethers, fluorine

Hazardous decomposition products: Does not decompose but reacts violently to form hydrochloric acid and other potentially toxic and/ or corrosive substances.

XI. TOXICOLOGICAL INFORMATION

Routes of exposure: inhalation, ingestion, skin and eye contact

Symptoms related to the physical, chemical and toxicological characteristics: causes severe irritation of the eyes and respiratory tract with eye injury, restlessness, shortness of breath, cough, choking sensation, sneezing, running nose, chest pain, dizziness, headache, nausea, cyanosis (lack of oxygen in the blood) and respiratory failure. Following respiratory tract injury, onset of severe breathing difficulties, including bronchitis, lung edema (accumulation of fluid in the lungs) and pneumonia, may be delayed and life threatening.

Delayed and immediate effects and also chronic effects from short and long term exposure: High concentrations of chlorine over a short period of time may aggravate pre-existing heart conditions, and cause congestive heart failure. At high concentrations, chlorine gas irritates the skin and can produce sensations of burning and pricking of the skin, with inflammation and blister formation. Exposure to concentrations as low as 5-10 ppm is reported to cause severe irritation of the eyes, nose and respiratory tract which is intolerable after a few minutes.

Numerical measures of toxicity The hazards via inhalation at different concentrations is reported to be as follows:

0.2-0.5 ppm	No toxic, long term effect
1-3 ppm	Definite odor; irritation of eyes and nose
5-8 ppm	Throat, eye, and mucous membrane irritation
30 ppm	Intense coughing fits
34-51 ppm	Lethal in 1 to 1.5 hours exposure
40-60 ppm	Exposure for 30-60 minutes without effective respiration may cause bronchitis, pulmonary edema or bronchopneumonia
100 ppm	May be lethal after 50 minutes of exposure (estimated)
430 ppm	Lowest concentration known to cause lethality after 30 minutes of exposure
1000 ppm	May be fatal with a few deep breaths

XII. ECOLOGICAL INFORMATION

Ecotoxicity
FISH TOXICITY: 390 ug/L 96 hour(s) LC50 (Mortality) Orangethroat darter (Etheostoma spectabile)
INVERTEBRATE TOXICITY: 637.5 ug/L 1 hour(s) LC50 (Mortality) Pacific oyster (Crassostrea gigas)
ALGAL TOXICITY: 50-1000 ug/L 23 hour(s) (Population) Algae,phytoplankton,algal mat (Algae)
PHYTOTOXICITY: 20 ug/L 96 day(s) (Growth) Water-milfoil (Myriophyllum spicatum)

ANNEX 8 – CERTIFICATION OF WATER SUPPLY FROM BULK SUPPLIER

BULACAN BULKWATER
LUZON CLEAN WATER DEVELOPMENT CORPORATION
SMC INFRASTRUCTURE

Bulacan Bulk Water Administration Building
Don Manuel Reyes Avenue
Gate 1, Phase 1, Pleasant Hills Subdivision
Barangay San Manuel, City of San Jose Del Monte
3023 Bulacan, Philippines

