Water Supply Improvement Project 2020

Conceptual Design

January 2020

LWUA-ADB WATER DISTRICT DEVELOPMENT SECTOR PROJECT

PLARIDEL WATER DISTRICT

PLARIDEL, BULACAN, PHILIPPINES

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1 PROJECT PROFILE SUMMARY

1.1 CCC No. 277:

Plaridel Water District (PLAWD) was established in March 2, 1987 by the issuance of Conditional Certificate of Conformance No. 277 by Local Water Utilities Administration (LWUA).

1.2 Project Location:

- Region: 3
- Province: Bulacan
- Municipality: Plaridel

1.3 Beneficiary Barangays:

1. Agnaya	11. Lumang Bayan
2. Bagong Silang	12. Parulan
3. Banga 1st	13. Poblacion
4. Banga 2nd	14. Rueda
5. Bintog	15. San Jose
6. Bulihan	16. Santa Ines
7. Culianin	17. Sto. Niño
8. Dampol	18. Sipat
9. Lagundi	19. Tabang
10. Lalangan	

2 PROJECT description

The proposed project aims to improve the existing water supply system in Plaridel, Bulacan. To date, Plaridel Water District (PLAWD) has attained a 100% service area coverage serving all nineteen (19) barangays in Plaridel. 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. The number of service connections is expected to reach 31,722 by year 2030. PLAWD utilizes groundwater through wells with an estimated combined discharge of around 293 L/s as source. Further, PLAWD purchased around 2 MLD from the Bulacan Bulk Water of Luzon Clean Water Development Corporation. In order to augment the present water supply to meet the projected water demand of the service area, additional water source/s will have to be developed and additional pipelines will have to be installed. The components of the proposed Program of Work (POW) include engineering basic cost items consist of provision for additional power generating set for the existing pumping stations, construction of storage facilities with booster, installation of around 28.2 km transmission and distribution pipelines, part of which is in preparation for the infusion of additional supply from the Bulacan Bulk Water of Luzon Clean Water Development Corporation and allocation for detailed engineering design, and non-engineering basic cost items consist of lot acquisition for the proposed storage facilities, construction of PLAWD office building, warehouse and motorpool, and purchase of service vehicles.

- **Project Type:** Water supply system improvement/expansion
- **Mode of Implementation:** Design and Build
- **Source Agency:** Local Water Utilities Administration (LWUA)
- **Implementing Agency:** Plaridel Water District (PLAWD)
- **Total Project Cost:** Php 335.0 Million
- **Budget Source:** Asian Development Bank (ADB) Loan and Water District (WD) Equity
- **Project Implementation Period:** 3 months for design and 18 months for construction stage, details in Annex 9.

3 INTRODUCTION

The population and infrastructure development in Plaridel, Bulacan is continuously growing and the consequent increase in water demand cannot be sustained by the existing water network system and facilities. To provide reliable, potable and adequate water supply, PLAWD will implement the Water Supply Improvement Project which consist of Transmission and Distribution Pipelines that will convey the water from Bulacan Bulk Water eastern part to western most part of PLAWD service area. New water reservoirs will be built in two strategic locations to cater peak hour demands and new office building will be constructed as a workplace of the growing number of employees in the district. The project will prepare the water network system to augment the existing water availability and pressure and to cope with the increasing water demand up to 2030.

The LWUA-ADB Credit Facility is an initiative of the Local Water Utilities Administration (LWUA) that addresses the need to create borrowing options to Water Districts (WDs). Under the facility, WDs have the option to borrow directly from the Asian Development Bank (ADB), provided that the proposed water supply improvement project is found to be technically, financially and economically viable, and that LWUA shall endorse the said water supply project of the WD subsequent loan approval from ADB.

This engineering study aims to determine the technical and financial viability of improving the existing Level III water supply system in the municipality of Plaridel, province of Bulacan. It is geared towards the development of cost-effective and technically sound program in order to provide an immediate impact to the water consumers, in accordance with the goals and objectives of the LWUA.

The major components of the Program of Work (POW) includes provision for additional power generating sets for the three (3) existing pumping stations of PLAWD, construction of two (2) storage facilities (glass fused steel bolted ground reservoir) with booster, installation of transmission/distribution pipelines, interconnection works in Bulacan Bulk Supply Project (BBSP), allocation for detailed engineering design, construction of office building/warehouse/motorpool and purchase of service vehicles/equipment. The recommended program has taken into account the existing conditions and developmental thrusts of the municipality and the potentials for growth of the water district. The proposed POW will entail an estimated cost of Php 335.0 Million.

See in **Annex 1** the Approved Program of Work details of Engineering and Non-Engineering Basic Cost Items for PLAWD Loan and Equity.

4 OVERVIEW OF PLARIDEL MUNICIPALITY

Plaridel is first class Municipality of the Province of Bulacan. It has a total land area of 3,244 hectares (32.44 sq.km) 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 sq.km. 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 as follows (based on NSO 2015 census):

Population Statistics of Plaridel Municipality Based on 2015 NSO Census

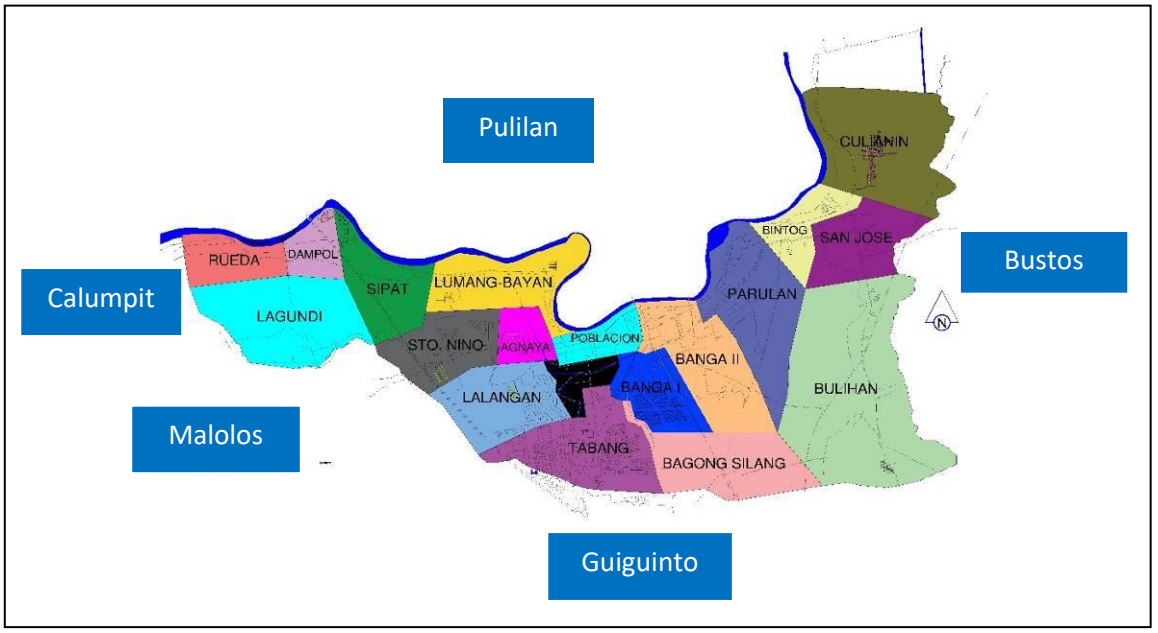
Number of Barangays	Name of Barangay	Total Population (2015)	Population Growth Rate (%)
1	Agnaya	2,585	2.4
2	Bagong Silang	3,322	3.1
3	Banga I	7,030	6.5
4	Banga II	9,036	8.4
5	Bintog	4,122	3.8
6	Bulihan	5,721	5.3
7	Culianin	4,130	3.8
8	Dampol	3,183	3.0
9	Lagundi	4,243	3.9
10	Lalangan	2,077	1.9
11	Lumang 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**	

The top three (3) most populous barangays based from the 2015 NSO census are Tabang, Sto. Niño and Banga II. Industrial estates and establishments are of small percentage and these 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 municipality of Plaridel 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. See Plaridel Location Map in **Annex 2**.

Plaridel Map with Adjacent Municipalities



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.

Plaridel is around 35 km southeast of Manila. From Manila, Plaridel can be reached by land transportation either by public utility buses/vans and/or by car. Travel time ranges from around one hour to one and a half hours.

The land topography is mostly flat with a difference of elevation from 5 m to 15 m above sea level. Although Plaridel 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. It is also becoming part of Metro-Manila's built-up area or what is called now as Mega Manila area. Migration of people from different parts of the country is evident through the increase in the number of residential, commercial and industrial developments in the area.

Agriculture used to play an important role in the economic development of Plaridel. Lately, it is becoming more urbanized/industrialized due largely to its proximity to Metro Manila. This transition is largely due to the massive land conversion, as more agricultural land is being converted into residential, commercial and industrial land.

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.

5 OVERVIEW OF PROJECT AREA / PLARIDEL WATER DISTRICT

The Plaridel Water District (PLAWD) was established in March 02, 1987 by the issuance of Conditional Certificate of Conformance No. 277 by LWUA and by virtue of P.D. 198 – Provincial Water Utilities Act of 1973. It was created to operate, maintain, improve and supply adequate and potable water to the residents of Plaridel. Plaridel Waterworks started its operation under the Plaridel Municipal Government with one (1) pumping station supplying 425 service connections in four (4) barangays and its service capability was limited only for nine (9) hours. In the first five (5) years of its operation, Plaridel Water District with a total of thirteen (13) manpower inclusive of the five (5) Board Members have increased water service connections to 712, all metered. At the outset of its second five (5) years, PLAWD through LWUA's 33 Million Project completed the initial water source development and yielded two (2) sources, one (1) in Barangay Tabang with production capacity of 70 lps and another in Barangay Bintog with a capacity of 30 lps, both superior to the sole source with a capacity of 22 lps. The program of work was however interrupted due to lack of available funds from LWUA. The Board of Directors and Management continue to explored other ways of acquiring funds from different sources.

In early year 1990's, Pump Station #1 was established in Barangay Banga (no longer in operation since year 2001); Subsequently followed in 1993, Pump Station #2 in Barangay Tabang; In 1998, Pump Station #3 in Brgy. Bintog; In 2001, Pump Station #4 in Brgy. Parulan; In 2005, Pump Station # 5 in Brgy. Rueda (no longer in operation since year 2006); In 2011, Pump Stations #6 & #7 in Brgy. Culianin and Parulan, respectively; In 2014, Pump Stations #8 & #9 in Brgy. Bulihan and Lalangan, respectively; and, In 2018, Pump Station #10 in Brgy.

Tabang (Sitio Santiago) were established. Currently, PLAWD water supply system is composed of a total of eight (8) operational pump stations and two (2) abandoned pump stations due to water quality problem. Information of the existing Pump Stations were shown in **Annex 3** and some photos in **Annex 4**. The water supply system also has a total of 2,313 meters of transmission pipelines and 135,785 meters of distribution pipelines covering all of the nineteen (19) barangays of Plaridel.

The Plaridel Water District was categorized as Category "B" Water District by the Local Water Utilities Administration (LWUA) on March 21, 2012 in compliance with the guidelines provided for in the Department of Budget and Management (DBM) approved Revised Local Water District (LWD) Manual on Categorization, Re-Categorization and Other Related Matters (LWD MaCRO) after reaching more than 10,000 active service connections. To date, as of September 2019, PLAWD has a total of 19,825 service connections, 18,010 of which are residential/governmental, 1,253 are semi-commercial (semi-commercial A – 319, semi-commercial B – 305 and semi-commercial C – 629), 382 are commercial and 2 are bulk water classified.

Presently, PLAWD has a total of ninety-nine (99) employees which composed of forty-two permanent employees and fifty-seven job order positions, and was headed by Engr. Esmeraldo L. Viloria as the Interim General Manager since February 2019. The Board of Directors consists of six (6) members representing different sectors/organizations from the business, academe, professionals, women's group and a representative from LWUA. PLAWD is consist of three (3) divisions, namely the Administration and Finance Division, Commercial Division and Engineering and Technical Division. Each division is headed by a division manager as shown in **Annex 5**: PLAWD Organizational Structure. The ratio of staff per concessionaire is around 1:200. This is below the LWUA's standard of 1:120, the proper ratio necessary for the water district to effectively function and serve its customers well. PLAWD is committed in the years to come to create the needed positions and employ additional employees of around 66 staff to meet this gap.

6 EXISTING WATER SUPPLY SYSTEM

Pursuant to Presidential Decree (PD) No. 198, as amended (Provincial Water Utilities Act of 1973), the Sangguniang Bayan of Plaridel enacted a resolution creating the Plaridel Water District (PLAWD). PLAWD was established in March 1987 with a Conditional Certificate of Conformance (CCC) No. 277. With its creation, the PLAWD acquired the ownership and management of the existing water supply system in Plaridel. Being a duly formed water district, PLAWD has been a beneficiary of technical, financial and institutional assistance from LWUA.

The governing policies of PLAWD emanates from a six-member Board of Directors (BOD), who are chosen and appointed from among the various sectors of the community with each member having a regular term of office of six years. The General Manager, who is appointed by the BOD, heads the PLAWD, oversees the daily operation of the water district and implements the policies, rules and regulations set by the BOD. The staff and line organizational units serve as the support group of the management and assist in operating and maintaining the water supply system.

Initial development/improvement of the water supply system in Plaridel was funded by a mini-loan amounting to Php 500,000.00 and an Interim Improvement Program Loan amounting to Php 13.48 Million from LWUA. Since then, several improvements on the existing water supply system had been implemented by the PLAWD using its own funds.

6.1 Service and Area Coverage

To date, PLAWD has attained a 100% service area coverage serving all nineteen (19) barangays in Plaridel. As of December 2018, PLAWD has a total of 18,329 service connections with a total estimated served population of 82,107. This represents around 71% of the total households within the service area. Shown in Table 2A is the breakdown of number of service connections, served population and water demand per barangay per classification for the year 2018.

PLAWD continuously served its concessionaires with safe and potable water at the least possible cost. It has not increased its water rate since September 01, 2001 which until today stood at Php 80.00 for the first 10 cu.m. It is the lowest water rate in the Province of Bulacan and in Region 3 and probably the rest of the country. The existing water rates imposed by PLAWD on its concessionaires are as follows:

Classification	Minimum Charge	Commodity Charge (Php/cum)				
		11-20 cum	21-30 cum	31-40 cum	41-50 cum	51 cum-up
Residential	80.00	8.50	9.50	10.60	11.80	13.10
Commercial	160.00	17.00	19.00	21.20	23.60	26.20
Commercial-A	140.00	14.85	16.60	18.55	20.65	22.90
Commercial-B	120.00	12.75	14.25	15.90	17.70	19.65
Commercial-C	100.00	10.80	11.85	13.25	14.75	18.35

6.2 System Facilities

The existing facilities of PLAWD consist of source, pumping stations, treatment and storage facilities, and transmission and distribution pipelines. PLAWD Water Supply System flowchart is shown in **ANNEX 6.**

a. *Source and Pumping Facilities.* – PLAWD utilizes groundwater through wells as source. PLAWD has ten (10) pumping stations, two (2) of which are non-operational due to water quality problem. The eight (8) operational pumping stations have a total combined discharge of around 293 L/s.

Pump Station	Location (Brgy.)	Depth (m)	Discharge (L/s)	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	Sitio Santiago	140	30.17	30	-

b. *Treatment facility* – PLAWD utilizes gas chlorinating facility in each pumping station to treat the water prior to distribution.

c. *Storage facility* – PLAWD has a 330 cum elevated steel tank located in Brgy. Lalangan at elevation of around 30 meters above ground level. The tank is currently in idle status but will operate on fill and draw after installation of float valve and other fittings. It will be filled by Lalangan Pumping Station (PS 09) during night and supply the area of Sta. Ines Bukid through gravity during daytime.

d. Transmission/Distribution Pipelines and other appurtenances – 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.

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

6.3 Service Connection and Water Consumption

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 Lpcd, 1.4 cum/day for commercial connection, 3 cum/day for institutional connection and 52.5 cum/day for bulk/industrial connection.

Water accountability was undertaken through the evaluation of water production, consumption, un-accounted-for water and non-revenue water to determine the effectiveness and efficiency of maintenance and operation of the system. Information utilized to assess water use profile was based on the December 2018 Monthly Data Sheets (MDS) of PLAWD.

The total production for PLAWD's existing operational well sources was recorded at 6,166,079.68 cum. The total volume of accounted-for water for the same period was 5,433,485.02 cum equivalent to 88.12% of the total production, of which 5,383,335.00 cum was for the metered billed service connections and 50,150.02 cum was from the unmetered unbilled service connections. Un-accounted for water was computed at 732,594.66 cum which is 11.88% of the total production. Non-revenue water was computed at 782,744.68 cum equivalent to 12.69% of the total production.

6.4 System Operation and Maintenance

PLAWD operates and maintains the water supply system in Plaridel, Bulacan. The existing system operates on a direct pumping scheme. Water service is provided 24 hours daily in most barangays within the service area. On the average, the eight (8) operational pump stations are operated around 16 hours per day. Water is treated/chlorinated prior to distribution.

The maintenance program of PLAWD includes the installation and reconnection of service connections, repair of leaks and damaged pipelines, servicing pump station facilities, and flushing of the distribution network through the existing blow-off valves and fire hydrants.

PLAWD conducts its daily operations in a two-storey building constructed on a lot located in Brgy. Poblacion owned by the Local Government of Plaridel.

6.5 Deficiencies of the Existing System

The current major operational concern of PLAWD is the provision of additional pipelines to replace/reinforce the existing distribution pipeline in order to improve the pressure within the service area. Low system pressure is experienced in some parts of distribution system during peak hour. Likewise, the existing supply of PLAWD is just enough to meet the water requirement of the existing number of connections thereby limiting PLAWD's capability to accommodate additional service connections.

The existing 330 cubic meter elevated reservoir will only cater the water requirement in Sta. Ines Bukid. Most of the existing water sources were developed in the Eastern part of Plaridel. Hence, two 1,500 cubic meter ground reservoir proposed in strategic locations, one is in Brgy. Banga 1st at the mid-section of the distribution system and one in Brgy Rueda at the Western part of the Municipality. The reservoirs will be filled during night time and will be boost through pump in the distribution system to augment the water supply during peak hours.

Another major concern of PLAWD is the issue regarding the office building it currently occupies. The Local Government of Plaridel has informed the PLAWD of its intention to reclaim the lot and for PLAWD to transfer to another location. Several meetings have been conducted between the LGU of Plaridel and PLAWD regarding this issue.

Part of the project is the purchase of transport vehicles, one Passenger Van to be used in transporting PLAWD staff via office to training, seminars, meetings and project sites, one Hauling Truck and one Boom Truck to be used in transporting construction materials and heavy equipment in projects sites.

7 POPULATION, SERVICE CONNECTIONS AND WATER DEMAND PROJECTIONS

7.1 Population

In the design of a water supply system, the population must be estimated in order to quantify the volume of water that will be required by the system. Population and water demand projections are fundamental in the design of a water supply system since these will affect facility layout and sizes, construction staging and cost of the project.

The populations of Plaridel and of the barangays included in this study were projected from year 2021 up to 2030. The projections took into consideration the past population trends, the potential for growth and the physical limits of the area. The figures were modified based on comparison with the NSO projections and engineering judgment. The historical and projected population of Plaridel and the barangays in the service area are presented in **Table 1** below.

TABLE 1
POPULATION PROJECTION
PLARIDEL WATER DISTRICT

Municipality/ Bgy. in the Service Area	Historical Population				Growth Rates (%)						Projected Population									
					Historical			Projected												
	2000	2007	2010	2015	2000-2007	2007-2010	2010-2015	2015-2020	2020-2025	2025-2030	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
TOTAL	80,481	99,817	101,441	107,805	3.12	0.54	1.22	2.46	2.46	2.46	124,729	127,797	130,941	134,162	137,462	140,844	144,308	147,858	151,496	155,222
1. Agnaya	2,149	2,825	2,633	2,585	3.98	-2.32	-0.37	1.05	1.36	1.69	2,695	2,720	2,747	2,779	2,808	2,845	2,878	2,921	2,960	3,008
2. Bagong Silang	1,657	2,828	2,775	3,322	7.94	-0.63	3.66	2.46	2.46	2.46	3,844	3,938	4,035	4,127	4,236	4,333	4,447	4,550	4,668	4,777
3. Banga I	5,381	7,101	6,710	7,030	4.04	-1.87	0.94	2.20	2.26	2.32	7,952	8,121	8,295	8,476	8,657	8,849	9,041	9,244	9,448	9,664
4. Banga II	7,696	9,528	8,775	9,036	3.10	-2.71	0.59	2.44	2.44	2.45	10,378	10,621	10,870	11,129	11,388	11,659	11,932	12,218	12,506	12,806
5. Bintog	3,153	3,390	3,930	4,122	1.04	5.05	0.96	2.46	2.46	2.46	4,769	4,886	5,007	5,123	5,256	5,378	5,518	5,647	5,793	5,929
6. Bulihan	4,297	5,473	5,404	5,721	3.52	-0.42	1.15	2.39	2.41	2.42	6,530	6,677	6,827	6,985	7,140	7,306	7,470	7,645	7,819	8,003
7. Culianin	3,524	4,795	4,177	4,130	4.50	-4.50	-0.23	1.17	1.46	1.76	4,375	4,426	4,480	4,542	4,600	4,668	4,735	4,813	4,888	4,974
8. Dampol	2,468	3,165	3,111	3,183	3.62	-0.57	0.46	1.78	1.93	2.09	3,479	3,535	3,593	3,657	3,717	3,785	3,851	3,925	3,997	4,077
9. Lagundi	2,537	3,055	4,135	4,243	2.69	10.62	0.52	2.46	2.46	2.46	4,909	5,030	5,154	5,273	5,410	5,536	5,680	5,813	5,963	6,103
10. Lalangan	1,386	1,749	1,923	2,077	3.38	3.21	1.55	2.68	2.63	2.58	2,371	2,423	2,477	2,535	2,588	2,648	2,705	2,769	2,828	2,895
11. Lumang Bayan	4,159	4,119	4,370	5,361	-0.14	1.99	4.17	3.76	3.47	3.17	6,615	6,838	7,064	7,298	7,529	7,770	8,009	8,257	8,502	8,755
12. Parulan	5,992	7,252	8,461	7,590	2.76	5.27	-2.15	2.46	2.46	2.46	8,782	8,998	9,219	9,439	9,678	9,909	10,160	10,404	10,666	10,922
13. Poblacion	3,628	4,090	3,907	3,901	1.73	-1.51	-0.03	1.34	1.59	1.85	4,171	4,225	4,282	4,346	4,407	4,477	4,545	4,623	4,699	4,785
14. Rueda	1,527	1,959	1,788	1,803	3.62	-3.00	0.17	1.52	1.73	1.95	1,915	1,937	1,960	1,988	2,011	2,041	2,068	2,102	2,132	2,170
15. San Jose	3,039	4,130	4,197	4,448	4.48	0.54	1.17	2.46	2.46	2.46	5,083	5,198	5,315	5,439	5,560	5,690	5,817	5,954	6,089	6,233
16. Santa Ines	1,773	2,440	2,319	2,953	4.67	-1.68	4.95	2.46	2.46	2.46	3,417	3,501	3,587	3,668	3,765	3,851	3,953	4,044	4,150	4,246
17. Santo Niño	7,847	8,707	9,744	10,761	1.50	3.82	2.01	3.16	3.00	2.84	12,890	13,271	13,658	14,056	14,456	14,868	15,283	15,711	16,141	16,583
18. Sipat	4,100	7,268	5,367	5,856	8.52	-9.61	1.76	2.46	2.46	2.46	6,775	6,942	7,113	7,281	7,467	7,644	7,839	8,026	8,229	8,426
19. Tabang	14,168	15,943	17,715	19,683	1.70	3.58	2.13	3.27	3.08	2.90	23,780	24,511	25,257	26,019	26,789	27,579	28,376	29,193	30,017	30,859
Total	80,481	99,817	101,441	107,805							124,729	127,797	130,941	134,162	137,462	140,844	144,308	147,858	151,496	155,222

7.2 Service Connections

Service connections in Plaridel 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. 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. **Table 2** shows the projected number of service connections and corresponding number of served population by years 2018, 2021 and 2030.