CERTIFICATION

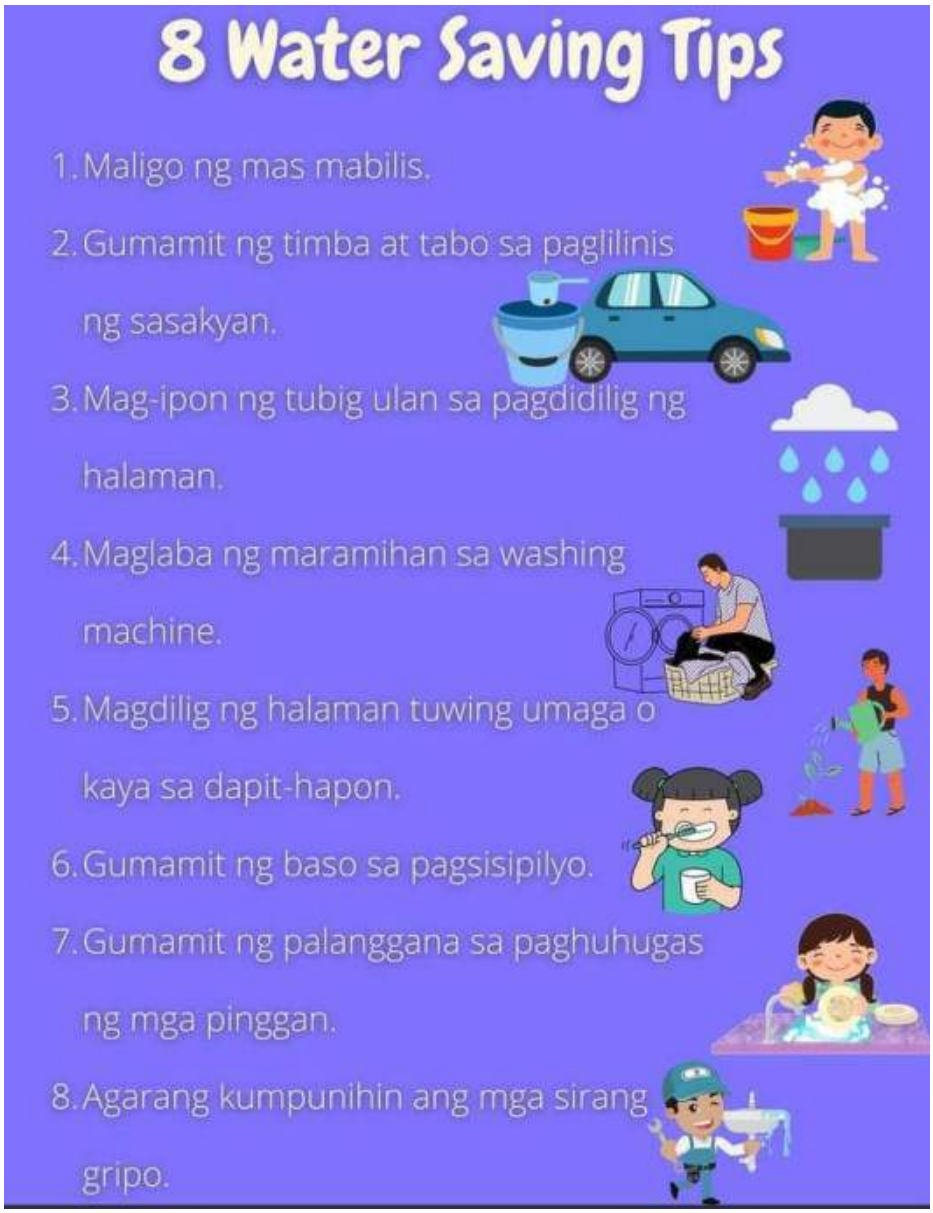
This is to certify that ***Luzon Clean Water Development Corporation***, the concessionaire of *Metropolitan Waterworks and Sewerage System for the Bulacan Bulk Water Supply Project*, is technically capable to deliver the requested additional water supply of 5 and 10 million liters per day (MLD) by Year 2021 and 2025, respectively, to Plaridel Water District.

This certification is issued upon the request of Plaridel Water District for the purpose of their document submittal as required by the ADB-LWUA.

Issued this 11th day of June 2020 at Bulacan Bulk Water Plant Office, Barangay Pleasant Hills, City of San Jose del Monte, Bulacan.

EDGAR L. DONA
SMHC VP and Head of Operations
LCWDC Authorized Representative

ANNEX 9 – IEC MATERIAL ON WATER SAVING MEASURES



ANNEX 10 – RISK ASSESSMENT PREPARED BY PACKAGE CW10A CONTRACTOR (M.E.SICAT) FOR OTHER HAZARDS

Hazard Identification			Risk Evaluation		Implementing Person
No.	Work Activities	Hazard	Persons at Risk	Risk Controls	
1	Vehicle movement on site	Risk with collision with person or object	Workers and machineries	Provide proper signage at the entry/exit points	Site Engineer/Safety Officer
				Hazard lights to be turned on while moving	
				Assigned spotters/riggers to assist drivers in maneuvering vehicles	
		Risk collision with pedestrian and passing vehicles	Pedestrians and passing vehicles	Driving and using construction machinery safely requires operators who are competent and trained for the task. Any lapse in concentration could cause an accident. Drivers and operators must not be distracted from their task: thus anyone operating plant should not use a mobile phone. Similarly, where a seat with seat belt is provided for safe operation of machineries.	Operations Manager
				Assigned traffic personnel assisting entrance/exit of vehicles	Site Engineer/Safety Officers
2	Delivery of Pipes	Risk in Preparation and set-up	Workers, pedestrians, passing vehicles	To facilitate the loading and unloading of pipe, trailer will be positioned in a location that it is a level as possible and wheel will be chock	Site Engineer/Safety Officers
				Prior to unstrapping loaded pipes, ensure that stakes/uprights in pockets on trailer edge, chocks on deck, or other similar devices are substantial enough, high enough and securely in place to prevent the highest layer of material from rolling off the trailer deck when the pipe banding/straps is removed	
				Trailer need to be sufficient in length similar to pipes to eliminate excessive overhang which is prohibited by Plaridel Traffic Management Team	
		Risk on Loading	Workers, pedestrians, passing vehicles	General condition of the trailer will be checked. Trailer deck shall be free from debris that may damage the pipe	Site Engineer/Safety Officers
				Once the bottom tier of a stacked load is completed, straps should be utilize to secure the load in place, as well as a means to craddle the pipe to prevent rolling.	
				The driver is ultimately responsible for appropriately and adequately securing the load of the trailer in a safe and legal manner	
				Once truck or trailer has arrived at offloading location, an operator will sound horn where trucks need to stop. At this point the driver will set all parking brakes on the trailer, exit the vehicle and securely chock the wheels.	
				Always position work activities on the uphill side of the trailer and/or material when a level surface is not available	