TABLE 2A
2018 EXISTING SERVED POPULATION AND WATER DEMAND
PLARIDEL WATER DISTRICT

Barangay	Barangay Population	Service Area Population	Domestic			Commercial			Institutional		Industrial/Bulk		Total			UFW (cum/d)	Ave.-Day Demand (cum/d)
			No. of Conn.	Served Pop.	Water Demand	No. of Conn.	Served Pop.	Water Demand	No. of Conn.	Water Demand	No. of Conn.	Water Demand	No. of Conn.	Served Pop.	Water Demand		
1. Agnaya	2,632	2,579	500	2,250	362.6	68	306	102.0	3	10.5	0	0.0	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	0	0.0	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	52.5	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	0	0.0	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	0	0.0	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	0	0.0	731	3,272	575.4	86.0	661.4
7. Culianin	4,240	4,155	349	1,571	253.2	4	18	6.0	0	0.0	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	52.5	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	105.0	18,329	82,115	14,886.9	2,224.6	17,111.5

TABLE 2B

2021 SERVED POPULATION AND WATER DEMAND PROJECTIONS

PLARIDEL WATER DISTRICT

Barangay	Barangay Population	Service Area Population	Domestic			Commercial			Institutional		Industrial/Bulk		Total			UFW (cum/d)	Ave.-Day Demand (cum/d)
			No. of Conn.	Served Pop.	Water Demand	No. of Conn.	Served Pop.	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	906	4,056	723.8	108.2	832.0
7. Culianin	4,375	4,287	434	1,951	321.9	4	18	6.0	0	0.0	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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 2C
2030 SERVED POPULATION AND WATER DEMAND PROJECTIONS
PLARIDEL WATER DISTRICT

Barangay	Barangay Pop.	Service Area Population	Domestic			Commercial			Institutional		Industrial/Bulk		Total			UFW (cum/d)	Ave.-Day Demand (cum/d)
			No. of Conn.	Served Pop.	Water Demand	No. of Conn.	Served Pop.	Water Demand	No. of Conn.	Water Demand	No. of Conn.	Water Demand	No. of Conn.	Served Pop.	Water Demand		
1. Agnaya	3,008	2,948	573	2,580	425.7	81	365	121.5	4	14.0	0	0.0	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	0	0.0	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	0	0.0	2,796	12,535	2,286.2	341.6	2,627.8
5. Bintog	5,929	5,811	1,224	5,509	909.0	65	293	97.5	6	21.0	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	0	0.0	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	155,222	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

7.3 Water Demand Projections

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: 0.75CMD (cubic meter per day) for domestic connection, 1.5 cum/day for commercial connection, 3.5 cmd for institutional connection and 52.50 cmd for

industrial/bulk connection. Non-revenue water is estimated at 20% of the total water demand.

Based on the foregoing, the projected average water demand of the system for the years 2021 and 2030 are estimated at 21,405.9 cum/d (247.8 L/s) and 29,602.0 cum/d (342.6 (L/s), respectively. **Table 3** shows the year by year served population, water demand and service connections projections.

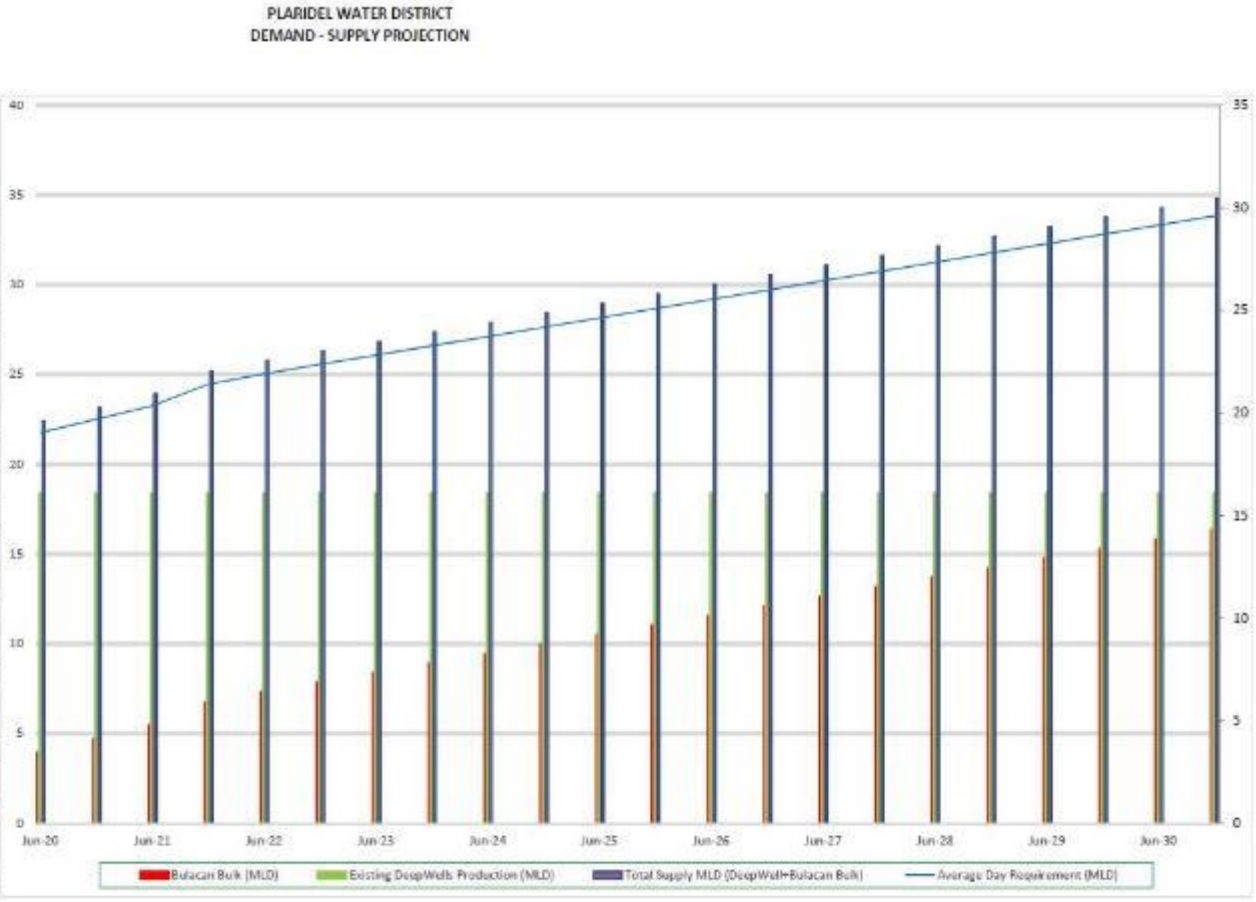
TABLE 3
SERVED POPULATION, WATER DEMAND AND NUMBER OF CONNECTIONS
PLARIDEL WATER DISTRICT

Period	Service Area Population	Served Population	Domestic		Commercial		Institutional		Industrial/Bulk		Total		UFW (cumd)	Ave-Day Demand (cumd)
			No. of Conn.	Demand (cumd)	No. of Conn.	Demand (cumd)	No. of Conn.	Demand (cumd)	No. of Conn.	Demand (cumd)	No. of Conn.	Demand (cumd)		
June 2018	112,275	79,078	16,021	11,619.0	1,551	2,326.5	81	281.8	2	105.0	17,655	14,332.3	2,141.8	16,474.0
Dec. 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	2,224.6	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	2,308.4	17,756.9
Dec. 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	2,392.6	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	2,476.7	19,051.5
Dec. 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	2,560.8	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	2,645.0	20,346.2
Dec. 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	2,782.8	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	2,849.0	21,915.5
Dec. 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	2,908.1	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	2,966.6	22,820.1
Dec. 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	3,025.6	23,273.6
June 2024	129,900	113,055	23,151	17,189.0	1,973	2,959.3	95	333.7	3	157.5	25,222	20,639.5	3,084.1	23,723.6
Dec. 2024	131,478	115,302	23,625	17,542.0	1,997	2,996.0	97	339.5	3	157.5	25,723	21,035.0	3,143.2	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	26,222	21,426.5	3,201.7	24,628.2
Dec. 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	3,260.6	25,081.6
June 2026	136,369	122,030	25,048	18,598.0	2,070	3,104.7	101	352.3	3	157.5	27,222	22,212.5	3,319.1	25,531.6
Dec. 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	3,378.2	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	3,436.7	26,436.2
Dec. 2027	141,422	128,764	26,472	19,655.0	2,143	3,214.0	105	367.5	3	157.5	28,722	23,394.0	3,495.7	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	29,221	23,785.5	3,554.2	27,339.7
Dec. 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	3,613.3	27,794.3
June 2029	146,683	135,493	27,894	20,712.0	2,215	3,322.7	109	380.3	3	157.5	30,221	24,572.5	3,671.8	28,244.3
Dec. 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	3,730.7	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	3,789.2	29,147.7
Dec. 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	3,848.1	29,602.0

The average production of the eight pumping stations is 18.4MLD (million liters per day), and started to purchased 2MLD of treated water in Bulacan Bulk Supply Project (BBSP) in June 2019.

To provide the water supply requirement up to year 2030, additional volume of 15MLD will be purchased to BBSP scheduled in the table below.

Year	Average Day Requirement (MLD)	Bulacan Bulk (MLD)	Existing DeepWells Production (MLD)	Total Supply MLD (DeepWell+Bulacan Bulk)
Jun-20	19.05	4.0	18.40	22.41
Dec-20	19.70	4.8	18.40	23.18
Jun-21	20.35	5.5	18.40	23.94
Dec-21	21.41	6.8	18.40	25.18
Jun-22	21.92	7.4	18.40	25.78
Dec-22	22.37	7.9	18.40	26.32
Jun-23	22.82	8.4	18.40	26.85
Dec-23	23.27	9.0	18.40	27.38
Jun-24	23.72	9.5	18.40	27.91
Dec-24	24.18	10.0	18.40	28.44
Jun-25	24.63	10.6	18.40	28.97
Dec-25	25.08	11.1	18.40	29.51
Jun-26	25.53	11.6	18.40	30.04
Dec-26	25.99	12.2	18.40	30.57
Jun-27	26.44	12.7	18.40	31.10
Dec-27	26.89	13.2	18.40	31.63
Jun-28	27.34	13.8	18.40	32.16
Dec-28	27.79	14.3	18.40	32.70
Jun-29	28.24	14.8	18.40	33.23
Dec-29	28.70	15.4	18.40	33.76
Jun-30	29.15	15.9	18.40	34.29
Dec-30	29.60	16.4	18.40	34.83



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 **Table 4** below.

TABLE 4
WATER DEMAND VARIATIONS
PLARIDEL WATER DISTRICT

Period	Average-Day Demand		Maximum-Day Demand		Peak-Hour Demand	
	(cumd)	(l/s)	(cumd)	(l/s)	(cumd)	(l/s)
June 2018	16,474.0	190.7	21,416.2	247.9	32,948.0	381.3
Dec. 2018	17,111.5	198.0	22,245.0	257.5	34,223.0	396.1
June 2019	17,756.9	205.5	23,084.0	267.2	35,513.8	411.0
Dec. 2019	18,404.4	213.0	23,925.7	276.9	36,808.8	426.0
June 2020	19,051.5	220.5	24,767.0	286.7	38,103.0	441.0
Dec. 2020	19,699.0	228.0	25,608.7	296.4	39,398.0	456.0
June 2021	20,346.2	235.5	26,450.1	306.1	40,692.4	471.0
Dec. 2021	21,405.9	247.8	27,827.7	322.1	42,811.8	495.5
June 2022	21,915.5	253.7	28,490.2	329.7	43,831.0	507.3
Dec. 2022	22,370.1	258.9	29,081.1	336.6	44,740.2	517.8
June 2023	22,820.1	264.1	29,666.1	343.4	45,640.2	528.2
Dec. 2023	23,273.6	269.4	30,255.7	350.2	46,547.2	538.7
June 2024	23,723.6	274.6	30,840.7	357.0	47,447.2	549.2
Dec. 2024	24,178.2	279.8	31,431.7	363.8	48,356.4	559.7
June 2025	24,628.2	285.0	32,016.7	370.6	49,256.4	570.1
Dec. 2025	25,081.6	290.3	32,606.1	377.4	50,163.2	580.6
June 2026	25,531.6	295.5	33,191.1	384.2	51,063.2	591.0
Dec. 2026	25,986.2	300.8	33,782.1	391.0	51,972.4	601.5
June 2027	26,436.2	306.0	34,367.1	397.8	52,872.4	611.9
Dec. 2027	26,889.7	311.2	34,956.6	404.6	53,779.4	622.4
June 2028	27,339.7	316.4	35,541.6	411.4	54,679.4	632.9
Dec. 2028	27,794.3	321.7	36,132.6	418.2	55,588.6	643.4
June 2029	28,244.3	326.9	36,717.6	425.0	56,488.6	653.8
Dec. 2029	28,697.7	332.1	37,307.0	431.8	57,395.4	664.3
June 2030	29,147.7	337.4	37,892.0	438.6	58,295.4	674.7
Dec. 2030	29,602.0	342.6	38,482.6	445.4	59,204.0	685.2

8 THE RECOMMENDED PROGRAM OF wORK / IMPROVEMENT

This Program of Work (POW)/Improvement has been conceptualized, in close coordination with the PLAWD, to enable the water supply system to function at its optimum capacity and benefit as many customers as possible. The components of the proposed POW are briefly discussed below.

8.1 Power Generating Set

Three (3) units of 60-Kva power generating set will be purchased and installed in three (3) existing pumping stations PS 07, PS 08, and PS 10 of PLAWD that does not have a stand-by power generating set. The generating set is of the close/silent-type with enclosure. Funds for these generating sets will be provided by PLAWD as equity. The cost allotted for this item includes materials, equipment and labor costs, overhead, contingency and miscellaneous costs, profit and taxes.

8.2 Storage Facilities with Booster

Two (2) 1,500-cu.m. glass fused steel bolted reservoirs will be constructed with booster pumping stations. The booster pumping stations 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, piping assembly, other electrical component, power generating set, distribution transformers and pump house with perimeter fence. The amount allotted for the electro-mechanical equipment includes materials, delivery and

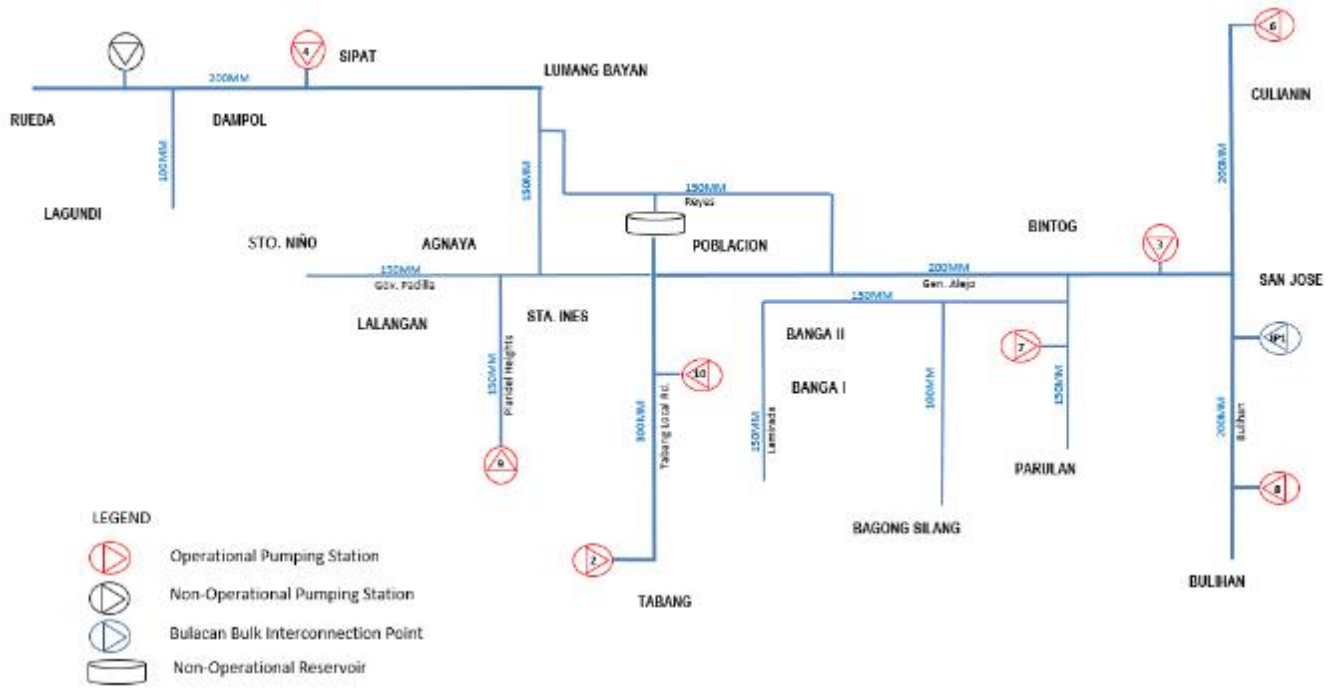
installation cost, civil works, commissioning and testing costs. The cost allocated for the ground reservoirs and pump houses with perimeter fences includes earthworks, concrete works, metal works, paintings and minor site development. See **Annex 7**: PLAWD Storage Facility and booster pumping station drawing details. This item will be funded one (1) for the loan from ADB and another one (1) for PLAWD as equity.

8.3 Transmission/Distribution Lines

A total of about 40.5 km of transmission/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. The amount allotted for this item covers materials and labor costs which include excavation and backfilling, disinfection and flushing and will funded by the loan from ADB.

To accommodate the additional volume from Bulacan Bulk, a new **Interconnection Point (IP)** will be constructed along Plaridel Bypass Road. The cost includes the tapping, short pipe laying, flow meters with chamber, electromagnetic equipment for SCADA RTU.

PLAWD Water Network Schematic Map



8.4 Detailed Engineering Design

An amount will be allocated for the conduct and preparation of detailed engineering design. Also covered by the amount allotted for this item is the cost of other incidental expenditure which include, among others, securing necessary documents related to the project such as permits, right-of-way, ECC, water rights and other. This item will be funded by the loan from ADB.

8.5 Land Acquisition

This item will cover the cost of acquiring lots for the proposed ground reservoirs and PLAWD's new office building/warehouse/motorpool. Although these are existing lots owned by PLAWD, the cost or value of the lots encompasses item in equity. The cost allotted for this item is based on the prevailing price in the area.

8.6 Office Building/Motorpool/Warehouse

This item will cover the amount needed for the construction of PLAWD's new office building with provision for warehouse and motorpool. The proposed new office building/warehouse/motorpool will be located in Bgy. Bintog (please see **Annex 8**: Lots for the Proposed Project). This item will be funded by the loan from ADB.

8.7 Service Vehicle/Equipment

Three (3) service vehicles/equipment will be purchased to be used by PLAWD during and after project implementation. The cost allotted for this item includes delivery and other incidental expenses. One will be funded by the loan from ADB and the other two for PLAWD as equity.

8.8 Operation/Maintenance Costs

The additional Operational & Maintenance (O & M) costs of this project is very minimal which will only include other operation and maintenance expenses. For PLAWD's Operation and Maintenance Cost, it is projected as shown in **Table 6** below.

TABLE 6
OPERATION AND MAINTENANCE COST (PHP x 1,000)
PLARIDEL WATER DISTRICT

Period	Salary	Power	Chemicals	Misc. and Maintenance	Purchased Water	Total
June 2018	8,143.68	7,769.46	347.90	8,021.35	0.00	24,282.39
Dec. 2018	9,500.96	8,076.05	361.63	8,333.78	0.00	26,272.42
June 2019	8,143.68	8,384.54	375.45	8,659.52	0.00	25,563.18
Dec. 2019	9,500.96	8,214.50	346.30	8,998.66	3,475.00	30,535.42
June 2020	8,203.56	8,044.88	360.24	9,337.80	3,475.00	29,421.48
Dec. 2020	9,920.12	8,356.18	374.18	9,676.94	3,475.00	31,802.42
June 2021	8,802.36	7,465.20	280.44	10,016.08	12,162.00	38,726.08
Dec. 2021	10,548.86	6,673.33	298.82	10,355.22	12,162.00	40,038.24
June 2022	9,281.40	7,338.67	315.72	10,640.63	12,162.00	39,738.42
Dec. 2022	11,037.88	7,580.00	326.10	10,872.44	12,162.00	41,978.41
June 2023	9,640.68	7,806.40	335.84	11,104.01	12,162.00	41,048.93
Dec. 2023	11,526.90	8,032.54	345.57	11,335.58	12,162.00	43,402.59
June 2024	10,059.84	8,527.35	355.30	11,567.16	12,162.00	42,671.65
Dec. 2024	11,946.06	8,761.13	365.04	11,798.73	12,162.00	45,032.96
June 2025	10,479.00	5,844.50	159.43	12,030.31	29,536.00	58,049.23
Dec. 2025	12,435.08	3,701.30	169.16	12,261.88	29,536.00	58,103.42
June 2026	10,838.28	3,929.03	178.88	12,493.46	29,536.00	56,975.65
Dec. 2026	12,924.10	4,142.96	188.62	12,725.03	29,536.00	59,516.72
June 2027	11,257.44	4,356.90	198.36	12,956.60	29,536.00	58,305.31
Dec. 2027	13,343.26	4,570.58	208.09	13,188.18	29,536.00	60,846.11
June 2028	11,676.60	4,864.41	217.82	13,419.75	29,536.00	59,714.58
Dec. 2028	13,832.28	5,081.93	227.56	13,651.33	29,536.00	62,329.10
June 2029	12,035.88	5,299.45	237.30	13,882.90	29,536.00	60,991.53
Dec. 2029	14,321.30	5,516.69	247.03	14,114.48	29,536.00	63,735.49
June 2030	12,455.04	5,968.12	256.76	14,346.05	29,536.00	62,561.96
Dec. 2030	14,740.46	6,194.45	266.49	14,577.62	29,536.00	65,315.03

Note: Reduced power and chemical costs due to infusion of additional supply from Bulacan Bulk of Maynilad (2MLD in 2019, 5MLD in 2021 and 10MLD in 2025) reducing the number of operating pumping stations.

8.9 Implementation Schedule

The Indicative Sub-Project Implementation Schedule-WDDSP for PLAWD is shown below and in **Annex 9**.