		Risk on Unloading	Workers, pedestrians, passing vehicles	Before unloading the pipes, the laydown area should be inspected and prepared. Confirm that the worksite is free from debris that could obstruct the unloading process, damage the pipe, or cause slips, trips and falls.	Site Engineer/Safety Officers
				When releasing the rachet on the trailer, confirm that the pry bar is in the holes securely and that fingers are clear when releasing the catch on the ratchet to release it.	
				Driver and ground crew will remove strapping from load and all ground crew will proceed to designate safe zone. Once all ground crew members are clear, the spotter will signal the operator to commence offloading pipes from truck	
3	Concrete cutting on pavement	Noise & Dust	Workers. Pedestrians, nearby residents	Wear earplugs, earmuffs and dust mask	Site Engineer/Safety Officers
				Control dust wherever possible by keeping the work area clean	
				All traffic routes in public areas near construction works should be kept clear of muck. To reduce the effects of air-borne dust, water spraying is recommended	
				Damping down with water spray to reduce dust creation	
				Eating, drinking and smoking shall be prohibited on site	
		Operating Machine Risk on Pedestrians	Pedestrians, workers	Cutting on road pavement must remain in a barricaded area at all times unless traffic flow is stopped to allow access in or out of the work area.	Site Engineer/Safety Officer
		Burns	Pedestrians, workers	Do not operate within 3 meters of any flammable material or liquid	Site Engineer/Safety Officer
4	Concrete Breaking	Debris/Sparks	Workers, pedestrians, passing vehicles	Alternate worker throughout the day if working with tool for 8hrs	Construction Manager/Site Engineer
		Heavy vibrations	Workers	Switch every 15-20mins the vibro control	Site Engineer/Safety Officer
		Ergonomics/Awkward postures	Workers	Keep backhoe trigger a proper footing and balance all times	Site Engineer/Safety Officer/Operator
		Inhalation of dust/harmful chemicals	Workers and pedestrians	Anti-vibration gloves, safety glasses/googles, dsut mask, and hearing protection	Site Engineer/Safety Officer
		Eye Injury	Workers and pedestrians	Damping down with water spray to reduce dust creation	Site Engineer/Safety Officer
		Noise Hazard	Workers, pedestrians and nearby residents	During night operations, breaking activities will be limited from 8pm-10pm only.	Construction Manager/Site Engineer
		Movement of excavator	Workers, pedestrians, passing vehicles	People will be kept away from the areas of excavator operation by the provision of suitable barriers. Board-ups will be used to create and maintain a pedestrian exclusion area	Site Engineer/Safety Officer
				Ensuring everyone in the immediate area is aware if the operating machines	
		Underground services or utility lines	Workers and consumers	Conduct surveying and staking to establish utility manholes	Construction Manager/Site Engineer
				Manual trail pit to locate/identify underground services	