Indicative Project Implementation Schedule

Activities	Accountable Units	Mo 1	Mo 2	Mo 3	Mo 4	Mo 5	Mo 6	Mo 7	Mo 8	Mo 9	Mo 10	Mo 11	Mo 12 to Mo 29
Business Plan Assessment	LWUA/IDS/UDEV												
Program of Work Validation	LWUA/ES/Planning												
Preliminary Engineering Design (Concept Design)	Consultant												
Bid Documents Preparation	Consultant												
Financial Evaluation	LWUA/IDS/LWRD												
Board of Trustees Approval	LWUA BOT												
Financial Agreement Contract	LWUA/FS/LPMD												
Safeguard Documents and Compliances	Consultant												
Bidding Activities	Consultant/WD												
Design Stage, Evaluation and Approval	Consultant/WD												
After Contract Award Support	Consultant												
Construction Works Stage	LWUA/Consultant/WD												

Source: Indicative Sub-Projects Implementation Schedule - WDDSP

8.10 Key Performance Indicator after Implementation

a. Improve Availability and Access to Clean Drinking Water

The construction of the proposed groundwater reservoirs, improved transmission and distribution pipelines, provision of power generating sets and the infusion of water from Bulacan Bulk Water will assure the constituents of Plaridel Municipality and neighboring communities within the service area a stable supply of potable water especially during peak hours. The additional pipelines will bring water to unserved areas which in return will bring additional consumers in the next 5 years of after–project implementation. More people can have access to potable water.

b. To Reduce the Waterborne Diseases Caused by Contaminated Water

The provision of potable water will reduce waterborne diseases among families and community. Thus, regular water quality monitoring and proper checking of the treatment facility (chlorine gas injection) before distribution to concessionaires must be properly undertaken. PLAWD in coordination with Municipality of Plaridel will also provide training on hygiene and water management.

9 Cost estimates

The cost estimates adopted in this study include both the Engineering and Non-engineering Basic Cost Items. The estimate for the engineering basic cost items was arrived at using the LWUA 2018 Updated In-placed Costs. For non-engineering basic cost items, the estimate was based on the prevailing price in the project area. Likewise included in the cost estimates are Price and Physical Contingencies (PPC), Engineering Study (ES) Costs and Construction Supervision (CS) Costs. Note that the estimates presented here is for budgetary purposes only.

The recommended improvement program will entail an estimated cost of Php 335.0 Million. Details of the cost estimates are presented in **Annex 13** shown below.

10 PERFORMANCE SPECIFICATION AND PARAMETERS

10.1 Design Horizon

Proposed Design must conform with LWUA, PNSDW standards and other governing Philippine Law but within the parameters stated by the end user in the Approved Program of Works/Concept Design.

10.2 Various Methods of Population Projection

Statistical methods of Population projection shall be used based on historical data from government agency involved in the locality.

10.3 Flow Rate of Water Supply

The Proposed transmission and distribution pipes were simulated in Epanet software to maximize the carrying capacity of the pipe size indicated in the approved Program of Works (POW), also for interconnection point of the bulk water supply design, average 15 MLD flow rate must be considered. The booster pump functional specifications will be based on the operational scheme of the reservoirs.

10.4 Availability of Bid Documents

PLAWD shall prepare the bidding documents and will post the same to Philippine Government Electronic Procurement System (PHILGEPS) within a maximum of 3 months (90 calendar days) posting. After which at the commencement of the 3-month period, opening of bids will be done.

10.5 Life of Civil Works and Mechanical Equipment

Civil Works: 50 years

Mechanical Equipment: 15 years

10.6 Material of Construction for various Components

Should be of Good Quality and pass the LWUA Standards

10.7 Peak Factor

2.0

10.8 Selection of Pump Set

Pumps and appurtenances must be of good quality and passed the prescribed standards and specifications, most favorable to the government and end user, with good after sales services and spare parts are readily available in the market.

10.9 Number of Pumps and Hours of Working

One pump running without spare and capable of running 24/7 for worst case scenario.

10.10 Capacity of Storage Reservoir

2 units - 1,500 cum capacity Glass fused steel bolted Reservoirs with booster

10.11 Selection of Pipe Materials

Should be of Good Quality and passed the LWUA Standards

10.12 Minimum Diameter

Pipe diameter as indicated in the approved Program of Work/ Concept Design

10.13 Reservoir Height

Maximum tank height is 9 meters.

10.14 Hydraulic Design Formula

Darcy–Weisbach and use Darcy friction factor for pipe flow

10.15 Velocity

The maximum velocity should not be more than 3.0 m/sec for distribution lines and transmission lines

10.16 Selection of Valves and Basis of Providing Isolation/Air/Scour Valves

All valves with Ten (10) year warranty, valves are highly recommended due to good performance.

11 PRELIMINARY INVESTIGATIONS

11.1 Data collection

Field data are available in PLAWD's office.

11.2 Water Quality Analysis at Source and Distribution System

For year 2019, PLAWD's water quality monitoring results for physical-chemical test and microbiological test were summarized in **Annex 10**. 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 is done yearly, and for microbiological test is every month.

11.3 Structural Stability of Structures

Structural details must be signed by a licensed Civil Engineer or Structural engineer.

11.4 Pipe Condition Assessment

The pipe conditions are all good and these were shown below. The pipe network consists of transmission mains (Steel), primary and secondary distribution lines (PVC) are all in good condition.

Pipe network

1. Transmission mains

Material	Dia.	Length	Coating		Age	Condition	Burst/ Leakage
			Outside	Inside			
STEEL	300	2104	concrete	concrete	26	Good	1
STEEL	250	209	concrete	concrete	26	Good	
		2313					

2. Primary Distribution lines

Material	Dia.	Length	Age	Condition	Pressure (psi)		Flow (mld)		Burst/ Leakage / Inside drainage
					PH	NPH	PH	NPH	
PVC	200	479	2	Good	10	20	2.5	0.5	
PVC	200	458	4	Good	10	20	2.5	0.5	
PVC	200	2177	6	Good	10	20	2.5	0.5	
PVC	200	2004	15	Good	10	20	2.5	0.5	Along Aiport rd. from Aerostop going to Sipat 169 meters
PVC	200	3376	16	Good	10	20	2.5	0.5	
PVC	200	1590	19	Good	10	20	2.5	0.5	
PVC	200	5383	26	Good	10	20	2.5	0.5	Along Gen. Alejo from Diversion rd to Cabiawan 726 meters
PVC	200	261		Good	10	20	2.5	0.5	
PVC	150	420	1	Good	10	20	2	0.4	
PVC	150	759	3	Good	10	20	2	0.4	
PVC	150	617	4	Good	10	20	2	0.4	
PVC	150	348	5	Good	10	20	2	0.4	
PVC	150	2661	6	Good	10	20	2	0.4	
PVC	150	1652	9	Good	10	20	2	0.4	
PVC	150	1090	11	Good	10	20	2	0.4	
PVC	150	585	12	Good	10	20	2	0.4	
PVC	150	1299	13	Good	10	20	2	0.4	
PVC	150	496	14	Good	10	20	2	0.4	
PVC	150	293	15	Good	10	20	2	0.4	
PVC	150	810	16	Good	10	20	2	0.4	Along Airport rd from Aerostop to Master 124 meters, Km 53 69 meters going to Sipat
PVC	150	1605	17	Good	10	20	2	0.4	
PVC	150	403	21	Good	10	20	2	0.4	
PVC	150	2404	26	Good	10	20	2	0.4	
PVC	150	1299		Good	10	20	2	0.4	

PH - Peak Hour

NPH - Non Peak Hour

Secondary Distribution lines

Material	Dia.	Length	Age	Condition	Pressure (psi)		Flow (mld)		Burst/ Leakage
					PH	NPH	PH	NPH	
PVC	100	1799	1	Good	5	15	1.5	0.3	
PVC	100	6271	3	Good	5	15	1.5	0.3	
PVC	100	6073	4	Good	5	15	1.5	0.3	
PVC	100	2507	7	Good	5	15	1.5	0.3	
PVC	100	244	8	Good	5	15	1.5	0.3	
PVC	100	2509	9	Good	5	15	1.5	0.3	
PVC	100	10128	11	Good	5	15	1.5	0.3	
PVC	100	1261	14	Good	5	15	1.5	0.3	Along Lugam rd. from Iglesia ni Cristo to Piñahan rd.
PVC	100	804	15	Good	5	15	1.5	0.3	
PVC	100	740	20	Good	5	15	1.5	0.3	
PVC	100	455	21	Good	5	15	1.5	0.3	
PVC	100	1409	22	Good	5	15	1.5	0.3	
PVC	100	2175	26	Good	5	15	1.5	0.3	
PVC	100	6176		Good	5	15	1.5	0.3	
PVC	75	2082	1	Good	4	12	1	0.2	
PVC	75	562	2	Good	4	12	1	0.2	
PVC	75	2704	3	Good	4	12	1	0.2	
PVC	75	1693	4	Good	4	12	1	0.2	
PVC	75	900	11	Good	4	12	1	0.2	
PVC	75	626	13	Good	4	12	1	0.2	
PVC	75	308	14	Good	4	12	1	0.2	
PVC	75	779	19	Good	4	12	1	0.2	
PVC	75	452	21	Good	4	12	1	0.2	
PVC	75	879	26	Good	4	12	1	0.2	
PVC	75	235	29	Good	4	12	1	0.2	
PVC	75	1646		Good	4	12	1	0.2	
PVC	50	334	1	Good	2	10	0.5	0.1	
PVC	50	708	2	Good	2	10	0.5	0.1	
PVC	50	1509	3	Good	2	10	0.5	0.1	
PVC	50	1538	4	Good	2	10	0.5	0.1	
PVC	50	770	7	Good	2	10	0.5	0.1	
PVC	50	1528	9	Good	2	10	0.5	0.1	
PVC	50	710	11	Good	2	10	0.5	0.1	
PVC	50	798	13	Good	2	10	0.5	0.1	
PVC	50	457	14	Good	2	10	0.5	0.1	
PVC	50	718	15	Good	2	10	0.5	0.1	Rueda junction to NIA rd. 678 meters
PVC	50	1241	16	Good	2	10	0.5	0.1	
PVC	50	2530	19	Good	2	10	0.5	0.1	
PVC	50	5348	20	Good	2	10	0.5	0.1	
PVC	50	3026	21	Good	2	10	0.5	0.1	
PVC	50	1301	22	Good	2	10	0.5	0.1	
PVC	50	2452	23	Good	2	10	0.5	0.1	
PVC	50	2083	24	Good	2	10	0.5	0.1	
PVC	50	11494	26	Good	2	10	0.5	0.1	Along Avendano st from Garcia to Sta Ines 120 meters
PVC	50	9041		Good	2	10	0.5	0.1	

135472

PH - Peak Hour

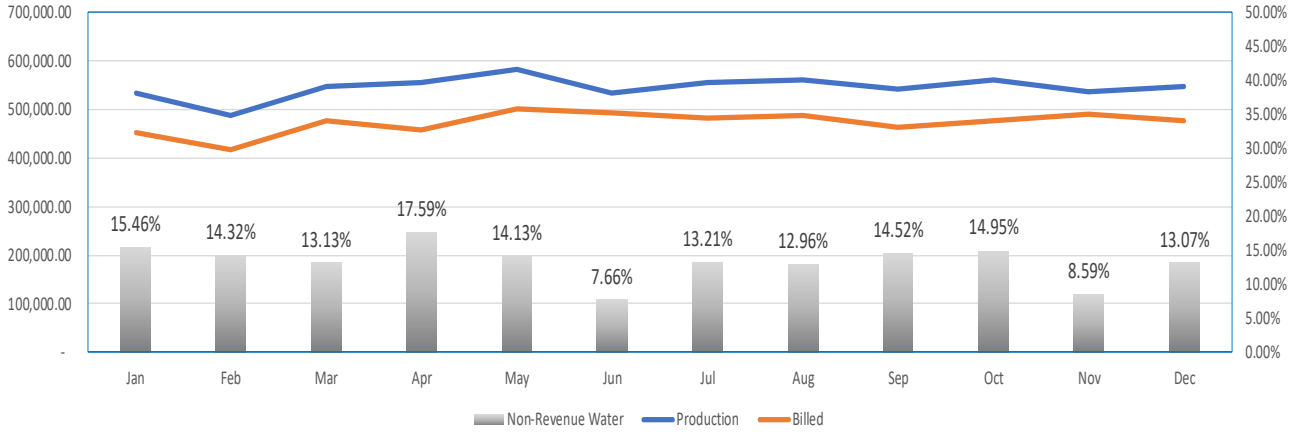
NPH - Non Peak Hour

11.5 NRW Study

Data shown below is year 2019 PLAWD Non-Revenue Water (NRW) Summary. The average Non-Revenue Water for 2019 is 13.30%.

Non-Revenue Water Summary 2019

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Production	534,838.00	487,783.00	548,328.00	556,407.00	584,092.20	535,154.60	556,686.10	560,888.92	541,332.48	560,621.55	535,802.87	547,697.30
Billed	452,173.31	417,916.92	476,357.50	458,531.19	501,574.12	494,155.05	483,144.35	488,179.01	462,721.77	476,784.90	489,792.08	476,109.71
NRW	15.46%	14.32%	13.13%	17.59%	14.13%	7.66%	13.21%	12.96%	14.52%	14.95%	8.59%	13.07%



Volumes		
NRW	2,437.03	cu.m/d
Commercial losses	620.17	cu.m/d
Physical losses	1,600.53	cu.m/d
Water Loss Performance Indicators		
NRW (L/conn./d)(w.s.p.)	131.01	L/conn./d
Physical losses (L/conn./d)(w.s.p.)	85.68	L/conn./d
Infrastructure Leakage Index (ILI)	5.06	
Commercial losses (% of authorized consumption)	3.94%	
Financials		
Value of commercial losses	2,461,973.10	Php
Value of physical losses taking additional water sales into account	6,429,753.99	Php
Total cost/value of NRW	8,891,727.09	Php

11.6 Topographic Survey and Mapping

The land topography of Plaridel is mostly flat with a difference of elevation from 5 m to 15 m above sea level.

11.7 Geotechnical Analysis

A Geotechnical Investigation was conducted at Barangay Banga 1st, Plaridel, Bulacan on 11 November 2017 for the Proposed Ground Reservoir as requested by the Plaridel Water District. The site is situated within the residential area of Plaridel, Bulacan with a topography that is relatively flat underlying by different types of soil materials.

The soil foundation type in the proposed site and its corresponding structures can be categorized into several types of soil, but generally, the dominant materials are silt, clay and sand or a mixture hereof.

Assessment of subsoils based on the boring results, the subsoil at the site can be idealized to consist of two (2) type of horizon, the weak zone and the over-consolidated zone. The weak zone composed of soft to medium stiff silt and silty clay at 1.0 meter to 4.5 meter depth for Boreholes 1 and 2 which are highly compressible, settlement prone and highly susceptible to liquefaction. The over-compacted/over-consolidated zone is composed of over-consolidated silt, silty clay, sandy silt, sandy clay and sand.

Type of foundation for the general subsurface condition prevailing at the project site, tabulated hereunder are the recommended depths and allowable bearing capacities that can be adopted in the design of foundations for the proposed structure:

Borehole No.	Bearing Capacities (kPa)					
	1.5 m.	2.0 m.	2.5 m.	3.0 m.	3.5 m.	4.0 m.
1	186.05	193.70	210.03	129.87	226.40	237.30
2	106.09	114.02	121.94	129.87	234.00	145.71

Manual or normal excavation works of footing foundations can still be undertaken at the option of the PLAWD since the overburden soil at the site are soft, medium stiff to stiff deposits. However, machine excavation works for the footing foundations is recommended to facilitate and expedite the works. Proper shoring and dewatering considerations should also be applied during excavation works until completion of formworks and concreting works, if necessary.

This geotechnical evaluation was prepared as a guide in the design of the foundation of the proposed structure. Its scope is limited to this project and at the site herein described.

The complete document or report on this geotechnical investigation is available in PLAWD office.

11.8 Resettlement Issues

a. There are no resettlement issues connected with the project. All three (3) lots are owned by the Water District, two (2) lots for the construction of storage facilities (ground reservoirs) and one (1) lot for the construction of office building/warehouse/motorpool.

b. As far as the transmission/distribution pipelines are concerned, road widening is not an issue since the pipes are to be buried below ground level and shall be imbedded at the road pavement in case of road widening.

12 ALTERNATIVE ANALYSIS

In alternative analysis, as we know it, usually several alternatives are given, and then analyzed. For PLAWD, the project components are basically requested by the Water District which LWUA verifies in the field, and if found technically feasible, a Program of Work is immediately prepared. The POW is already the result of a final Concept (as envisioned/requested by the WD and verified/approved by LWUA), and eventually designed and to be implemented. Thus, after verifying the existing system, taking note of its deficiencies, and assessing the project request of the WD, LWUA went directly in formulating the Recommended Plan with the description of the work items and cost

12.1 Water Sources (Quality and Quantity)

PLAWD existing water sources are 8 groundwater wells and 2 MLD bulk water from Bulacan Bulk Water. There's a plan in the future to construct more deep wells as additional water source, but right the proposal is to initially draw an additional 5 MLD and incremental 10 MLD by year 2030 of water from Bulacan Bulk Water of Luzon Clean Water Development Corporation.

PLAWD's water quality is potable and it has passed the microbiological and the physical-chemical test, summary results of these as shown in Item 10.2. With regards to quantity, 8 existing well sources plus the 2MLD from the Bulacan Bulk Water is just enough for the needs of the entire populace/concessionaires in 2019 only.

12.2 Transmission Main / Feeder Main (Alternative Alignment and Optimization)

PLAWD has an available lay-out of the pipeline if needed. **Annex 11** shows the PLAWD Water Supply Network of the existing and proposed pipelines.

12.3 Water Treatment (Alternative Technologies)

PLAWD has an existing water treatment chlorine gas injection, other technologies that can offer the same or better for the district are also acceptable.

12.4 Distribution Lines

Most of the pumping stations including the Bulacan Bulk supply is in the Eastern part of Plaridel. The sizes of distribution pipes are not enough to reach the barangays at the farthest part like Lagundi, Lumang Bayan, Sto. Niño, and Bagong Silang. Consequently, these barangays are experiencing low to no water supply during peak hours. New subdivisions like Bria Homes, Camella, and Alveo were developing in Brgys. Lagundi and Sto. Niño will benefit from the project.

12.5 House Service Connection (Water Meter Set Assembly)

PLAWD's standard connection materials:

Label No.	Item Description	Quantity
1	GI Nipple ¾" x 12'	1 pc.
2	GI St Elbow ¾"	1 pc.
3	Brass Ball Valve ¾"	1 pc.
4	Water Meter ½ with Tailpiece	1 pc.
5	Meter Protector	1 pc.
6	Brass Swing Type Check Valve ½"	1 pc.
7	GI St Elbow ½" x ½"	1 pc.
8	GI Nipple ½" x 10'	1 pc.
9	Concrete Block	1 pc.
10	Main Line/Service Line	1 pc.
11	CI Saddle Clamp, size "varies"	1 pc.
12	Brass Corporation Stop, size "varies"	1 pc.
13	HDPE Tubing, size "varies"	1 pc.
14	Brass Replacement Piece, size "varies"	1 pc.
15	GI Elbow , size "varies" ¾"	1 pc.

12.6 SCADA System

The district has an updated digitized as built plan of the system, as preparation for SCADA system.

13 INSTITUTIONAL ASPECTS

13.1 Organizational Structure

Existing PLAWD Organizational Structure (please see **Annex 8**).

13.2 Additional Technical and Skilled Staff Required

Increased in the coverage and number of connections mainly due to the increasing populace and its water demand will also mean additional workforce to meet additional work loads. PLAWD will be needing additional staff and this will involve technical staff, plumbers, meter readers and other supporting staff.

13.3 Training Requirements

Plaridel Water District ensures that materials used in this project are all in compliance to material standards set by the Local Water Utilities Administration (LWUA). PLAWD is committed to preserve its assets by aligning itself to the evolving technological advancement. Part of the program is the periodic benchmarking to leading local water companies. PLAWD key personnel are sent to various National and International Expositions, advance courses on water management, training and require them to echo to the concerned staff. Continuing Professional Development is also provided to its professional staff.

Sustainability of the project is ensured through training of the operators and maintenance personnel prior to their assignment in the area. PLAWD section head in the Maintenance and Operation of the Water District takes all the responsibility over these hinterland areas, thus they are obliged to visit various installation regularly to ensure proper operation of the system.

14 ENVIRONMENTAL AND SOCIAL ASSESSMENT, AND SAFEGUARD MEASURES

14.1 Flora/Fauna

Based on the initial rapid assessment, the implementation of the project will somehow disturb the environment but not to the extent that will cause undue damage. During this phase, the district will ensure that the environment will be safe and well protected. There will be a regular monitoring of the activity.

14.2 Air/Noise

During the construction phase, a minimal noise will be generated particularly in the site preparation, but will not greatly affect the community and environment since we will be working only in the day time, civil works is minimal in the project, excavation and pipe laying are done manually thus do not emit so much noise and pollution to the environment.

14.3 Resettlement

No settler will be affected in the project implementation and operations since area involved are vacant and owned by the district.

14.4 Gender

The Project will greatly help the women particularly the mother who are in charge of fetching water from source to their home especially those families without access to the Water District. A supply of 24/7 safe and potable water for the family will give them the assurance that they are free from waterborne disease, thus giving them peace of mind. The role of women in the community is emphasized in Plaridel Water District (PLAWD) as exemplified by the fact that the two Division Managers and other staff are women.

14.5 Safeguard Measures (i) Environmental; and (ii) Social

The initial assessment of the natural and social environment showed that there will be no noticeable interference of environment during implementation and operation of the project. Further environmental and social studies will be conducted for the proposed project. An Environmental Management Plan (EMP) will be prepared to manage further impacts to be identified and will be monitored. In general, the Plaridel Water District will make sure that impacts will be managed using mitigation hierarchy. It is planned that there will be regular tree planting and tree growing activities in the Water Production Areas.

Currently, PLAWD is serving 71% of the total population of Municipality of Plaridel. With the components of the proposed water supply improvement/development project, it is envisioned that in the next 5 years, an additional of around 6,000 household connections will be served and have access to clean, potable drinking water, thereby improving their way of living, and the overall health, hygiene and sanitation will also be promoted.

15 OPERATION AND MAINTENANCE ISSUES

The district is equipped with personnel with enough knowledge and experience in the water industry, yet we still look forward for further training and exposure to improve our capacity to handle the operation and maintenance and be able to echo to our personnel and staff involved.

16 CONCLUSION AND RECOMMENDATIONS

Encountering the challenge of the steadfast developing community like Plaridel Municipality is not an easy task for the Plaridel Water District (PLAWD). Aligning our capacity to this will be attainable by translating the proposed program of work into action/reality which is the water supply improvement project of PLAWD with components, such as; provision of reservoirs, additional transmission and distribution pipelines, power generating sets, office buildings, warehouse, motorpool, and service vehicles/equipment that would upgrade the water service delivery to the concessionaires/populace of Plaridel Municipality.

17 ANNEXES

ANNEX 1: Program of Work

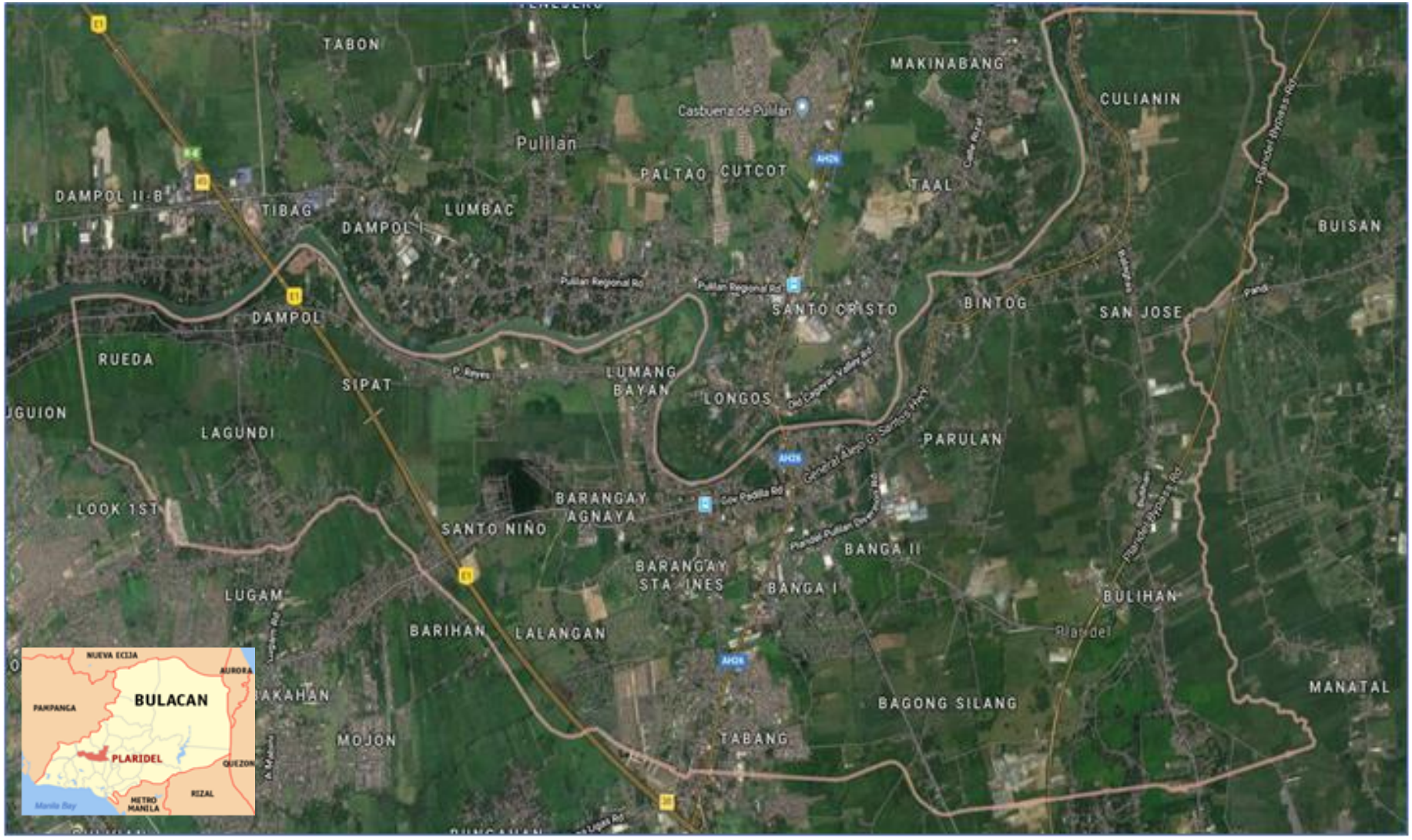
PROGRAM OF WORK
PLARIDEL WATER DISTRICT
PLARIDEL, BULACAN
FEBRUARY 2020

Cost Reference: 2018 LWUA In-Place Costs

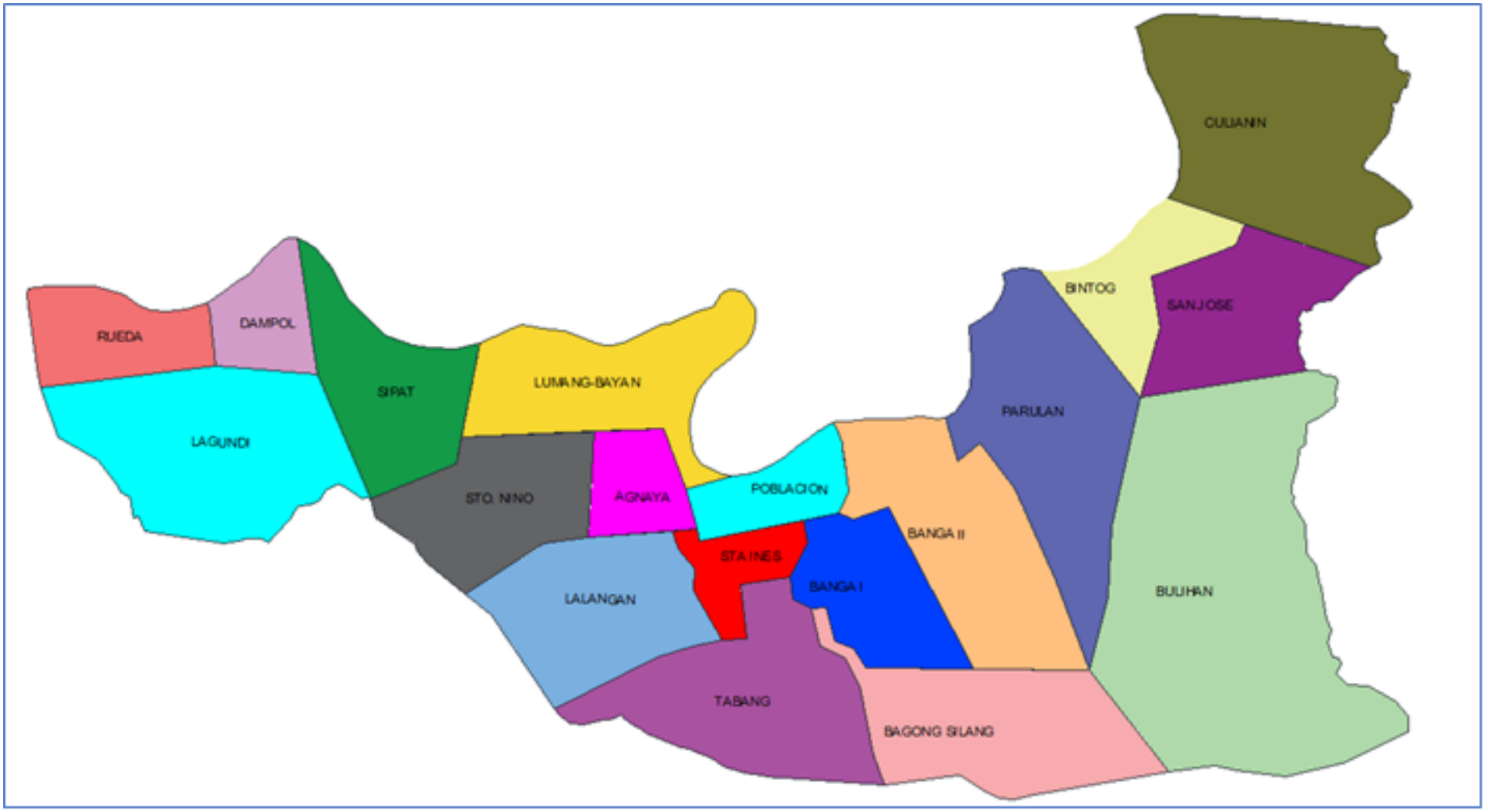
ENGINEERING BASIC COST ITEMS	WD LOAN	WD EQUITY	TOTAL
A. POWER GENERATING SET			
B. STORAGE FACILITIES WITH BOOSTER			
C. TRANSMISSION/DISTRIBUTION PIPELINES			
D. BULACAN BULK WATER SUPPLY INTERCONNECTION			
E. OFFICE BUILDING/MOTORPOOL/WAREHOUSE			
F. DETAILED ENGINEERING DESIGN			
SUB-TOTAL I	Php -	Php -	Php -
PRICE AND PHYSICAL CONTINGENCIES, PPC	-	-	-
ENGINEERING STUDY, ES			
CONSTRUCTION MONITORING, CM			
TOTAL COST I	Php -	Php -	Php -

NON-ENGINEERING BASIC COST ITEMS	WD LOAN	WD EQUITY	TOTAL
A. LOT ACQUISITION	Php -	Php -	Php -
B. SERVICE VEHICLE			-
SUB-TOTAL II	Php	Php	Php -
TOTAL PROJECT COST	**Php -**	**Php -**	**Php -**

ANNEX 2: Plaridel Location Map



Barangay Boundary



ANNEX 3: Existing Pumping Stations Information

Pumping Station Information Sheet as of May 15, 2019	
Pumping Station No.: 02	**Elavation: 8.64**
Location : Ma. Lourdes Subd, Tabang, Plaridel, Bulacan	**NWRB Conditional WP No.: 023320**
Lot Area : 500 sq.m.	**NWRB Permit to Drill No.:**
Year Drilled : 1993	**NWRB Water Permit Application No. III-Bul-2012-04-051**
Well Casing Diameter : 300 mm	**Pump Data :**
Well Depth : 185 m	Type of Pump : Submersible
Static Water Level : 24.30	Brand : Dynaflo
Pumping Water Level : 42	Model : DP160-2
Well Capacity : 68.8 lps	No. of Stages : 2
Water Quality : 7.52	Riser Pipe Size : 150
Motor Data :	Pump Setting : 65
Motor Type : Submersible without pump	Discharge Line : 250
Brand : Franklin	**Panel Control Data :**
Model : 236618	Type of Control : VFD
Rated Hp : 50	Main Circuit Breaker : 200
Rated Rpm : 3450	Rated Amperes : 91
Volts : 460	Volt : 460
Amperes Full Load: 67.7	Phase : 3
Amperes Max: 77	Frequency : 60
Production Data :	
Discharge Capacity : 67	**Gen-Set Data :**
HL : 1.65	Gen-Set brand : Perkins/ Stamford
TDH : 43.65	Rating : 166
WHP : 38.41	Voltage : 460
DP : 0	Frenquency : 60
Meralco Service Data :	Phase : 3
Transformer Rating : 75	Ampers : 208
Service ID No. 100007090101	RPM : 1800
Treatment Data : > Gas Chlorine	Power : 0.8
	Type : Silent

Pumping Station Information Sheet as of May 15, 2019	
Pumping Station No.: 03	**Elavation: 17.28**
Location : **Bintog, Plaridel, Bulacan**	**NWRB Conditional WP No.: 023321**
Lot Area : 1,160 sq.m.	**NWRB Permit to Drill No.:**
Year Drilled : 1993	**NWRB Water Permit Application No. III-Bul-2012-04-052**
Well Casing Diameter : 300 mm	**Pump Data :**
Well Depth : 52 m	Type of Pump : Submersible
Static Water Level : 4.07	Brand : Dynaflo
Pumping Water Level : 18.45	Model : DP160-2
Well Capacity :	No. of Stages : 2
Water Quality :	Riser Pipe Size : 150
Motor Data :	Pump Setting : 34
Motor Type : Submersible with spare	Discharge Line : 150
Brand : Franklin	**Panel Control Data :**
Model : 236606	Type of Control : VFD
Rated Hp : 30	Main Circuit Breaker : 200
Rated Rpm : 3450	Rated Amperes : 99
Volts : 230	Volt : 230
Amperes Full load : 79	Phase : 3
Amperes Max : 90.4	Frequency : 60
Production Data :	**Gen-Set Data :**
Discharge Capacity : 32.6	Gen-Set brand : Perkins/ Stamford
HL : 0.57	Rating : 75
TDH : 19.02	Voltage : 230
WHP : 8.19	Frenquency : 60
DP : 0	Phase : 3
Meralco Service Data :	Amperes : 188
Transformer Rating : 75	RPM : 1800
Service ID No. 100007090101	Power Factor : 0.8
Treatment Data : > Gas Chlorine	Type : Silent

Pumping Station Information Sheet as of May 15, 2019	
Pumping Station No.: 04	**Elavation: 8.64**
Location : Sipat, Plaridel, Bulacan	**NWRB Conditional WP No.: 023320**
Lot Area : 172.00 sq.m.	**NWRB Permit to Drill No.:**
Year Drilled : 2000	**NWRB Water Permit Application No. III-Bul-2012-04-053**
Well Casing Diameter : 250	**Pump Data :**
Well Depth : 101	Type of Pump : Submersible
Static Water Level : 29.28	Brand : Berkely
Pumping Water Level : 35.16	Model: BP 8RM-3
Well Capacity : 40 lps	No. of Stages : 3
Water Quality : 6.82	Riser Pipe Size : 150
Motor Data :	Pump Setting : 49.6
Motor Type : Submersible without spare	Discharge Line : 150
Brand : Pleuger	**Panel Control Data :**
Model : verify	Type of Control : VFD
Rated Hp : 50	Main Circuit Breaker : 200
Rated Rpm : 3445	Rated Amperes : 91
Volts : 440	Volt : 460
Amperes (Full load) : 67.7	Phase : 3
Amperes (Max) : 77	Frequency : 60
Production Data :	**Gen-Set Data :**
Discharge Capacity : 48.12	Gen-Set brand : Perkins/ FG Wilson
HL : 1.94	Rating : 75
TDH : 37.10	Voltage : 460
WHP : 23.44	Frenquency :
DP : 0	Phase : 3
Meralco Service Data :	Ampers : 94
Transformer Rating : 37.5	RPM ; 1800
Service ID No. 100105790101	Power Factor : 0.8
Treatment Data : > Gas Chlorine	Type : Silent

Pumping Station Information Sheet as of May 15, 2019	
Pumping Station No.: 06	**Elavation: 21.87**
Location : Culianin, Plaridel Bulacan	**NWRB Conditional WP No.: 023323**
Lot Area : 327.00 sq.m.	**NWRB Permit to Drill No.:**
Year Drilled : 2007	**NWRB Water Permit Application No. III-Bul-2012-04-054**
Well Casing Diameter :250 mm	**Pump Data :**
Well Depth : 65 m	Type of Pump : Submersible
Static Water Level : 5.4 m	Brand : unknown
Pumping Water Level : 9.67m	Model : Series 400-2
Well Capacity : 21 lps	No. of Stages : 2
Water Quality : 6.82 ph	Riser Pipe Size : 100
Motor Data :	Pump Setting : 48.78
Motor Type : Submersible with spare	Discharge Line : 100
Brand : Franklin	**Panel Control Data :**
Model : 236603	Type of Control : VFD
Rated Hp : 15	Main Circuit Breaker : 175
Rated Rpm : 3450	Rated Amperes : 52
Volts : 230	Volt : 230
Amperes (Full load) : 41.6	Phase : 3
Amperes (Max) : 47.4	Frequency : 60
Production Data :	**Gen-Set Data :**
Discharge Capacity : 24.45	Gen-Set brand : Perkins/ Stamford
HL : 3.95	Rating : 36.4
TDH : 14.17	Voltage : 230
WHP : 4.55	Frenquency : 60
DP :	Phase : 3
Meralco Service Data :	Amperes : 91.4
Transformer Rating : 25	RPM : 1800
Service ID No. 324352810101	Power Factor : 0.8
Treatment Data : > Gas Chlorine	Type : Silent

Pumping Station Information Sheet as of May 15, 2019	
Pumping Station No.: 07	**Elavation: 10.44**
Location : Parulan, Plaridel Bulacan	**NWRB Conditional WP No.: 023324**
Lot Area : 300.00 sq.m.	**NWRB Permit to Drill No.:**
Year Drilled : 2010	**NWRB Water Permit Application No. III-Bul-2012-04-055**
Well Casing Diameter : 250 mm	**Pump Data :**
Well Depth : 78	Type of Pump : Submersible
Static Water Level : 8.74	Brand : Unknown
Pumping Water Level : 9.76	Model : Series 400-6
Well Capacity : 28 lps	No. of Stages : 6
Water Quality : 6.82 ph	Riser Pipe Size : 100
Motor Data :	Pump Setting : 54.88
Motor Type : Submersible without spare	Discharge Line : 100
Brand : Franklin	**Panel Control Data :**
Model : 236606	Type of Control : VFD
Rated Hp : 30	Main Circuit Breaker : 160
Rated Rpm : 3450	Rated Amperes : 99
Volts : 230	Volt : 230
Amperes (Full load) : 79	Phase : 3
Amperes (Max) : 90.4	Frequency : 60
Production Data :	**Gen-Set Data :**
Discharge Capacity : 28.6	Gen-Set brand :
HL : 6.47	Rating :
TDH : 16.23	Voltage :
WHP : 6.10	Frenquency :
DP :	Phase :
Meralco Service Data :	Amperes :
Transformer Rating : 25	RPM :
Service ID No. 324431300101	Power Factor
Treatment Data : > Gas Chlorine	Type :

Pumping Station Information Sheet as of May 15, 2019	
Pumping Station No.: 08	**Elavation:**
Location : Bulihan, Plaridel, Bulacan	**NWRB Conditional WP No.: 01-24-18-025 (Conditional)**
Lot Area : 111.00 sq.m.	**NWRB Permit to Drill No.: 2012-193**
Year Drilled : 2013	**NWRB Water Permit Application No. III-Bul-2012-001**
Well Casing Diameter : 250 mm	**Pump Data :**
Well Depth : 150 m	Type of Pump : Submersible w/ spare
Static Water Level : 5.6 m	Brand : Caprari/ Dynaflo
Pumping Water Level : 20.98	Model : Unknown/DP 95-3
Well Capacity :	No. of Stages : 2/3
Water Quality :	Riser Pipe Size : 150
Motor Data :	Pump Setting : 60
Motor Type : Submersible with spare	Discharge Line : 150
Brand : Franklin	**Panel Control Data :**
Model : 236605	Type of Control : VFD
Rated Hp : 25	Main Circuit Breaker : 160
Rated Rpm : 3450	Rated Amperes : 75
Volts : 230	Volt : 230
Amperes (Full load) : 67	Phase : 3
Amperes (Max) : 75	Frequency : 60
Production Data :	**Gen-Set Data :**
Discharge Capacity : 40.58	Gen-Set brand :
HL : 1.71	Rating :
TDH : 17.89	Voltage :
WHP : 9.53	Frenquency :
DP :	Phase :
Meralco Service Data :	Amperes :
Transformer Rating : 25	RPM :
Service ID No. 324345380101	Power Factor
Treatment Data : > Gas Chlorine	Type :

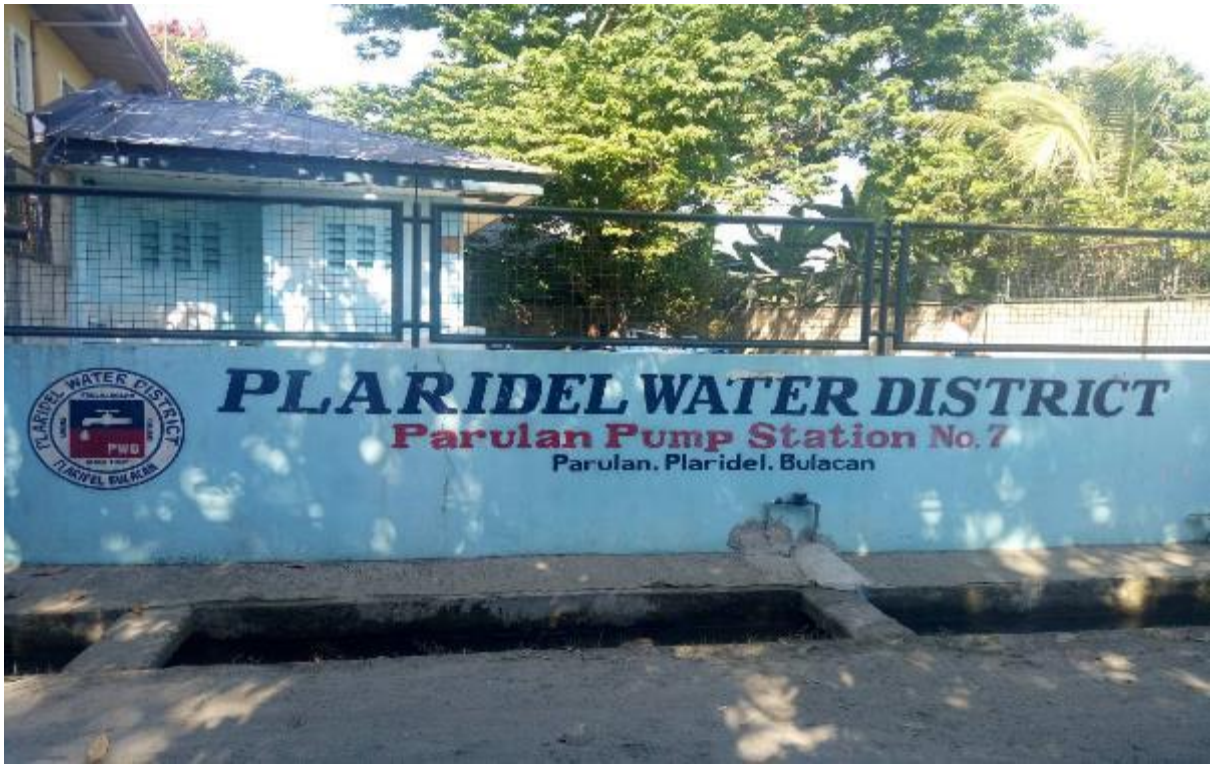
Pumping Station Information Sheet as of May 15, 2019	
Pumping Station No.: 09	**Elavation:**
Location : Plaridel Heights Subd. Brgy. Lalangan, Plaridel, Bulacan	**NWRB Conditional WP No.: 02-21-18-036**
Lot Area : 572.00 sq.m.	**NWRB Permit to Drill No.:**
Year Drilled :	**NWRB Water Permit Application No. III-Bul-2016-12-110**
Well Casing Diameter : 250 mm	**Pump Data :**
Well Depth : 141	Type of Pump : Submersible
Static Water Level : 21 mbgl	Brand : Grundfos
Pumping Water Level : 25.32 mbgl	Model : SP 95-03
Well Capacity : 10.42 lps	No. of Stages : 3 or 4
Water Quality :	Riser Pipe Size : 150
Motor Data :	Pump Setting : 72
Motor Type : Submersible with spare	Discharge Line : 150
Brand : Franklin	**Panel Control Data :**
Model : 236606	Type of Control : VFD
Rated Hp : 30	Main Circuit Breaker : 160
Rated Rpm : 3450	Rated Amperes : 99
Volts : 220	Volt : 230
Amperes (Full load) : 79	Phase : 3
Amperes (Max) : 90.4	Frequency : 60
Production Data :	**Gen-Set Data :**
Discharge Capacity : 34.18	Gen-Set brand :
HL : 1.34	Rating :
TDH : 27.79	Voltage :
WHP : 12.47	Frenquency :
DP : 0	Phase :
Meralco Service Data :	Amperes :
Transformer Rating : 25	RPM :
Service ID No. 370213110101	Power Factor
Treatment Data : > Gas Chlorine	Type :