5	Excavation			Prepare repair materials incase excavator accidentally hits utility lines e.g. straight plassons for damaged pipeline service connections	
		Fall of workers, pedestrians/Fall of materials and trench collapse	Workers and pedestrians	Keep the access area cleared, keep the spoil 1 meter away from the edge.	Site Engineer/Safety Officer
				Provide proper access and egress every 30 meters, erect hard barricades with signage	
				For excavations left open after work schedule, steelplate shall be provided and appropriately strong enough	
				For unstable soils, sloping and benching could be done to minimize erosions	
				Ensure construction machinery with vibration shall stopped if operative working inside the trench	
				Provide ladders, stairs, or ramp to access in the trench for a depth of more than 1.2m with maximum distance of 15m traveling distance. Ladders used as access ways shall extend from the bottom of excavation to not less than 0.90m above the ground surface	
		Water inrush	Workers	Pumps and other dewatering systems will be provisioned to remove water and prevent build-up	Site Engineer
6	Loading/Unloading of Excavated soil	Struck with machinery and vehicles	Workers and pedestrians	Barricade and signage around loading area	Safety Officer
				Flagman shall be present on site to provide direction/signals to operators and drivers	
		Fall of machineries on trench	Operators	Vehicle shall be 1 meter awat from the trench	Safety Officer
		Dust and Noise	Workers and pedestrians	Tailgates of dumptrucks will be gently open/closed to avoid big impact on dump box that causes loud noise	Site Engineer, Drivers
				Dumpbox will be covered with blue sheet or luna to avoid spillage of excavated soil as well as dust particles	
7	Laying of pipes	Suspended load	Workers and pedestrians	Crossing or walking under suspended load is strictly prohibited	Safety Officer
		Unauthorized entry	Pedestrians	Workers, outsiders should not be working under an area where loads are being lifted or within the working radius. People should be kept a safe distance from construction area; barriers should be used where possible	Site Engineer and Safety Officer
		Improper slinging	Workers	Before lifting gear is used, it must be examined to check for safe working load (SWL) and so that defects, which may reduce its capacity to function safely, are repaired.	Safety Officer and Operators
		Fall of lifted pipe	Workers and pedestians	While lifting pipes on to the trench, nobody will allowed to stay below the trench	Site Engineer
		Equipment failure	Workers	Ensure backhoe outrigger are on firm and stable on ground	Site Engineer and Safety Officer
				Outrigger shall be fully exteneded when using wheel-type backhoes	
				Ensure operator are well-trained and TESDA Certified, rigger will also be appointed to assist backhoe operators	
		Lack of Communication	Workers	Keep visual contact with rigger (pick up & landing points) at all times	Site Engineer and Driver
				Once pick/ lift occurs, sound air horn prior to swing	
		Damaged cement mortar lining and coating	Workers	Proper storage and handling will be greatly enforce. If necessary, damage mortar and linings will be repaired as approved by PLAWD	Construction Manager/Site Engineer

8	Backfilling and compaction	Fall from elevated heights, striking person or objects, falling debris	Workes and pedestrians	Inspect the site to be worked on and assess the hazards prior to backfilling activities	Site Engineer and Safety Officer
				Board-up will be ensure in place to prevent entry of unauthorized person	
				Flagman/rigger will be provided to assist heavy equipment operators	
		Operating defective machinery	Workers and pedestrians	Backhoes, dumptrucks and other equipment will be check regularly for any defects which must be corrected before the machine starts to work.	Construction Manager/Site Engineer
				Functionality of machine horn, reverse horn will be checked.	
		Un-authorized use of compaction equipment	Workers	Immobilize(remove keys) all equipment to prevent unauthorized person form attempting to use it	Construction Manager/Site Engineer
				Only trained competent persons are permitted to use compaction equipment	
9	Working in adverse wheather conditions	Heat stress, heat exhaustion, heat stroke	Workers	Ensuring availability of drinking water to all workers at all times	Construction Manager/Site Engineer
				Ensuring the work is self paced and provide appropriate rest breaks for heat stress conditions	
				Rest shelters will be provided e.g. tents	
				Heat exhausted person will be immediately attended by first aider and will be referred to the hospital if required.	
10	Welding works on steelpipes and manholes	Burns, heat and fire	Workers	Executing hot works, hot works permit must be obtained and task specific instrucitons/checklist are followed.	Construction Manager/Site Engineer/Safety Officer
				All gas cyclinders shall have their contents clearly labeled.	
				Gas cylinder shall always be stored, transported, used and secured in an upright position using cart. Valve keys must be on cylinder when in use	
				Oxygen shall not be used for ventilation or cooling, blowing dust or cleaning work	
				Sparks or molten metal will not fall on people or combustible materials	
				Fire extinguisher shall be available wihtin 15m of work.	
				While doing welding works, welders must use the personal protective equipment required for the job. Leather type body apron shall also be provided for body protection.	
				Work location is adequately ventilated.	
11	Concreting works	Dust	Workers and pedestrians	All traffic routes in public areas near construction works should be kept clear of muck. To reduce the effects of air-borne dust, water spraying is recommended	Site Engineer and Safety Officer
		Concrete Scaling		Concrete mix will be properly design, on restoration of concrete pavement DPWH standard will be followed	Construction Manager
				Finishin operation will be perform properly	
		Concrete cracking		Joint will be properly provided	Construction Manager
				Proper curing	
				Moisture penetration will be avoided	
		Noise from operating machinery e.g. vibrator, concrete mixer	Workers, pedestrian and nearby residents	Temporary absorption screen or board-ups will be placed to protect other person from the area	Site Engineer and Safety Officer
		Wet concrete splashes on the eye	Workers	Eye protection shall be worn by operators and pouring crews	Site Engineer and Safety Officer
				Water shall always be available in the area to flash concrete from the eys	