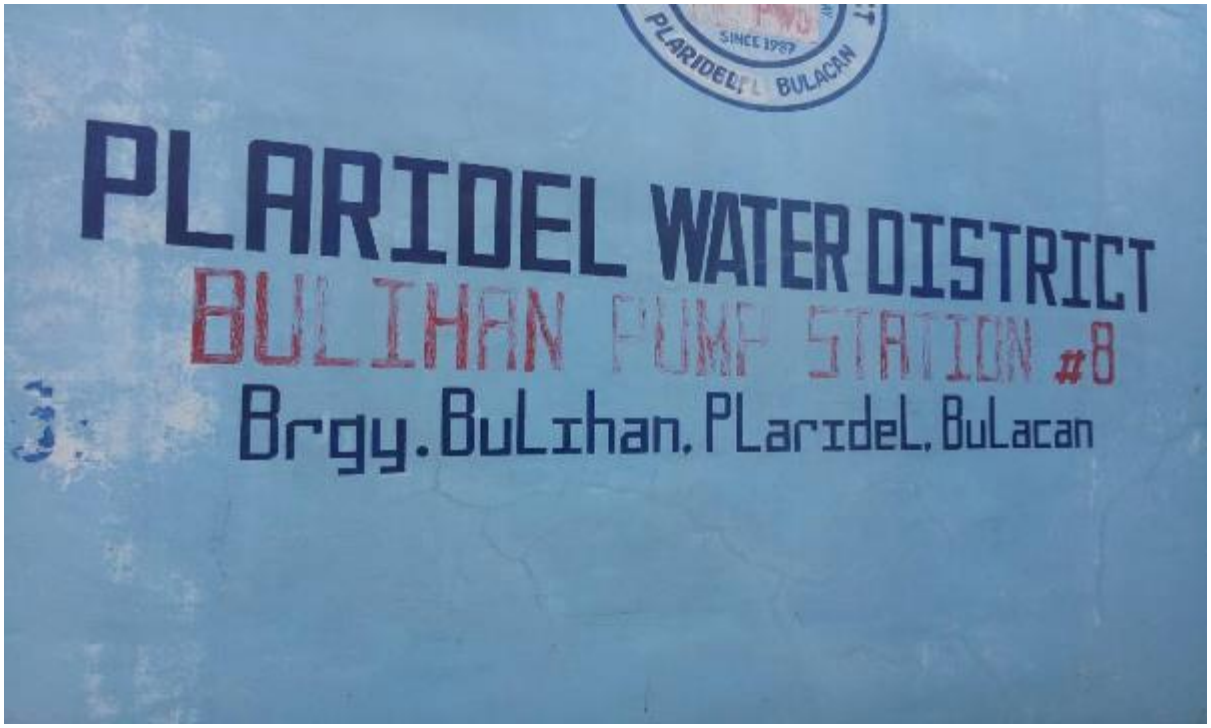
Pumping Station Information Sheet as of May 15, 2019																				
Pumping Station No.: 10											**Elavation: 17 m**									
	Location : Sitio Santiago Tabang Plaridel, Bulacan										**NWRB Conditional WP No.: 03-24-17-016**									
	Lot Area : 74 sq.m.										**NWRB Permit to Drill No.:**									
Year Drilled : 2016											**NWRB Water Permit Application No. III-Bul-2015-03-043**									
	Well Casing Diameter : 250 mm										**Pump Data :**									
	Well Depth : 140 m											Type of Pump :		Submersible						
	Static Water Level : 27.55											Brand :	Dynaflo							
	Pumping Water Level : 30.15											Model :	DP 77-4B							
	Well Capacity : 25 lps											No. of Stages :		3/4						
	Water Quality : 9.62											Riser Pipe Size :		125						
Motor Data :												Pump Setting :		72						
	Motor Type :		Submersible									Discharge Line :		150						
	Brand :		Franklin								**Panel Control Data :**									
	Model :		236606									Type of Control :		VFD						
	Rated Hp :		30									Main Circuit Breaker :		160						
	Rated Rpm :		3450									Rated Amperes :		99						
	Volts :		230									Volt :		230						
	Amperes (Full load) :		79									Phase :		3						
	Amperes (Max) :		90.4									Frequency :		60						
Production Data :											**Gen-Set Data :**									
	Discharge Capacity :		25									Gen-Set brand :		N/A						
	HL :	2.21										Rating :		N/A						
	TDH :	55.49										Voltage :		N/A						
	WHP :	22										Frenquency :		N/A						
	DP :	35										Phase :		N/A						
Meralco Service Data :												Amperes :		N/A						
	Transformer Rating :											RPM :		N/A						
	Service ID No. 459298890101											Power Factor		N/A						
Treatment Data : > Gas Chlorine												Type :		N/A						

ANNEX 4: Existing Pumping Stations Photo


PLARIDEL WATER DISTRICT
Pump Station No. 4
Sipat, Plaridel, Bulacan

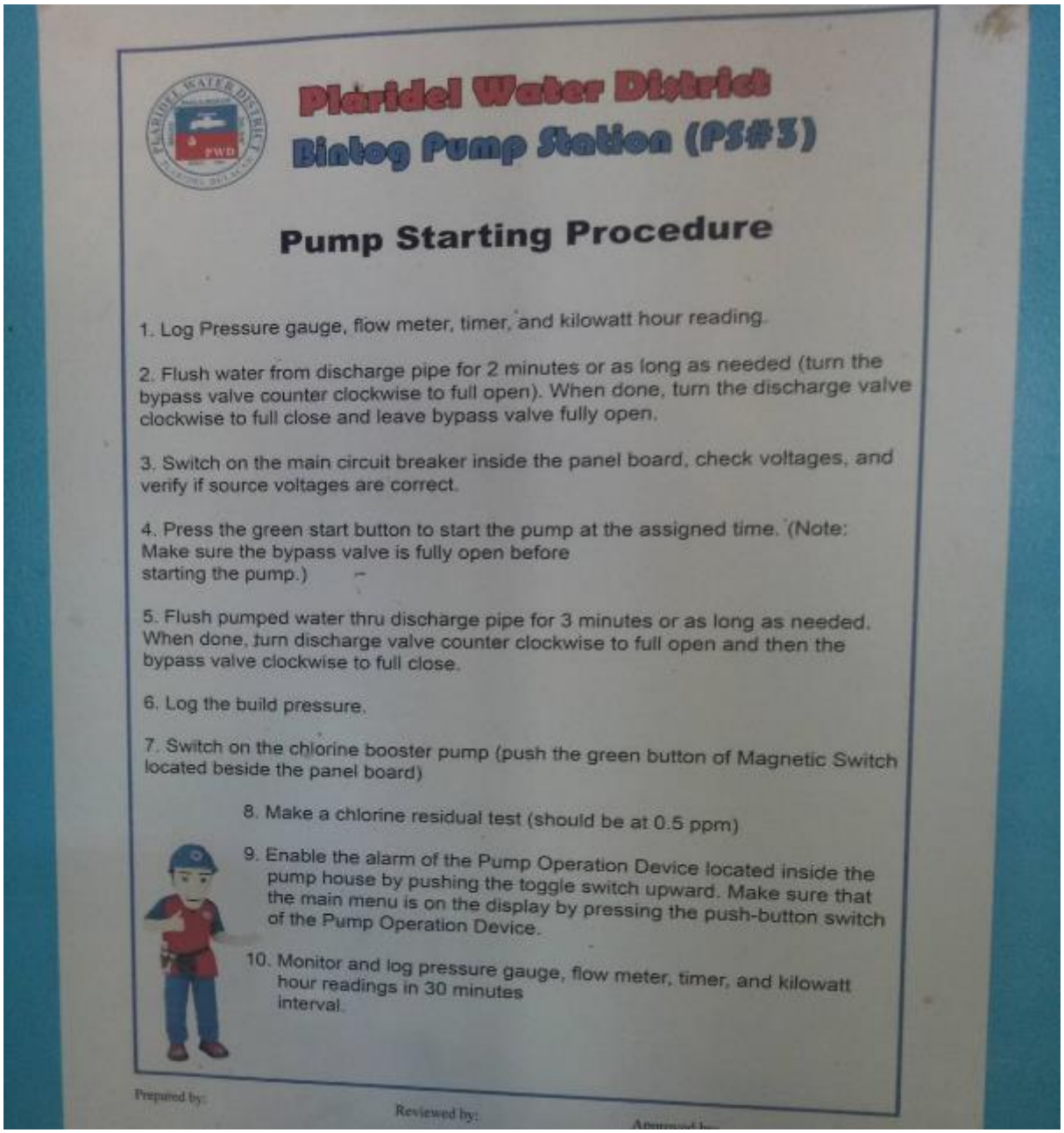

PLARIDEL WATER DISTRICT
RUEDA PUMPING STATION
PUMP STATION No.5 Rueda, Plaridel, Bulacan


PLARIDEL WATER DISTRICT
Parulan Pump Station No. 7
Parulan, Plaridel, Bulacan


PLARIDEL WATER DISTRICT
BULIHAN PUMP STATION #8
Brgy. Bulihan, Plaridel, Bulacan


PLARIDEL HEIGHTS
PUMP STATION NO.9


PLAWD
1987
PLARIDEL
WATER DISTRICT
SITIO
SANTIAGO
PUMP STATION NO.10



Plaridel Water District
Binlog Pump Station (PS#3)

Pump Starting Procedure

1. Log Pressure gauge, flow meter, timer, and kilowatt hour reading.

2. Flush water from discharge pipe for 2 minutes or as long as needed (turn the bypass valve counter clockwise to full open). When done, turn the discharge valve clockwise to full close and leave bypass valve fully open.

3. Switch on the main circuit breaker inside the panel board, check voltages, and verify if source voltages are correct.

4. Press the green start button to start the pump at the assigned time. (Note: Make sure the bypass valve is fully open before starting the pump.)

5. Flush pumped water thru discharge pipe for 3 minutes or as long as needed. When done, turn discharge valve counter clockwise to full open and then the bypass valve clockwise to full close.

6. Log the build pressure.

7. Switch on the chlorine booster pump (push the green button of Magnetic Switch located beside the panel board)

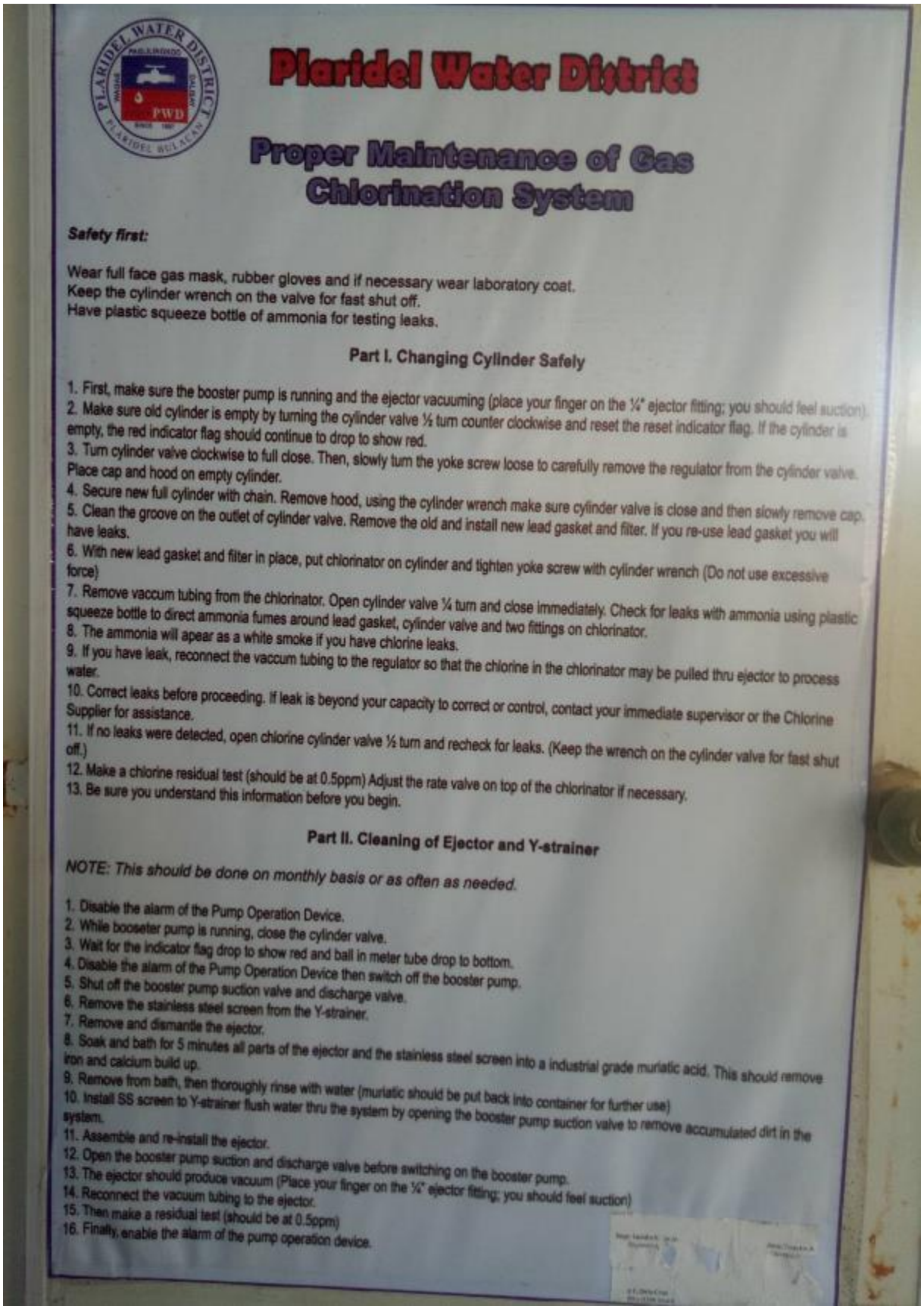
8. Make a chlorine residual test (should be at 0.5 ppm)

9. Enable the alarm of the Pump Operation Device located inside the pump house by pushing the toggle switch upward. Make sure that the main menu is on the display by pressing the push-button switch of the Pump Operation Device.

10. Monitor and log pressure gauge, flow meter, timer, and kilowatt hour readings in 30 minutes interval.

Prepared by:

Reviewed by:



Plaridel Water District

Proper Maintenance of Gas Chlorination System

Safety first:

Wear full face gas mask, rubber gloves and if necessary wear laboratory coat.
Keep the cylinder wrench on the valve for fast shut off.
Have plastic squeeze bottle of ammonia for testing leaks.

Part I. Changing Cylinder Safely

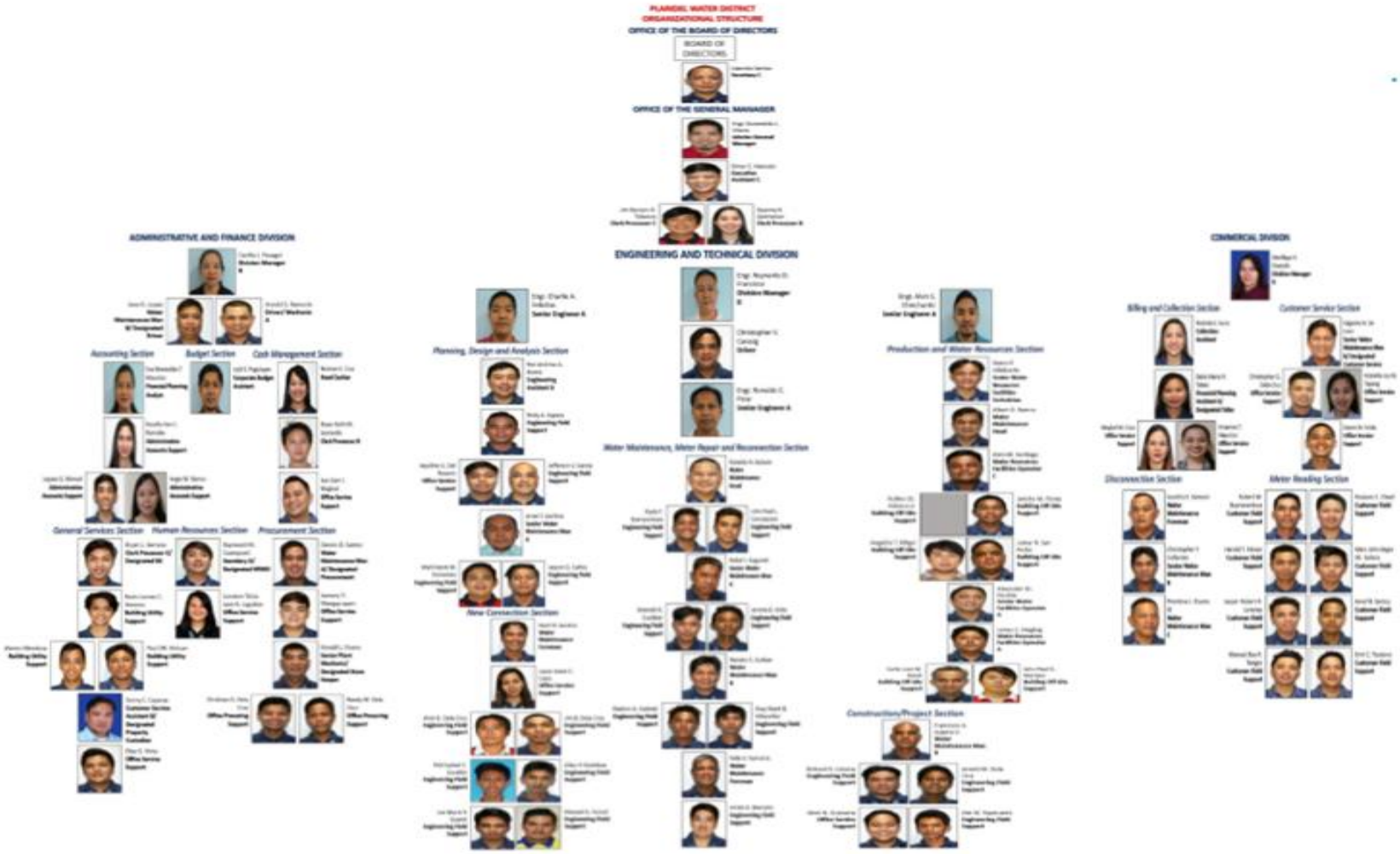
1. First, make sure the booster pump is running and the ejector vacuuming (place your finger on the ¼" ejector fitting; you should feel suction).
2. Make sure old cylinder is empty by turning the cylinder valve ½ turn counter clockwise and reset the reset indicator flag. If the cylinder is empty, the red indicator flag should continue to drop to show red.
3. Turn cylinder valve clockwise to full close. Then, slowly turn the yoke screw loose to carefully remove the regulator from the cylinder valve. Place cap and hood on empty cylinder.
4. Secure new full cylinder with chain. Remove hood, using the cylinder wrench make sure cylinder valve is close and then slowly remove cap.
5. Clean the groove on the outlet of cylinder valve. Remove the old and install new lead gasket and filter. If you re-use lead gasket you will have leaks.
6. With new lead gasket and filter in place, put chlorinator on cylinder and tighten yoke screw with cylinder wrench (Do not use excessive force)
7. Remove vaccum tubing from the chlorinator. Open cylinder valve ¼ turn and close immediately. Check for leaks with ammonia using plastic squeeze bottle to direct ammonia fumes around lead gasket, cylinder valve and two fittings on chlorinator.
8. The ammonia will apear as a white smoke if you have chlorine leaks.
9. If you have leak, reconnect the vaccum tubing to the regulator so that the chlorine in the chlorinator may be pulled thru ejector to process water.
10. Correct leaks before proceeding. If leak is beyond your capacity to correct or control, contact your immediate supervisor or the Chlorine Supplier for assistance.
11. If no leaks were detected, open chlorine cylinder valve ½ turn and recheck for leaks. (Keep the wrench on the cylinder valve for fast shut off.)
12. Make a chlorine residual test (should be at 0.5ppm) Adjust the rate valve on top of the chlorinator if necessary.
13. Be sure you understand this information before you begin.

Part II. Cleaning of Ejector and Y-strainer

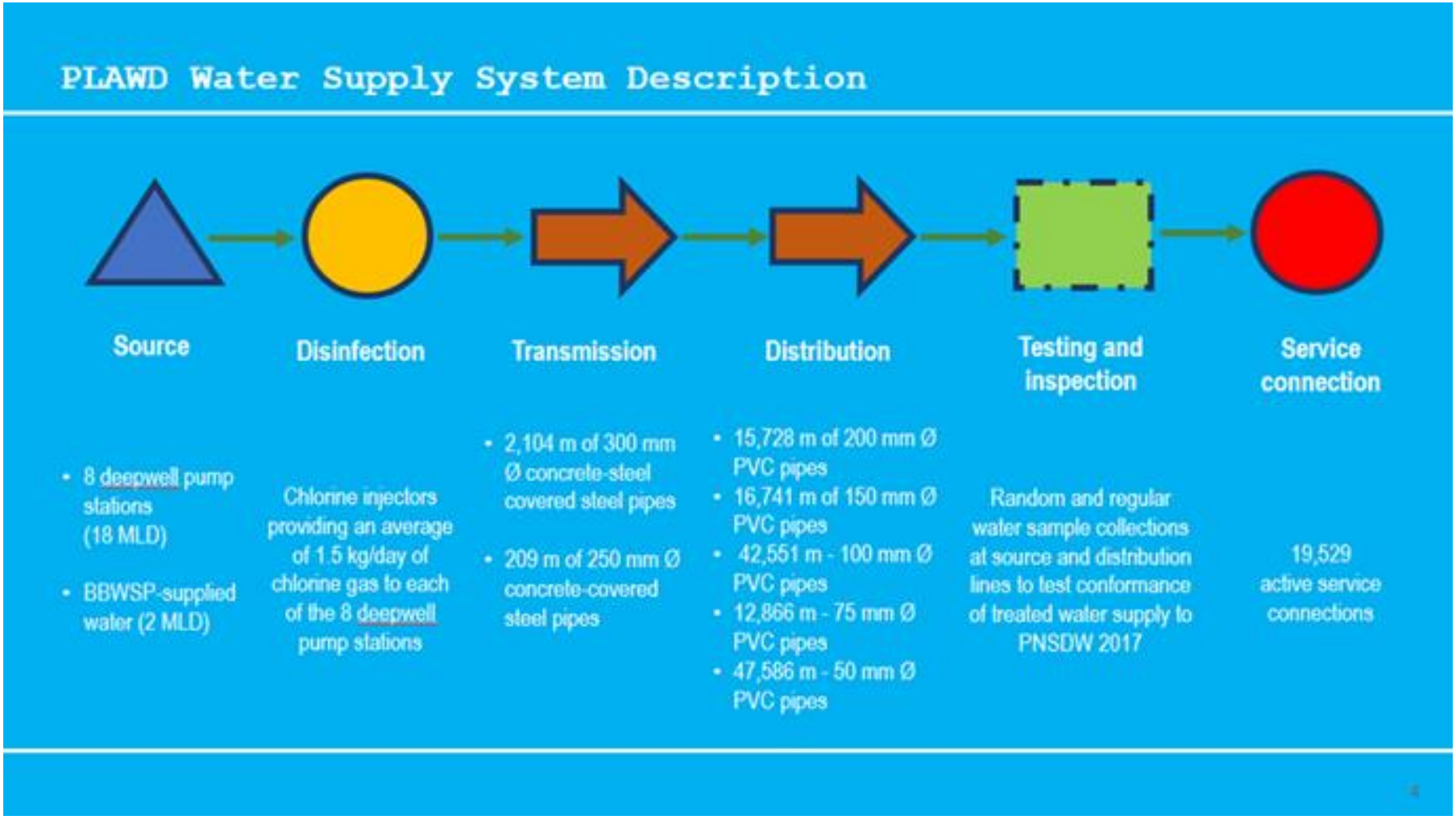
NOTE: This should be done on monthly basis or as often as needed.

1. Disable the alarm of the Pump Operation Device.
2. While booseter pump is running, close the cylinder valve.
3. Wait for the indicator flag drop to show red and ball in meter tube drop to bottom.
4. Disable the alarm of the Pump Operation Device then switch off the booster pump.
5. Shut off the booster pump suction valve and discharge valve.
6. Remove the stainless steel screen from the Y-strainer.
7. Remove and dismantle the ejector.
8. Soak and bath for 5 minutes all parts of the ejector and the stainless steel screen into a industrial grade muriatic acid. This should remove iron and calcium build up.
9. Remove from bath, then thoroughly rinse with water (muriatic should be put back into container for further use)
10. Install SS screen to Y-strainer flush water thru the system by opening the booster pump suction valve to remove accumulated dirt in the system.
11. Assemble and re-install the ejector.
12. Open the booster pump suction and discharge valve before switching on the booster pump.
13. The ejector should produce vacuum (Place your finger on the ¼" ejector fitting; you should feel suction)
14. Reconnect the vacuum tubing to the ejector.
15. Then make a residual test (should be at 0.5ppm)
16. Finally, enable the alarm of the pump operation device.