12	Hydrotesting	Breaking/failure of line, gaskets, flanges and gauges	Workers and pedestrians	Hydro test test Area shall be board-up and safety signages will be provided to prevent entry of unauthorized personnel.	Construction Manager/Site Engineer/Safety Officer
		Air entrapment inside the pipe	Workers	Rating of fittings, pressure gauges, vent valves, gaskets shall be suitable for the test pressure.	Construction Manager/Site Engineer/Safety Officer
		Inadvertently/suddenly increase of pressure due to underrated or non calibrated pressure gauges.	Workers	Flanges and valves shall be as per plan and specification approved by PLAWD.	Construction Manager/Site Engineer/Safety Officer
		Substandard support		All the temporary welding shall be performed by qualified welders and TESDA accredited.	Construction Manager/Site Engineer/Safety Officer
		Pressur safety valve failure	Workers	Ensure air vent provided at the highest elevation.	Construction Manager/Site Engineer/Safety Officer
				Gradual filling of lines shall be done keeping vent to open.	Construction Manager/Site Engineer/Safety Officer
				Pressure should be raised gradually under control to allow time for pipes to strain and time for personnel to check for leak.	Construction Manager/Site Engineer/Safety Officer
				There shall be at least two pressure gauges, one at lowest point and another at the highest point in the system.	Construction Manager/Site Engineer/Safety Officer
				Hydro testing crew should not stay in the direction of the blind flanges to prevent injury in case of flange rapture.	Construction Manager/Site Engineer/Safety Officer
				All hoses/ piping/gaskets and connectors/clamps shall be of adequate rating to withstand pressure.	Construction Manager/Site Engineer/Safety Officer
				Personnel shall not approach the system under high Pressure.	Site Engineer/Safety Officer
				Supervisors shall be present at work location during hydro testing activities are done.	Construction Manager/Site Engineer/Safety Officer
13	Flushing and Disinfection	Contamination	Workers and consumers	All items and equipment shall be free of foreign materials that may cause contamination prior to entering water mains.	Construction Manager/Site Engineer/Safety Officer
			Workers and consumers	Any items or equipment needing cleaning shall be cleaned with a hypochlorite solution containing a free chlorine residual of 20-50mg/L using an appropriate application method such as spray, brush, mopping or swabbing etc.	Construction Manager/Site Engineer/Safety Officer
			Workers and consumers	Water mains should be capped; and fittings, valves, gaskets, seals and other fittings/appurtenances should be boxed, capped or sealed during storage and transportation;	Construction Manager/Site Engineer/Safety Officer
			Workers and consumers	Any gross contamination of the water main such as by soil, dirt or debris, animals/vermin and any faecal contamination of the water main must be removed and cleaned in a way to prevent further contamination prior to local disinfection	Construction Manager/Site Engineer/Safety Officer

			Workers and consumers	If any water other than treated drinking water including rainwater/runoff, floodwater, groundwater or construction water enters the water main during construction, the water main shall be fully drained, the extent of the flooding and contamination of the main determined and delineated and cleaned by an acceptable method prior to localised disinfection	Construction Manager/Site Engineer/Safety Officer
		Backflow	Workers and consumers	Backflow prevention shall be maintained during disinfection, with all activities undertaken to prevent the contamination of any existing drinking water supply system. In addition to minimising contamination of the water main, the water main must also be kept isolated from the existing water system until satisfactory bacteriological results are achieved	Construction Manager/Site Engineer/Safety Officer

Prepared by :

Engr. Rohn Rey Q. Catipay
Construction Manager

ANNEX 11 – INFORMATION DISSEMINATION AND DISCLOSURE QUESTIONNAIRE (PAGE 1)