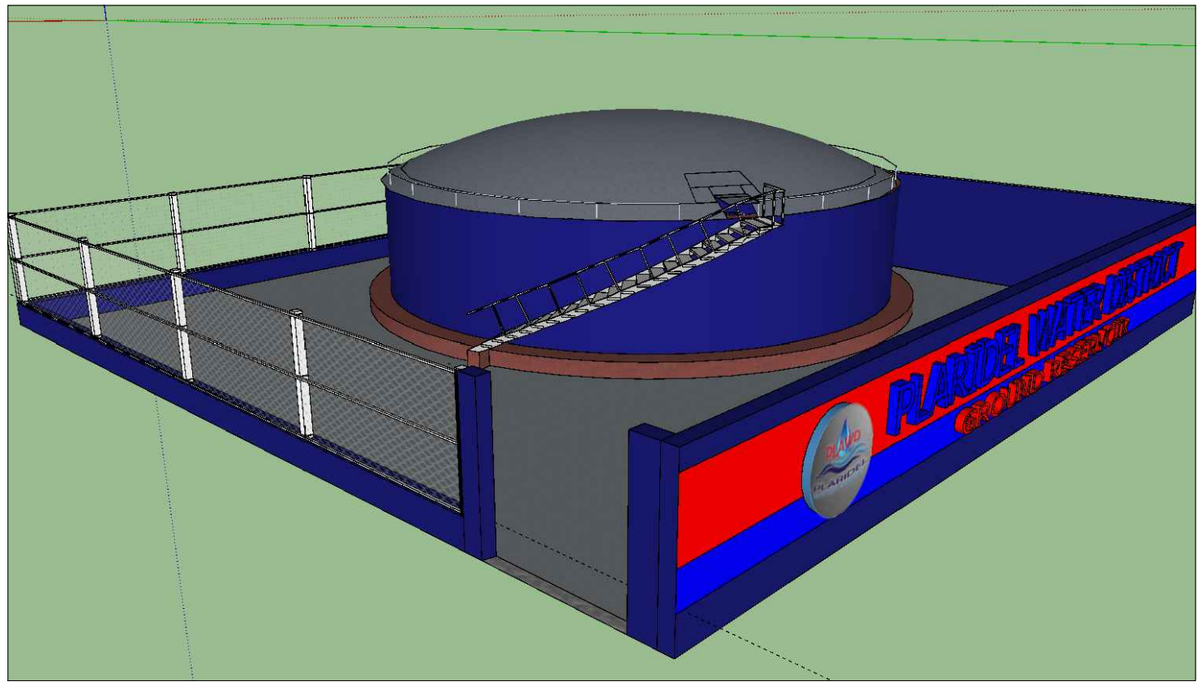
ANNEX 5: PLAWD Organizational Structure

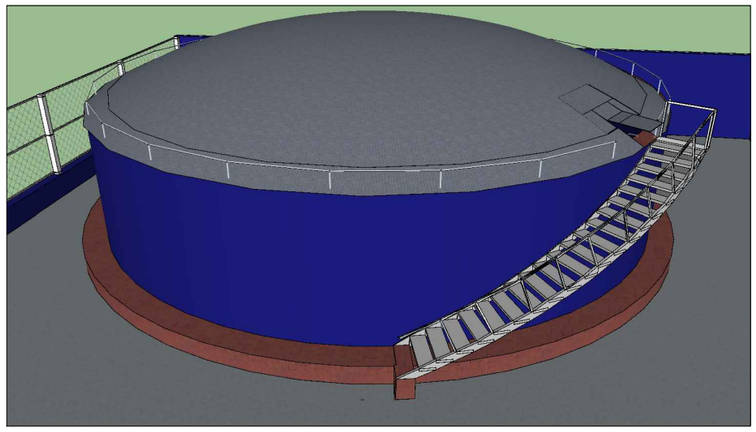


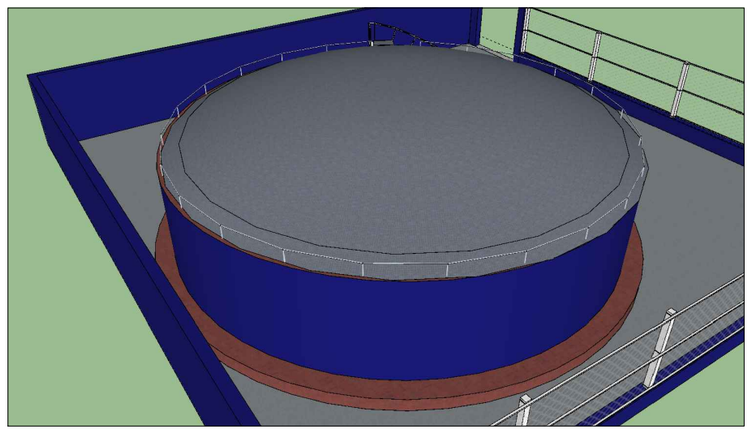
ANNEX 6: PLAWD Water Supply System Description

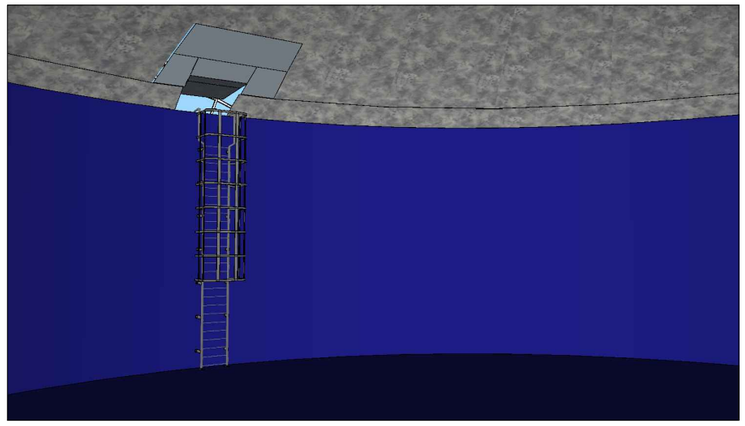


ANNEX 7: PLAWD Storage Facility









PERSPECTIVE VIEW

SCALE NTS

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO. 4833847 REG NO. 77419
DATE 02/26/2020 DATE 03/25/2021
PLACE PLARIDEL, BUL. TIN 908-505-748

CADD BY : RON
DATE : 02.28.2020
REVISION : 00
CHECKED BY : CHARLIE
DATE : 02.28.2020

PROJECT TITLE

DESIGN AND BUILD OF BANGA I
STORAGE FACILITY WITH BOOSTER PUMP

LOCATION: BRGY. BANGA I, PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

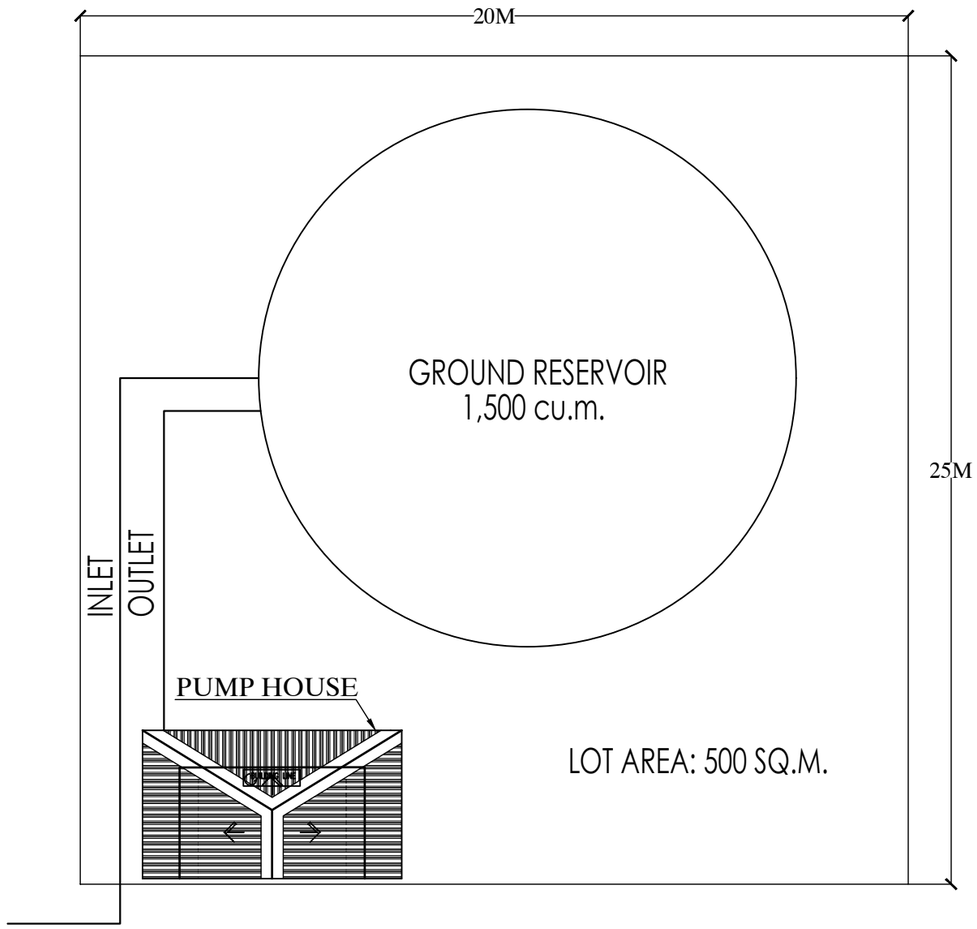
SHEET CONTENTS

PERSPECTIVE VIEW

SHEET NO.

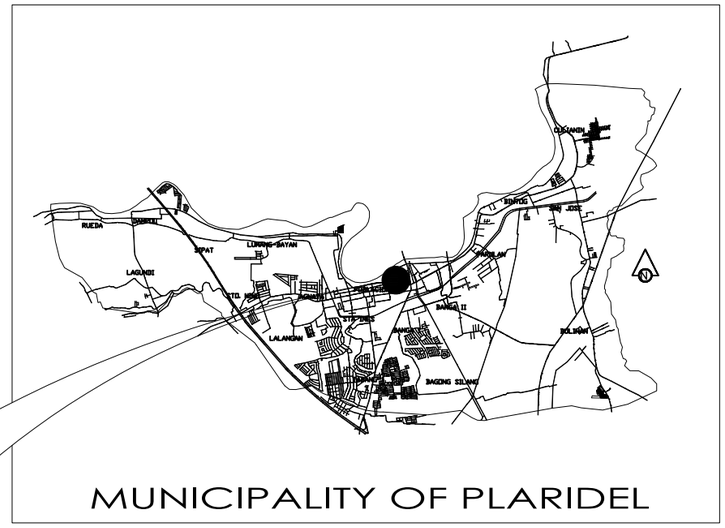
01

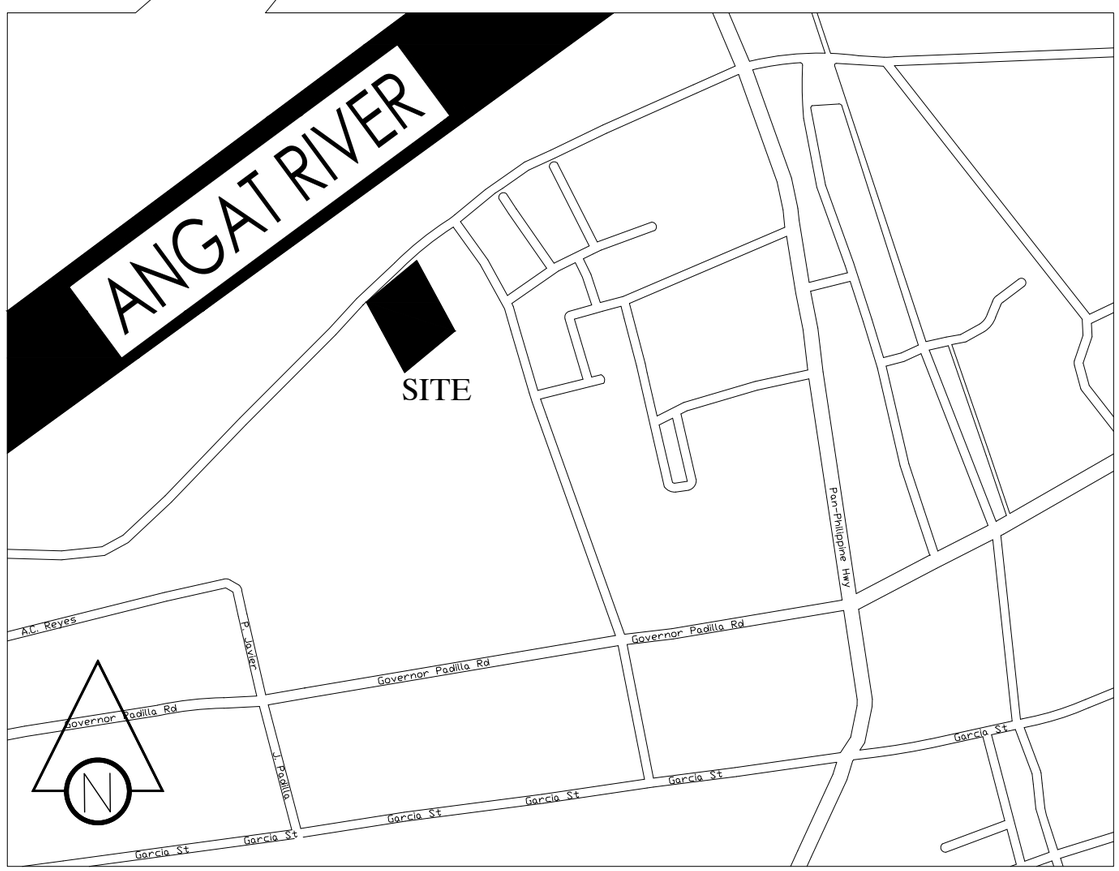
FILE NAME : PLAN
DATE 02.28.2020



SITE DEVELOPMENT PLAN

SCALE NTS





OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044–795 – 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	: RON
DATE	: 02.28.2020
REVISION	: 00
CHECKED BY	: CHARLIE
DATE	: 02.28.2020

PROJECT TITLE

DESIGN AND BUILD OF BANGA I
STORAGE FACILITY WITH BOOSTER PUMP

LOCATION: BRGY. BANGA I, PLARIDEL, BULACAN

APPROVED BY :

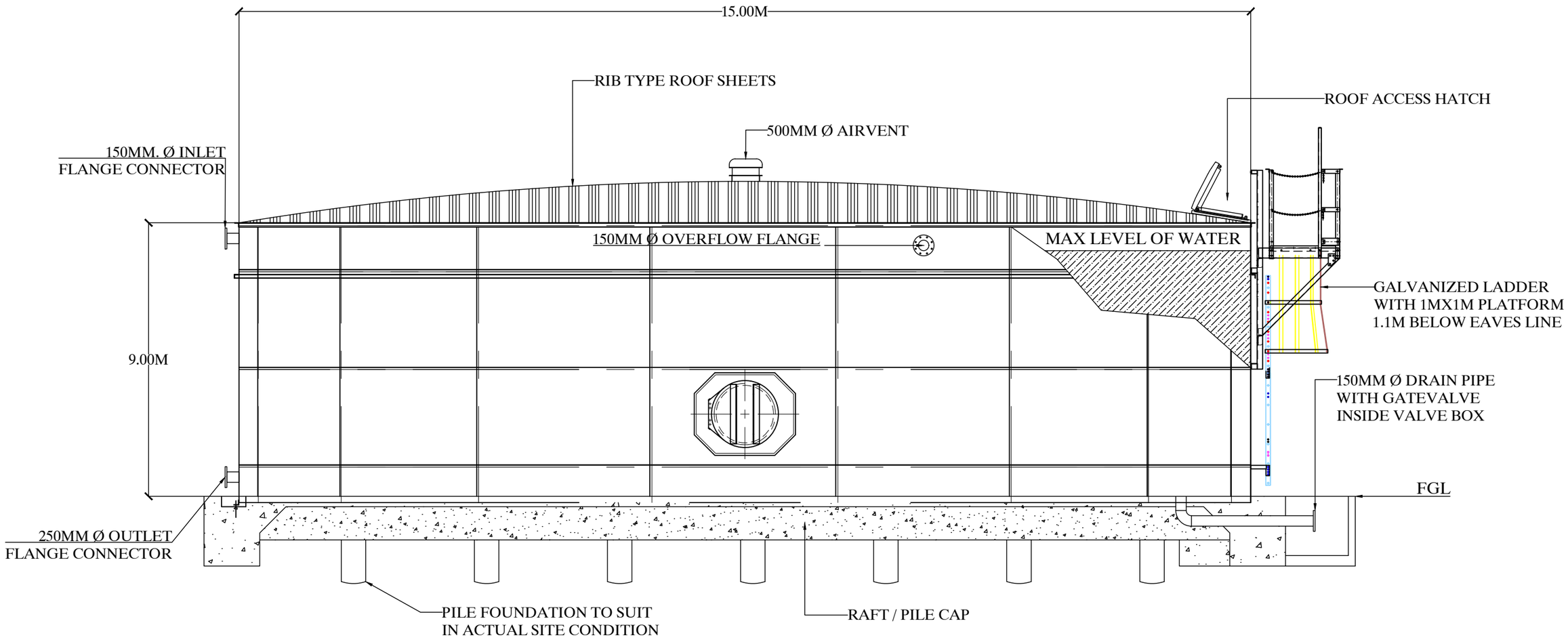
ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

SITE DEVELOPMENT PLAN
VICINITY MAP

SHEET NO. 02

FILE NAME : PLAN
DATE 02.28.2020



NOTES:

1. TANK CAPACITY 1,500 CU.M EXPANDABLE TO 2,000 CU.M

GLASS FUSED TO STEEL BOLTED TANK DETAILS

SCALE NTS

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	: RON
DATE	: 02.28.2020
REVISION	: 00
CHECKED BY	: CHARLIE
DATE	: 02.28.2020

PROJECT TITLE

DESIGN AND BUILD OF BANGA I
STORAGE FACILITY WITH BOOSTER PUMP

LOCATION: BRGY. BANGA I, PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

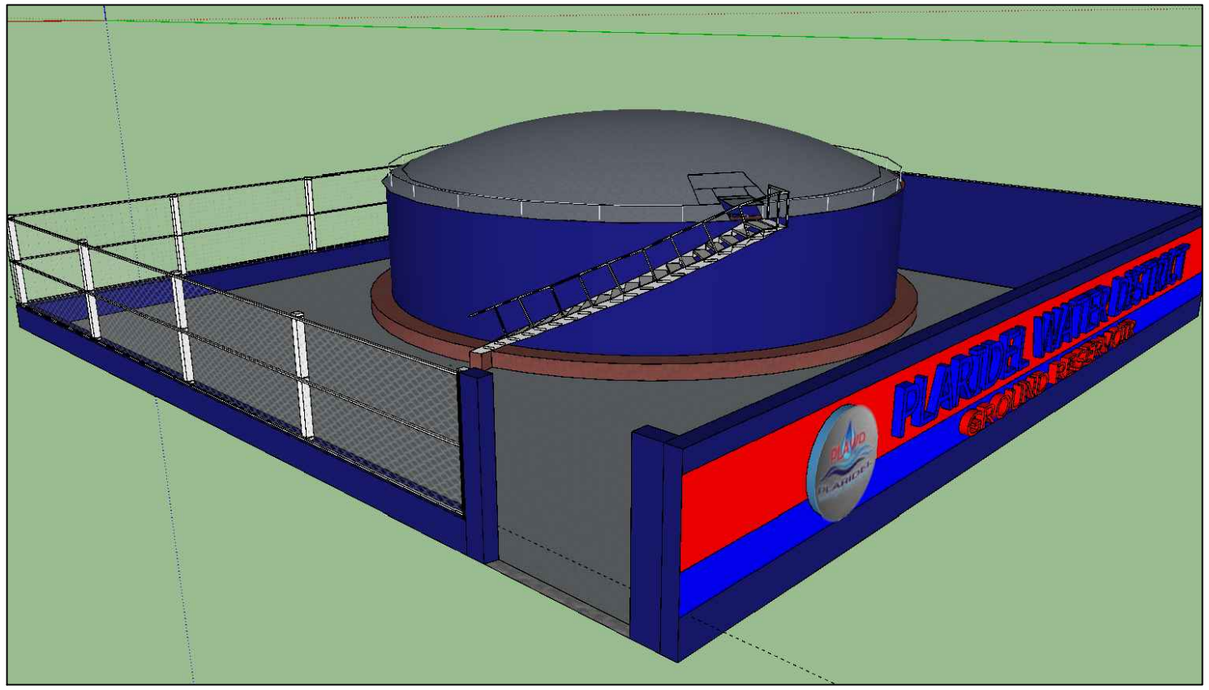
SHEET CONTENTS

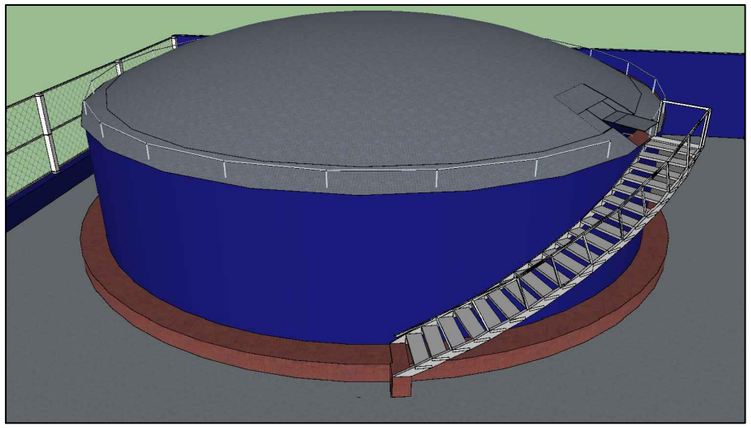
TANK ELEVATION
DETAILS

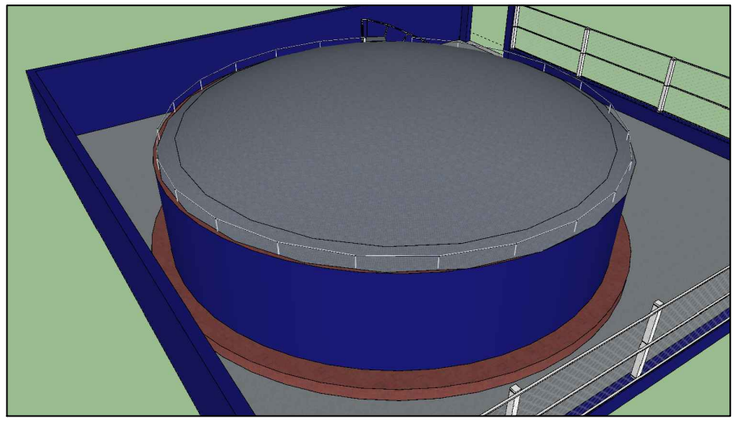
SHEET NO.