PLARIDEL WATER DISTRICT
A.C. Reyes St., Poblacion, Plaridel, Bulacan 3004
Tel. Nos. (044) 795-0102 / 795-1613; Fax No. (044) 760-0229
Email Address: plaridel_water_district1987@yahoo.com
Website: plaridelwaterdistrict.ph

Information Dissemination and Disclosure Questionnaire

Background

The **Improvement of Plaridel Water Supply System** is an Asian Development Bank (ADB) funded project under the Local Water Utilities Administration (LWUA) through the Plaridel Water District (PLAWD). This project aims to ensure the provision and access of quality water supply to all households of the Municipality of Plaridel.

The project will begin in November 2021 and shall be completed in March 2023.

This questionnaire serves as part of PLAWD's information, education, and campaign program to ensure transparency, successful dissemination of public information and introduce the Grievance Redress Mechanism (GRM) tool of the institution where stakeholders can be involved in problem resolution in all grievances reported.

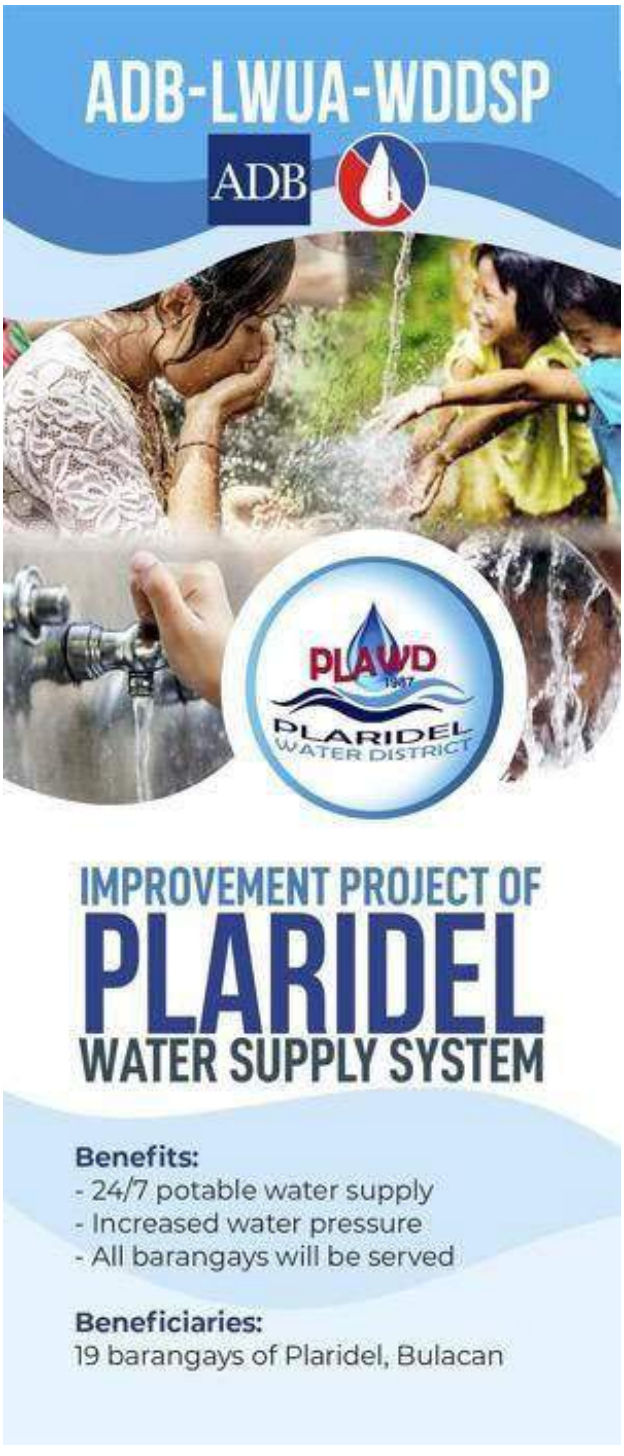
The project ensures that the successful delivery of services begins with proper public information and consultations to immediately mitigate unforeseen circumstances during and after the project that might adversely affect the general public's interest.

All information in this questionnaire is confidential to PLAWD and shall not be disclosed to the public.