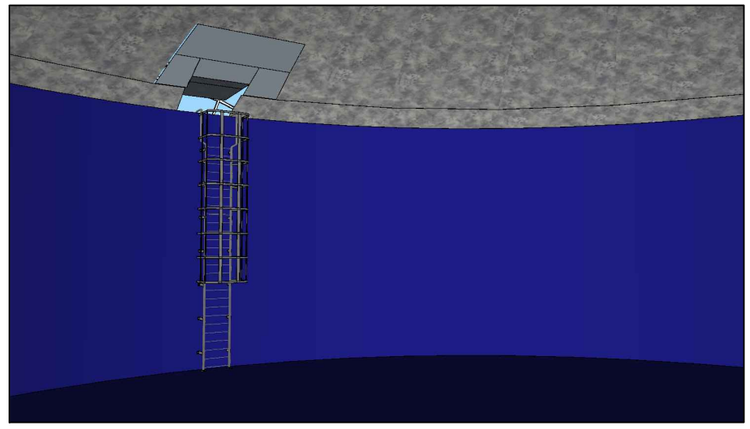
03

FILE NAME : PLAN
DATE 02.28.2020









PERSPECTIVE VIEW

SCALE NTS

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:	RON
DATE	:	02.28.2020
REVISION	:	00
CHECKED BY	:	CHARLIE
DATE	:	02.28.2020

PROJECT TITLE

DESIGN AND BUILD OF RUEDA
STORAGE FACILITY WITH BOOSTER PUMP

LOCATION: BRGY. RUEDA, PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

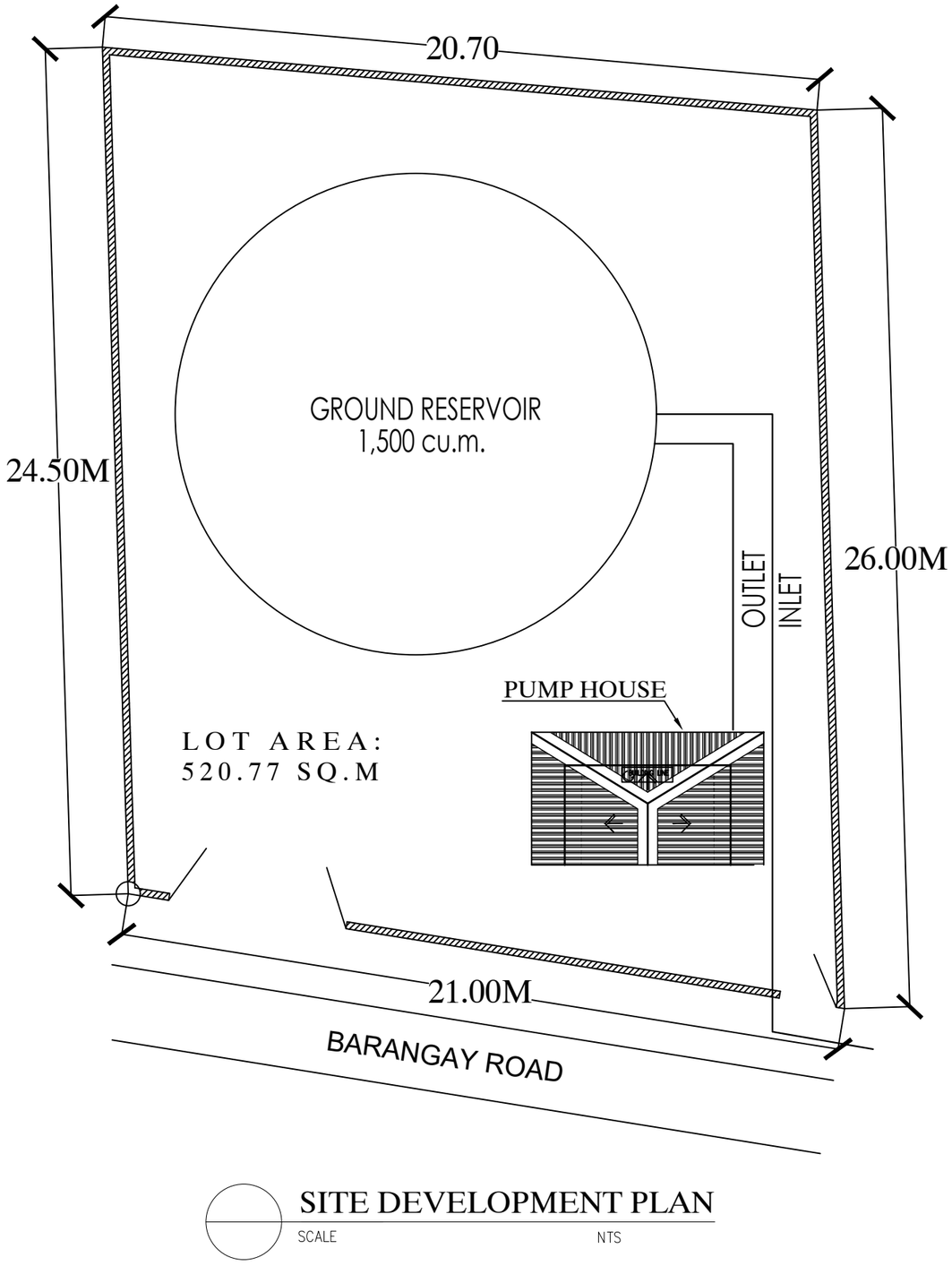
SHEET CONTENTS

PERSPECTIVE VIEW

SHEET NO.

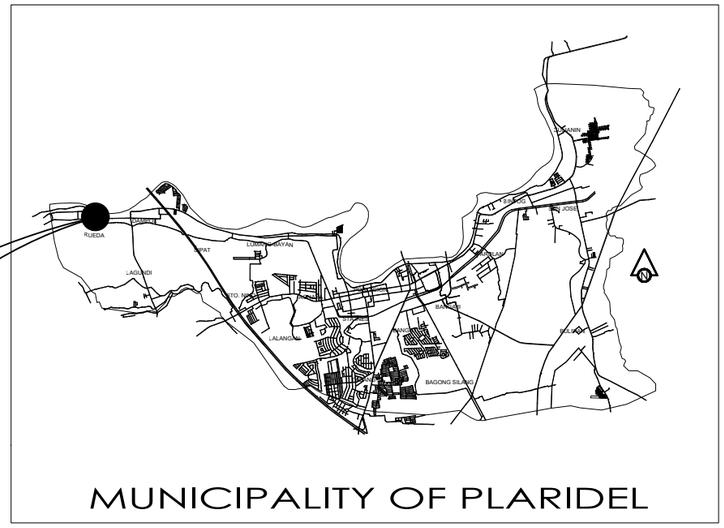
01

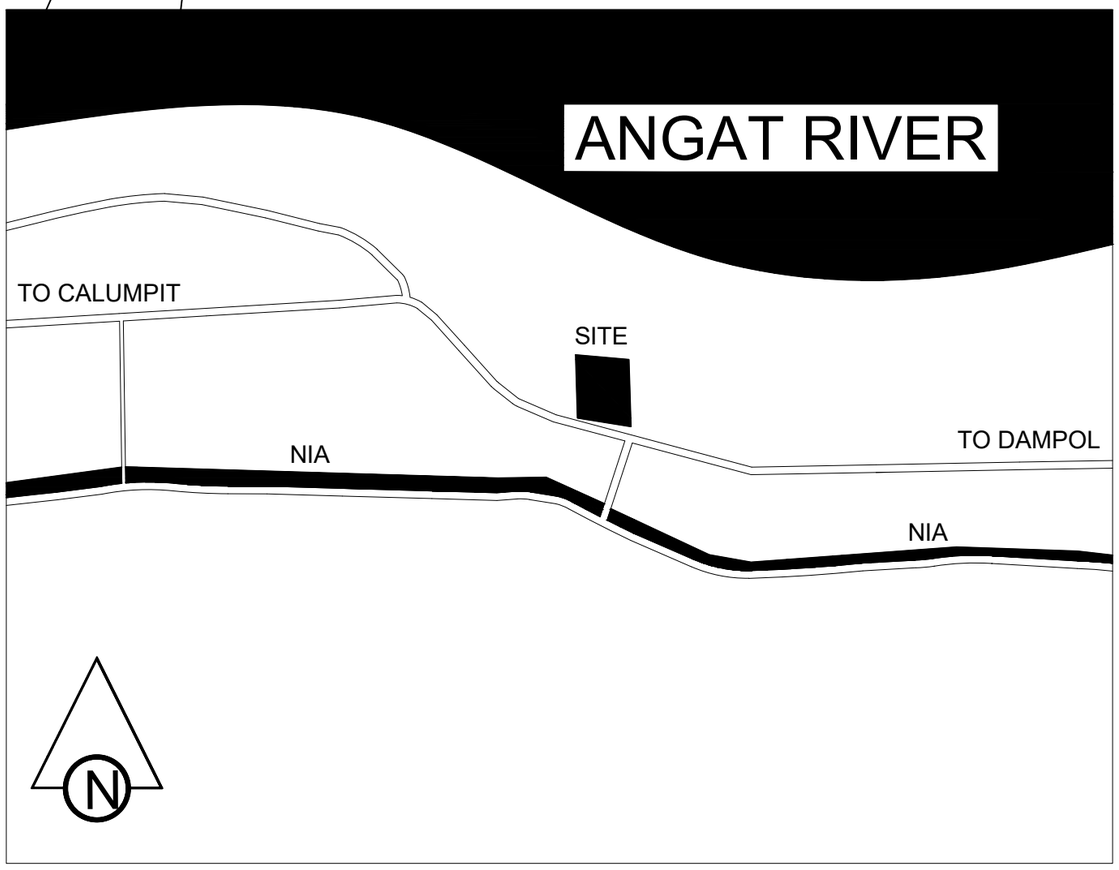
FILE NAME : PLAN
DATE 02.28.2020



SITE DEVELOPMENT PLAN

SCALE NTS





OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	: RON
DATE	: 02.28.2020
REVISION	: 00
CHECKED BY	: CHARLIE
DATE	: 02.28.2020

PROJECT TITLE

DESIGN AND BUILD OF RUEDA
STORAGE FACILITY WITH BOOSTER PUMP

LOCATION: BRGY. RUEDA, PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

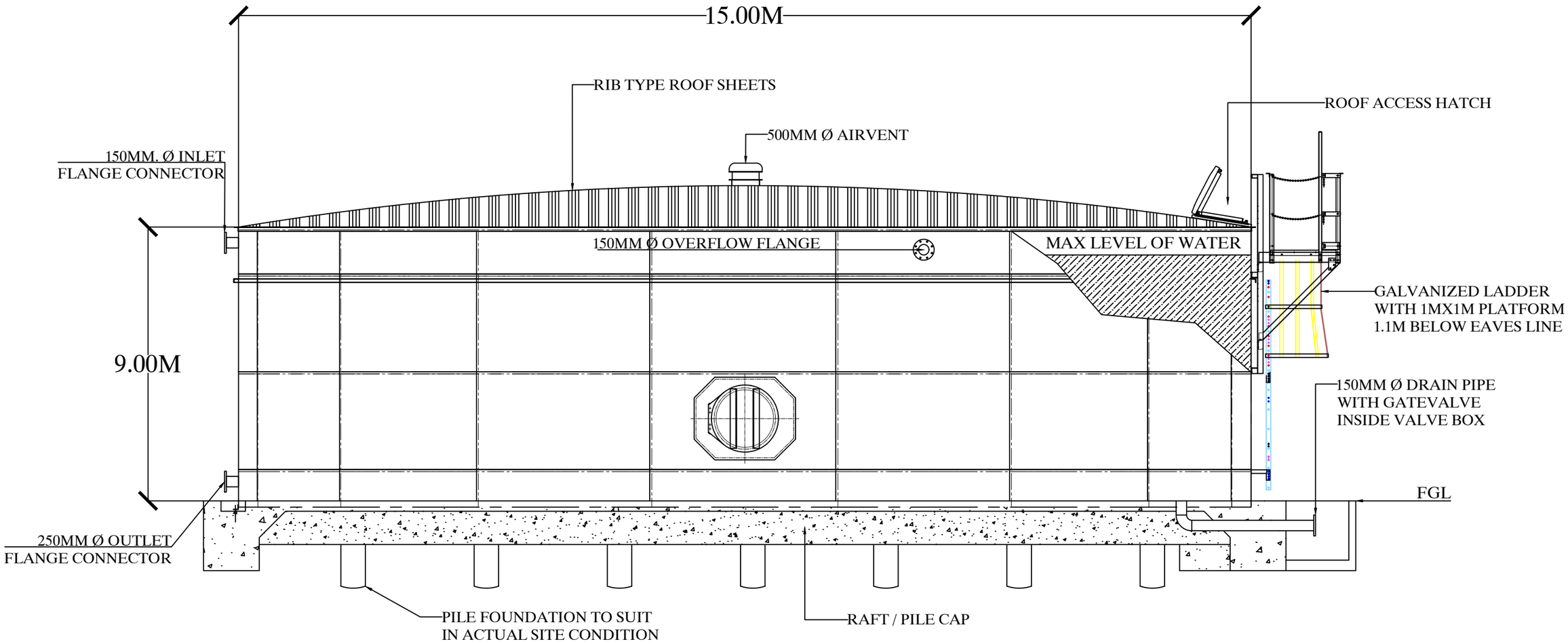
SHEET CONTENTS

SITE DEVELOPMENT PLAN
VICINITY MAP

SHEET NO.

02

FILE NAME : PLAN
DATE 02.28.2020



NOTES:

1. TANK CAPACITY 1,500 CU.M EXPANDABLE TO 2,000 CU.M

GLASS FUSED TO STEEL BOLTED TANK DETAILS

SCALE NTS

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	: RON
DATE	: 02.28.2020
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PROJECT TITLE

DESIGN AND BUILD OF RUEDA
STORAGE FACILITY WITH BOOSTER PUMP

LOCATION: BRGY. RUEDA, PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

TANK ELEVATION
DETAILS

SHEET NO.

03

FILE NAME : PLAN
DATE 02.28.2020

ANNEX 8: Lots for the Proposed Project

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

Proposed Location of PLAWD Office Building

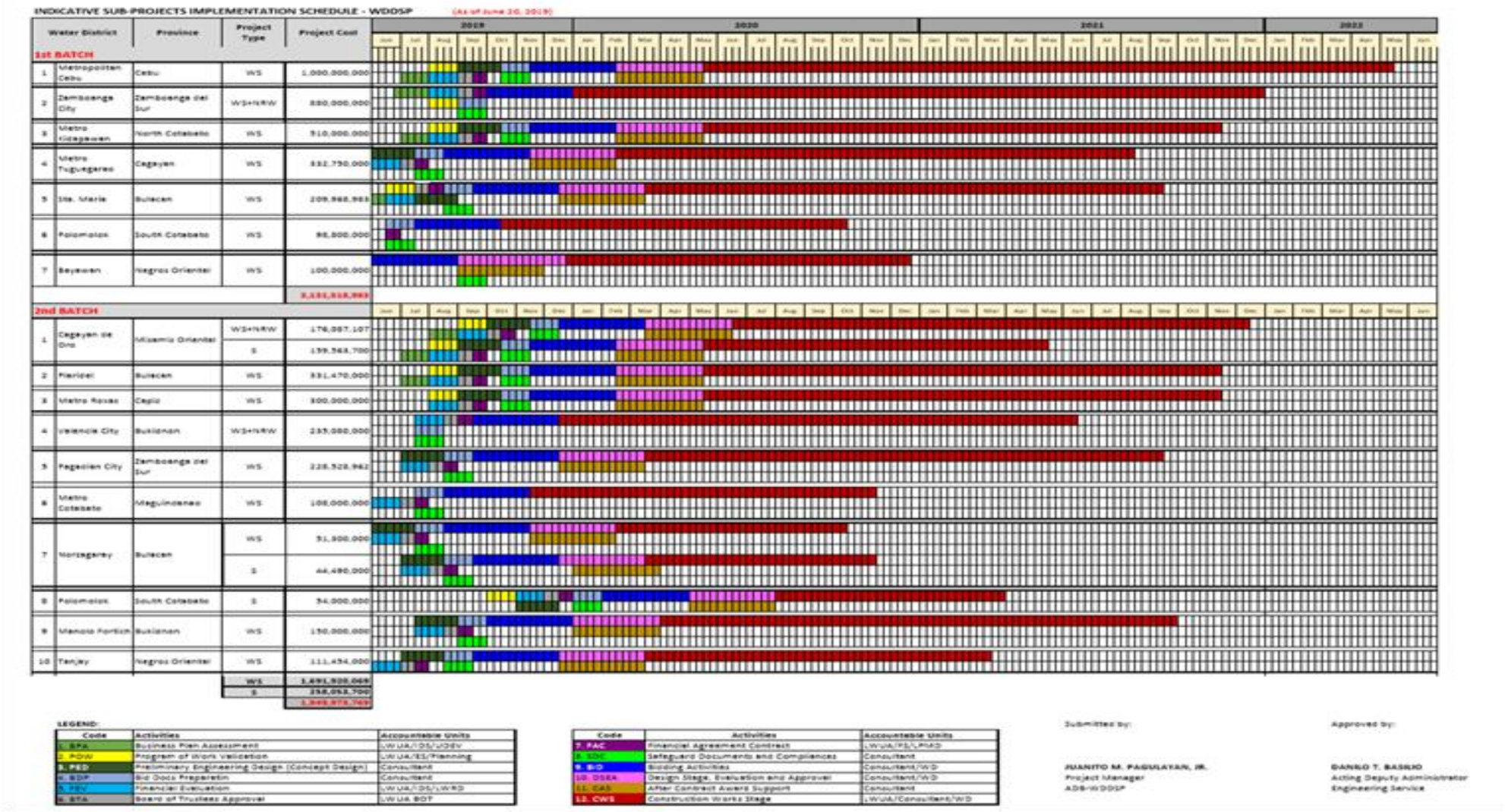
RUEDA PUMP STATION
LOT AREA = 500 SQ. M
Based on actual measurement of Rueda

Proposed Ground Reservoir

BANGA 1ST RESERVOIR
LOT AREA = 500 SQ. M

Proposed Ground Reservoir

ANNEX 9: Indicative Sub-Project Implementation Schedule-WDDSP



Indicative Project Implementation Schedule

Activities	Accountable Units	Mo 1	Mo 2	Mo 3	Mo 4	Mo 5	Mo 6	Mo 7	Mo 8	Mo 9	Mo 10	Mo 11	Mo 12 to Mo 29
Business Plan Assessment	LWUA/IDS/UDEV	■											
Program of Work Validation	LWUA/ES/Planning		■										
Preliminary Engineering Design (Concept Design)	Consultant			■	■								
Bid Documents Preparation	Consultant				■	■							
Financial Evaluation	LWUA/IDS/LWRD		■										
Board of Trustees Approval	LWUA BOT			■									
Financial Agreement Contract	LWUA/FS/LPMD			■									
Safeguard Documents and Compliances	Consultant				■	■							
Bidding Activities	Consultant/WD					■	■	■	■				
Design Stage, Evaluation and Approval	Consultant/WD								■	■	■	■	
After Contract Award Support	Consultant								■	■	■	■	
Construction Works Stage	LWUA/Consultant/WD											■	■

Source: Indicative Sub-Projects Implementation Schedule - WDDSP

ANNEX 10: Summary Results for Physical-Chemical and Microbiological Tests, 2019

Physical-Chemical Test Result Summary

Consumer's Tap — 4-Parameters

		Color	Turbidity	ph	Lead	REMARKS
	units	TCU/ACU	NTU	-	mg/l	
	limits	5/10	5	6.5 to 8.5	0.01	
Tabang		1.0 TCU	1	6.94 @25.0 c	ND (< 0.002)	PASSED
Bintog		1.0 TCU	1	7.32 @25.0 c	ND (< 0.002)	PASSED
Sipat		1.0 TCU	1	6.90 @25.0 c	ND (< 0.002)	PASSED
Parulan		1.0 TCU	1	7.30 @25.0 c	ND (< 0.002)	PASSED
Bulihan		1.0 TCU	1	7.29 @25.0 c	ND (< 0.002)	PASSED
Culianin		1.0 TCU	1	7.28 @25.0 c	ND (< 0.002)	PASSED
Plaridel Heights		1.0 TCU	1	7.01 @25.0 c	ND (< 0.002)	PASSED
Sitio Santiago		1.0 TCU	1	6.98 @25.0 c	ND (< 0.002)	PASSED

Source — 12-Parameters

		Color	Turbidity	ph	Lead	TDS	Nitrate	Arsenic	Cadnium	Iron	Manganese	Chloride	Sulfate	REMARKS
	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 @25.0 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 @25.0 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 @25.0 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 @25.0 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 @25.0 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 @25.0 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 @25.0 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 @25.0 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 @25.0 c	ND (< 0.002)	409	ND (<0.23)	ND (< 0.002)	ND (< 0.003)	ND (< 0.05)	ND (< 0.02)	22	167	PASSED

MICROBIOLOGICAL TEST RESULT SUMMARY 2019

JANUARY

		RESULTS				
Sampling Location	Date	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, Reuda Brgy. Hall	January, 31	<1.1 mpn	<1.1 mpn	>5700	DID NOT PASS	PASSED
Lagundin Brgy. Hall, Lagundi	January, 31	<1.1 mpn	<1.1 mpn	100	PASSED	-
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, Juliana 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	-

FEBRUARY

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Rueda Saklolo, Tabang Looban	February, 28	<1.1 mpn	<1.1 mpn	160	PASSED	-
Premitivo, Rocka 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	-
Rodolfo Aquino, 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	-

MARCH

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Lumang Bayan, Acro Stop	march, 19	>8.0 mpn	1.1 mpn	2400	DID NOT PASS	PASSED
Sipat, Sipat Brgy. Hall	march, 19	<1.1 mpn	<1.1 mpn	160	PASSED	-
NHA, Rhonnel Reyes	march, 19	8.0 mpn	1.1 mpn	1500	DID NOT PASS	PASSED
Dampol, Dampol Highschool	march, 19	<1.1 mpn	<1.1 mpn	200	PASSED	-
Rueda, Rueda Health Care Center	march, 19	<1.1 mpn	<1.1 mpn	220	PASSED	-
Lagundi, Lagundi Brgy. Hall	march, 19	<1.1 mpn	<1.1 mpn	180	PASSED	-
Sta. Monica Subd., Ibarra Villafuerte	march, 19	<1.1 mpn	<1.1 mpn	60	PASSED	-
Mary Grace Subd., Rafael Austero	march, 19	<1.1 mpn	<1.1 mpn	90	PASSED	-
Lalangan. Phil-state Guard House	march, 19	<1.1 mpn	<1.1 mpn	170	PASSED	-
Agnaya, Agnaya Brgy. Hall	march, 19	<1.1 mpn	<1.1 mpn	60	PASSED	-
Sta. Ines Bukid, Juliana Ensinas	march, 19	<1.1 mpn	<1.1 mpn	35	PASSED	-
Tabang Looban, Anso Steban	march, 19	<1.1 mpn	<1.1 mpn	60	PASSED	-
Rocka Ville, Osorya	march, 19	<1.1 mpn	<1.1 mpn	120	PASSED	-
Banga II, Gatmalan Mazla	march, 19	<1.1 mpn	<1.1 mpn	110	PASSED	-
Parulan, Pacifico	march, 19	<1.1 mpn	<1.1 mpn	170	PASSED	-
Bintog, Crispin Revera	march, 19	<1.1 mpn	<1.1 mpn	50	PASSED	-
Culianin, Ventura	march, 19	<1.1 mpn	<1.1 mpn	250	PASSED	-
San Jose, Analyn Castillo	march, 19	<1.1 mpn	<1.1 mpn	60	PASSED	-
Bulihan, Santiago Manuel	march, 19	<1.1 mpn	<1.1 mpn	35	PASSED	-
Bagong Silang, Glen Islvio	march, 19	<1.1 mpn	<1.1 mpn	300	PASSED	-
La Mirada Subd., Oscar oy	march, 19	<1.1 mpn	<1.1 mpn	150	PASSED	-
Banga I, Rudle Saclolo	march, 19	<1.1 mpn	<1.1 mpn	120	PASSED	-
Poblacion, jaycob Coldero	march, 19	8.0 mpn	2.6 mpn	2400	DID NOT PASS	PASSED