Personal Information	
Name:	
E-mail:	
Designation:	
Affiliation/Department:	
Contact No.:	
Gender:	
Barangay:	
Years of residence:	

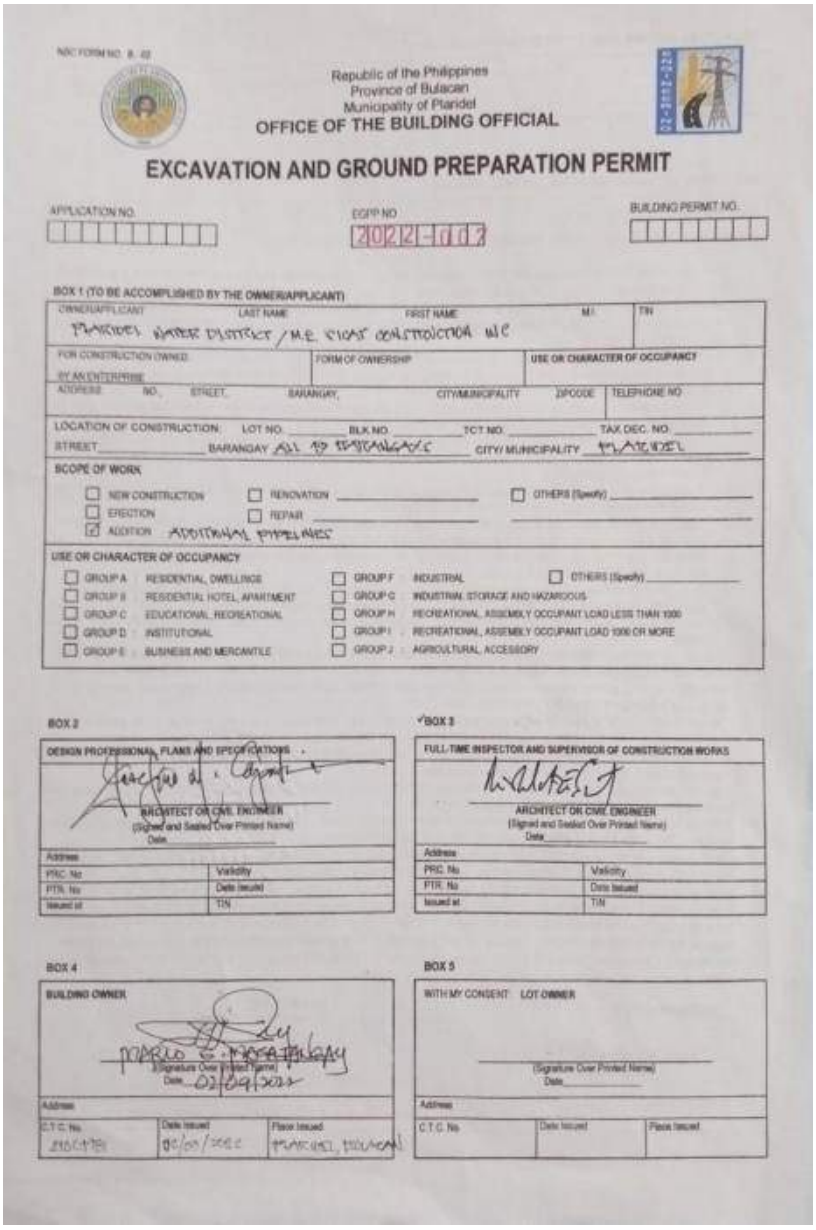
Tell us your views about this project			
1. Are you aware of the PLAWD?	☐Yes	☐ No	☐ NA
2. Are you aware that PLAWD develops the water supply system in Plaridel?	☐Yes	☐ No	☐ NA
3. Is this your first time to know about this project?	☐Yes	☐ No	☐ NA

ANNEX 12 – IEC MATERIAL




Project Title:
Design and Construction
of Plaridel Water Supply System
Funding Agency : Asian Development Bank (ADB)
Executing Agency : Local Water Utilities Administration (LWUA)
Implementing Agency: Plaridel Water District
Contractor : M.E. Sicat Construction Inc.
Contract No. : WDDSP-PLAWD-OCB-CW10a
Project Cost : Php 220M.
Project Duration : 20 Months (600 calendar days)
Target Construction Start Date: November 2021
Target Project Completion Date: March 2023
Project Beneficiary : Municipality of Plaridel (19 Barangays)
" We look forward to hearing your comments, suggestions, and questions."
You may send them at the official Facebook page of Plaridel Water District or at the contact details below:
PLAWD Hotline:
(044) 795 0102 0945-346-0808

ANNEX 13 – EXCAVATION AND GROUND PREPARATION PERMIT



NSC FORM NO. 8 - 02

Republic of the Philippines
Province of Bulacan
Municipality of Plaridel
OFFICE OF THE BUILDING OFFICIAL

EXCAVATION AND GROUND PREPARATION PERMIT

APPLICATION NO.

EGPP NO. 2022-002

BUILDING PERMIT NO.

BOX 1 (TO BE ACCOMPLISHED BY THE OWNER/APPLICANT)

OWNER/APPLICANT	LAST NAME	FIRST NAME	M.I.	TIN
PLARIDEL WATER DISTRICT / M.E. CIOAS CONSTRUCTION OIC				

FOR CONSTRUCTION OWNED BY AN ENTERPRISE	FORM OF OWNERSHIP	USE OR CHARACTER OF OCCUPANCY

ADDRESS: NO.	STREET	BARANGAY	CITY/MUNICIPALITY	ZIPCODE	TELEPHONE NO.

LOCATION OF CONSTRUCTION: LOT NO. _____ BLK NO. _____ TCT NO. _____ TAX DEC. NO. _____
STREET _____ BARANGAY ALL OF BARANGAYS CITY/ MUNICIPALITY PLARIDEL

SCOPE OF WORK

- ☐ NEW CONSTRUCTION
- ☐ ERECTION
- ☑ ADDITION ADDITIONAL PIPELINES
- ☐ RENOVATION _____
- ☐ REPAIR _____
- ☐ OTHERS (Specify) _____

USE OR CHARACTER OF OCCUPANCY

- ☐ GROUP A RESIDENTIAL, DWELLINGS
- ☐ GROUP B RESIDENTIAL HOTEL, APARTMENT
- ☐ GROUP C EDUCATIONAL, RECREATIONAL
- ☐ GROUP D INSTITUTIONAL
- ☐ GROUP E BUSINESS AND MERCANTILE
- ☐ GROUP F INDUSTRIAL
- ☐ GROUP G INDUSTRIAL STORAGE AND HAZARDOUS
- ☐ GROUP H RECREATIONAL, ASSEMBLY OCCUPANT LOAD LESS THAN 1000
- ☐ GROUP I RECREATIONAL, ASSEMBLY OCCUPANT LOAD 1000 OR MORE
- ☐ GROUP J AGRICULTURAL, ACCESSORY
- ☐ OTHERS (Specify) _____

BOX 2

DESIGN PROFESSIONAL, PLANS AND SPECIFICATIONS

ARCHITECT OR CIVIL ENGINEER
(Signed and Sealed Over Printed Name)
Date

Address	
PRC No	Validity
PTR No	Date Issued
Issued at	TIN

BOX 3

FULL-TIME INSPECTOR AND SUPERVISOR OF CONSTRUCTION WORKS

ARCHITECT OR CIVIL ENGINEER
(Signed and Sealed Over Printed Name)
Date

Address	
PRC No	Validity
PTR No	Date Issued
Issued at	TIN

BOX 4

BUILDING OWNER

MARIO C. MASATAKAY
(Signature Over Printed Name)
Date 02/09/2022

Address		
C.T.C. No. 2101479	Date Issued 02/09/2022	Place Issued PLARIDEL, BULACAN

BOX 5

WITH MY CONSENT: LOT OWNER

(Signature Over Printed Name)
Date

Address		
C.T.C. No.	Date Issued	Place Issued

ANNEX 13 – CONTRACTORS' ENVIRONMENTAL MANAGEMENT PLANS

CONTRACTOR'S ENVIRONMENTAL MANAGEMENT PLAN

FOR

DESIGN AND CONSTRUCTION OF PLARIDEL WATER SUPPLY SYSTEM
PLARIDEL WATER DISTRICT
PLARIDEL, BULACAN

May 2023

AMH Philippines, Inc./M.E. Sicat Construction, Inc.	
Prepared by:	Ludivina A. Naraval Name / Sign
Reviewed by:	Edgardo P. Kasilag II Name / Sign

CG INTEGRA CORPORATION

CONTRACTOR'S ENVIRONTMENTAL MANAGEMENT PLAN

FOR

DESIGN AND CONSTRUCTION OF GROUND RESERVOIR
PLARIDEL WATER DISTRICT
BARANGAY BANGA 1ST PLARIDEL BULACAN

AUGUST 2022

Prepared by	Reviewed by	Approved by
Ghenalyn Reyna	Dominador Natividad Jr	Chito Cole
	Project Engineer	*President/CEO*

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