APRIL

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Lumang Bayan, Ligaya	April, 16	<1.1 mpn	<1.1 mpn	160	PASSED	-
Sipat, Marisa	April, 16	<1.1 mpn	<1.1 mpn	35	PASSED	-
Dampol, Maginang	April, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
Rueda, Melinda	April, 16	<1.1 mpn	<1.1 mpn	130	PASSED	-
Lagundi, Austria	April, 16	<1.1 mpn	<1.1 mpn	150	PASSED	-
Sta. Monica Subd., De Guzman	April, 16	<1.1 mpn	<1.1 mpn	35	PASSED	-
Mary Grace Subd., Marina Sayo	April, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
Lalangan, Pagdanganan	April, 16	<1.1 mpn	<1.1 mpn	110	PASSED	-
Agnaya, Nemicia	April, 16	<1.1 mpn	<1.1 mpn	150	PASSED	-
Sta. Ines Bukid, Mercado	April, 16	<1.1 mpn	<1.1 mpn	35	PASSED	-
Tabang Looban, Erund Surio	April, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
Rocka Ville, Joselito Samson	April, 16	<1.1 mpn	<1.1 mpn	90	PASSED	-
Banga II, Lety Murande	April, 16	<1.1 mpn	<1.1 mpn	45	PASSED	-
Parulan, Brgy. Hall	April, 16	<1.1 mpn	<1.1 mpn	180	PASSED	-
Bintog, Vicente Dela Cruz	April, 16	<1.1 mpn	<1.1 mpn	35	PASSED	-
Culianin, Lilita Garcia	April, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
San Jose, Celerina Aguilar	April, 16	<1.1 mpn	<1.1 mpn	120	PASSED	-
Bulihan 1, Brgy. Hall	April, 16	<1.1 mpn	<1.1 mpn	35	PASSED	-
Bagong Silang, Crispina Dimapilis	April, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
La Mirada Subd., La Mirada	April, 16	<1.1 mpn	<1.1 mpn	120	PASSED	-
Banga I, Malon Galang	April, 16	<1.1 mpn	<1.1 mpn	110	PASSED	-
Poblacion, Brgy. Hall	April, 16	<1.1 mpn	<1.1 mpn	180	PASSED	-

May

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Lumang Bayan, Remedios San Pedro	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Sipat, Eliseo Vinta	May, 20	<1.1 mpn	<1.1 mpn	45	PASSED	-
NHA, Celson Santillina	May, 20	<1.1 mpn	<1.1 mpn	90	PASSED	-
Dampol, Dampol High School	May, 20	<1.1 mpn	<1.1 mpn	170	PASSED	-
Rueda, Rueda Brgy. Hall	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Lagundi, Lagundi Brgy. Hall	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Sta. Monica Subd., Ibarra Villafuerte	May, 20	<1.1 mpn	<1.1 mpn	50	PASSED	-
Mary Grace Subd., Rafael Austero	May, 20	<1.1 mpn	<1.1 mpn	45	PASSED	-
Lalangan, Phil-State Guard House	May, 20	<1.1 mpn	<1.1 mpn	90	PASSED	-
Agnaya, Agnaya Brgy. Hall	May, 20	<1.1 mpn	<1.1 mpn	160	PASSED	-
Sta. Ines Bukid, Juliana Ensinas	May, 20	<1.1 mpn	<1.1 mpn	35	PASSED	-
Tabang Looban, Manreza Armando	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Rocka Ville, Primitivo Osorio	May, 20	<1.1 mpn	<1.1 mpn	170	PASSED	-
Banga II, Cecilia Rodriguez	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Parulan, Analiza Paucate	May, 20	<1.1 mpn	<1.1 mpn	170	PASSED	-
Bintog, Bintog Elem.	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Culinain	May, 20	<1.1 mpn	<1.1 mpn	35	PASSED	-
San Jose, San Jose elem.	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Bulihan, Don Nemencio Clemena M. School	May, 20	<1.1 mpn	<1.1 mpn	120	PASSED	-
Bagong Silang, Victorina Ospena	May, 20	<1.1 mpn	<1.1 mpn	110	PASSED	-
La Mirada Subd. Clubhouse Panaligan	May, 20	<1.1 mpn	<1.1 mpn	170	PASSED	-
Banga I, Mauro Pangolina	May, 20	<1.1 mpn	<1.1 mpn	60	PASSED	-
Poblacion, PLAWD	May, 20	<1.1 mpn	<1.1 mpn	80	PASSED	-

June

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Lumang Bayan. Brgy. Hall	June, 25	<1.1 mpn	<1.1 mpn	50	PASSED	-
Sipat, June Yumul	June, 25	<1.1 mpn	<1.1 mpn	45	PASSED	-
NHA, Nalyn Tengco	June, 25	<1.1 mpn	<1.1 mpn	50	PASSED	-
Dampol, Arlyn Manahan	June, 25	<1.1 mpn	<1.1 mpn	100	PASSED	-
Rueda, Alexander Concepcion	June, 25	<1.1 mpn	<1.1 mpn	60	PASSED	-
Lagundi, Brgy. Hall	June, 25	<1.1 mpn	<1.1 mpn	35	PASSED	-
Sta. Monica Subd. Feleza Lucas	June, 25	<1.1 mpn	<1.1 mpn	160	PASSED	-
Mary Grace Subd. O.B.G	June, 25	<1.1 mpn	<1.1 mpn	130	PASSED	-
Lalangan, Pagdanganan	June, 25	<1.1 mpn	<1.1 mpn	60	PASSED	-
Agnaya, Brgy. Hall	June, 25	<1.1 mpn	<1.1 mpn	50	PASSED	-
Sta. Ines Bukid, Concia Manal	June, 25	<1.1 mpn	<1.1 mpn	60	PASSED	-
Tabang Looban, Emiliana Roque	June, 25	<1.1 mpn	<1.1 mpn	70	PASSED	-
Rocka Ville, Ryan Bernejo	June, 25	<1.1 mpn	<1.1 mpn	60	PASSED	-
Banga II, Banga II Brgy. Hall	June, 25	<1.1 mpn	<1.1 mpn	35	PASSED	-
Parulan, Parulan Brgy. Hall	June, 25	<1.1 mpn	<1.1 mpn	60	PASSED	-
Bintog, Bintog Brgy. Hall	June, 25	<1.1 mpn	<1.1 mpn	150	PASSED	-
Culianin, Griselda Suterio	June, 25	<1.1 mpn	<1.1 mpn	60	PASSED	-
San jose, Donato Jacinto	June, 25	<1.1 mpn	<1.1 mpn	45	PASSED	-
Bulihan, Bulihan Brgy. Hall	June, 25	<1.1 mpn	<1.1 mpn	90	PASSED	-
Bagong Silang, Giliermo Reves	June, 25	<1.1 mpn	<1.1 mpn	110	PASSED	-
La Mirada Subd. Rustico Bernabe	June, 25	<1.1 mpn	<1.1 mpn	160	PASSED	-
Banga I, R. Javier	June, 25	<1.1 mpn	<1.1 mpn	35	PASSED	-
Poblacion, PLAWD	June, 25	<1.1 mpn	<1.1 mpn	90	PASSED	-

July

RESULTS

Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Lumang Bayan, N. Espiritu	July, 24	1.1 mpn	<1.1 mpn	80	DID NOT PASS	PASSED
Sipat, E. Escibar	July, 24	<1.1 mpn	<1.1 mpn	300	PASSED	-
NHA, A. Laza	July, 24	1.1 mpn	<1.1 mpn	80	DID NOT PASS	PASSED
Dampol, J. San Pedro	July, 24	<1.1 mpn	<1.1 mpn	100	PASSED	-
Rueda, Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	5700	DID NOT PASS	PASSED
Lagundi/ Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	50	PASSED	-
Sta. Monica Subd., P. Lucas	July, 24	<1.1 mpn	<1.1 mpn	15	PASSED	-
Mary Grace Subd., C. Mizon	July, 24	<1.1 mpn	<1.1 mpn	35	PASSED	-
Lalangan, E. Pagdanganan	July, 24	2.6 mpn	>8.0 mpn	2000	DID NOT PASS	PASSED
Agnaya, Brgy. Hall	July, 24	>8.0 mpn	>8.0 mpn	>5700	DID NOT PASS	PASSED
Sta. Ines Bukid, M. Acosta	July, 24	<1.1 mpn	<1.1 mpn	20	PASSED	-
Tabang Looban, Agnes Ramos	July, 24	<1.1 mpn	<1.1 mpn	60	PASSED	-
Rocka Ville, P. Osorio III	July, 24	<1.1 mpn	<1.1 mpn	10	PASSED	-
BangaII, Banga II Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	20	PASSED	-
Parulan, Parulan Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	10	PASSED	-
Bintog, Bintog Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	10	PASSED	-
Culianin, Analy Manaloto	July, 24	1.1 mpn	<1.1 mpn	50	DID NOT PASS	PASSED
San Jose, San Jose Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	50	PASSED	
Bulihan, Bulihan Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	150	PASSED	-
Bagong Silang, Bagong Silang Brgy. Hall	July, 24	>8.0 mpn	>8.0 mpn	>5700	DID NOT PASS	PASSED
La Mirada Subd., La Mirada Club House	July, 24	<1.1 mpn	<1.1 mpn	80	PASSED	-
Banga I, Banga I Brgy. Hall	July, 24	<1.1 mpn	<1.1 mpn	130	PASSED	-
Poblacion, Poblacion Brgy. Hall	July, 24	>8.0 mpn	>8.0 mpn	>5700	DID NOT PASS	PASSED

August

RESULTS

Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Tabang Pump Station	August, 16	<1.1 mpn	<1.1 mpn	120	PASSED	-
Sitio Santiago Pump Station	August, 16	<1.1 mpn	<1.1 mpn	90	PASSED	-
Plaridel Heights Pump Station	August, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
Sipat Pump Station	August, 16	<1.1 mpn	<1.1 mpn	80	PASSED	-
Isabel Village Daycare Center	August, 16	<1.1 mpn	<1.1 mpn	90	PASSED	-
Rueda Elementary School	August, 16	<1.1 mpn	<1.1 mpn	120	PASSED	-
NHA	August, 16	<1.1 mpn	<1.1 mpn	150	PASSED	-
Poblacion	August, 16	<1.1 mpn	<1.1 mpn	70	PASSED	-
Banga II Elementary School	August, 16	<1.1 mpn	<1.1 mpn	120	PASSED	-
Lalangan Elementary School	August, 16	<1.1 mpn	<1.1 mpn	150	PASSED	-
Agnaya Daycare Center	August, 16	<1.1 mpn	<1.1 mpn	90	PASSED	-
Sta. Monica Subdivision	August, 16	<1.1 mpn	<1.1 mpn	80	PASSED	-
Rocka Village	August, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
La Mirada	August, 16	<1.1 mpn	<1.1 mpn	90	PASSED	-
Parulan Pump Station	August, 16	<1.1 mpn	<1.1 mpn	80	PASSED	-
Bulihan Pump Station	August, 16	<1.1 mpn	<1.1 mpn	110	PASSED	-
Culianin Pump Station	August, 16	<1.1 mpn	<1.1 mpn	120	PASSED	-
Bintog Pump Station	August, 16	<1.1 mpn	<1.1 mpn	90	PASSED	-
Parulan Elementary School	August, 16	<1.1 mpn	<1.1 mpn	70	PASSED	-
Bintog Elementary School/Daycare Center	August, 16	<1.1 mpn	<1.1 mpn	110	PASSED	-
San Jose Elementary School/Daycare Center	August, 16	<1.1 mpn	<1.1 mpn	90	PASSED	-
Lumina	August, 16	<1.1 mpn	<1.1 mpn	60	PASSED	-
Bulihan Elementary School/Daycare Center	August, 16	<1.1 mpn	<1.1 mpn	80	PASSED	-

September

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Tabang Pump Station	September, 13	<1.1 mpn	<1.1 mpn	60	PASSED	-
Sitio Santiago Pump Station	September, 13	<1.1 mpn	<1.1 mpn	80	PASSED	-
Plaridel Heights Pump Station	September, 13	<1.1 mpn	<1.1 mpn	70	PASSED	-
Sipat Pump Station	September, 13	<1.1 mpn	<1.1 mpn	50	PASSED	-
Isabel Village Daycare Center	September, 13	<1.1 mpn	<1.1 mpn	90	PASSED	-
Rueda Elementary School	September, 13	<1.1 mpn	<1.1 mpn	80	PASSED	-
NHA	September, 13	<1.1 mpn	<1.1 mpn	90	PASSED	-
Poblacion	September, 13	<1.1 mpn	<1.1 mpn	70	PASSED	-
Banga II Elementary School	September, 13	<1.1 mpn	<1.1 mpn	90	PASSED	-
Lalangan Elementary School	September, 13	<1.1 mpn	<1.1 mpn	60	PASSED	-
Agnaya Daycare Center	September, 13	<1.1 mpn	<1.1 mpn	70	PASSED	-
Sta. Monica Subdivision	September, 13	<1.1 mpn	<1.1 mpn	90	PASSED	-
Rocka Village	September, 13	<1.1 mpn	<1.1 mpn	50	PASSED	-
La Mirada	September, 13	<1.1 mpn	<1.1 mpn	60	PASSED	-
Parulan Pump Station	September, 13	<1.1 mpn	<1.1 mpn	80	PASSED	-
Bulihan Pump Station	September, 13	<1.1 mpn	<1.1 mpn	50	PASSED	-
Culianin Pump Station	September, 13	<1.1 mpn	<1.1 mpn	70	PASSED	-
Bintog Pump Station	September, 13	<1.1 mpn	<1.1 mpn	40	PASSED	-
Parulan Elementary School	September, 13	<1.1 mpn	<1.1 mpn	60	PASSED	-
Bintog Elementary School/Daycare Center	September, 13	<1.1 mpn	<1.1 mpn	80	PASSED	-
San Jose Elementary School/Daycare Center	September, 13	<1.1 mpn	<1.1 mpn	90	PASSED	-
Lumina	September, 13	<1.1 mpn	<1.1 mpn	70	PASSED	-
Bulihan Elementary School/Daycare Center	September, 13	<1.1 mpn	<1.1 mpn	90	PASSED	-

October

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Tabang Pump Station	October, 4	<1.1 mpn	<1.1 mpn	90	PASSED	-
Sitio Santiago Pump Station	October, 4	<1.1 mpn	<1.1 mpn	60	PASSED	-
Plaridel Heights Pump Station	October, 4	<1.1 mpn	<1.1 mpn	70	PASSED	-
Sipat Pump Station	October, 4	<1.1 mpn	<1.1 mpn	60	PASSED	-
Isabel Village Daycare Center	October, 4	<1.1 mpn	<1.1 mpn	90	PASSED	-
Rueda Elementary School	October, 4	<1.1 mpn	<1.1 mpn	70	PASSED	-
NHA	October, 4	<1.1 mpn	<1.1 mpn	60	PASSED	-
Poblacion	October, 4	<1.1 mpn	<1.1 mpn	90	PASSED	-
Banga II Elementary School	October, 4	<1.1 mpn	<1.1 mpn	80	PASSED	-
Lalangan Elementary School	October, 4	<1.1 mpn	<1.1 mpn	50	PASSED	-
Agnaya Daycare Center	October, 4	<1.1 mpn	<1.1 mpn	60	PASSED	-
Sta. Monica Subdivision	October, 4	<1.1 mpn	<1.1 mpn	120	PASSED	-
Rocka Village	October, 4	<1.1 mpn	<1.1 mpn	50	PASSED	-
La Mirada	October, 4	<1.1 mpn	<1.1 mpn	90	PASSED	-
Parulan Pump Station	October, 4	<1.1 mpn	<1.1 mpn	80	PASSED	-
Bulihan Pump Station	October, 4	<1.1 mpn	<1.1 mpn	120	PASSED	-
Culianin Pump Station	October, 4	<1.1 mpn	<1.1 mpn	70	PASSED	-
Bintog Pump Station	October, 4	<1.1 mpn	<1.1 mpn	40	PASSED	-
Parulan Elementary School	October, 4	<1.1 mpn	<1.1 mpn	90	PASSED	-
Bintog Elementary School/Daycare Center	October, 4	<1.1 mpn	<1.1 mpn	70	PASSED	-
San Jose Elementary School/Daycare Center	October, 4	<1.1 mpn	<1.1 mpn	60	PASSED	-
Lumina	October, 4	<1.1 mpn	<1.1 mpn	110	PASSED	-
Bulihan Elementary School/Daycare Center	October, 4	<1.1 mpn	<1.1 mpn	90	PASSED	-

November

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Banga II Elementary School	November, 8	<1.1 mpn	<1.1 mpn	80	PASSED	-
Rocka Village	November, 8	<1.1 mpn	<1.1 mpn	120	PASSED	-
La Mirada	November, 8	<1.1 mpn	<1.1 mpn	90	PASSED	-
Parulan Pump Station	November, 8	<1.1 mpn	<1.1 mpn	110	PASSED	-
Bulihan Pump Station	November, 8	<1.1 mpn	<1.1 mpn	110	PASSED	-
Culianin Pump Station	November, 8	<1.1 mpn	<1.1 mpn	80	PASSED	-
Bintog Pump Station	November, 8	<1.1 mpn	<1.1 mpn	50	PASSED	-
Parulan Elementary School	November, 8	<1.1 mpn	<1.1 mpn	70	PASSED	-
Bintog Elementary School/Daycare Center	November, 8	<1.1 mpn	<1.1 mpn	40	PASSED	-
San Jose Elementary School/Daycare Center	November, 8	<1.1 mpn	<1.1 mpn	90	PASSED	-
Lumina	November, 8	<1.1 mpn	<1.1 mpn	110	PASSED	-
Bulihan Elementary School/Daycare Center	November, 8	<1.1 mpn	<1.1 mpn	90	PASSED	-
Tabang Pump Station	November, 8	<1.1 mpn	<1.1 mpn	80	PASSED	-
Sitio Santiago Pump Station	November, 8	<1.1 mpn	<1.1 mpn	120	PASSED	-
Plaridel Heights Pump Station	November, 8	<1.1 mpn	<1.1 mpn	90	PASSED	-
Sipat Pump Station	November, 8	<1.1 mpn	<1.1 mpn	110	PASSED	-
Isabel Village Daycare Center	November, 8	<1.1 mpn	<1.1 mpn	110	PASSED	-
Rueda Elementary School	November, 8	<1.1 mpn	<1.1 mpn	80	PASSED	-
Sipat Elementary School	November, 8	<1.1 mpn	<1.1 mpn	50	PASSED	-
Poblacion	November, 8	<1.1 mpn	<1.1 mpn	70	PASSED	-
Lalangan Elementary School	November, 8	<1.1 mpn	<1.1 mpn	120	PASSED	-
Agnaya Daycare Center	November, 8	<1.1 mpn	<1.1 mpn	90	PASSED	-
Sta. Monica Subdivision	November, 8	<1.1 mpn	<1.1 mpn	50	PASSED	-

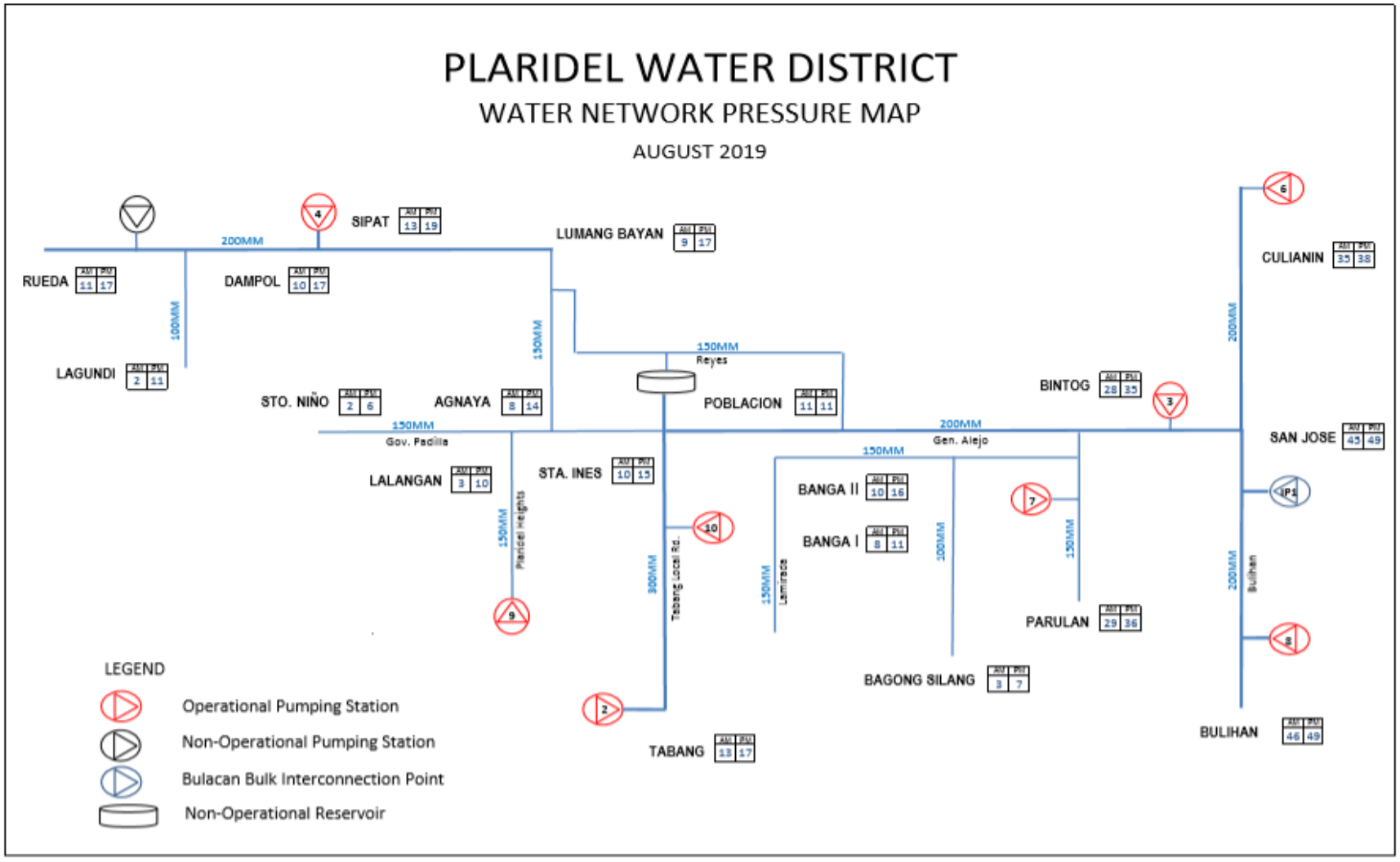
December

		RESULTS				
Sampling Location	Date	Total Coliform	Thermotolerant Coliform	HPC	Remarks	Re-test
Banga II Elementary School	December, 6	<1.1 mpn	<1.1 mpn	120	PASSED	-
Rocka Village	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
La Mirada	December, 6	<1.1 mpn	<1.1 mpn	60	PASSED	-
Parulan Pump Station	December, 6	<1.1 mpn	<1.1 mpn	80	PASSED	-
Bulihan Pump Station	December, 6	<1.1 mpn	<1.1 mpn	50	PASSED	-
Culianin Pump Station	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
Bintog Pump Station	December, 6	<1.1 mpn	<1.1 mpn	120	PASSED	-
Parulan Elementary School	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
Bintog Elementary School/Daycare Center	December, 6	<1.1 mpn	<1.1 mpn	70	PASSED	-
San Jose Elementary School/Daycare Center	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
Lumina	December, 6	<1.1 mpn	<1.1 mpn	50	PASSED	-
Bulihan Elementary School/Daycare Center	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
Tabang Pump Station	December, 6	<1.1 mpn	<1.1 mpn	150	PASSED	-
Sitio Santiago Pump Station	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
Plaridel Heights Pump Station	December, 6	<1.1 mpn	<1.1 mpn	80	PASSED	-
Sipat Pump Station	December, 6	<1.1 mpn	<1.1 mpn	50	PASSED	-
Isabel Village Daycare Center	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
St. James Academy	December, 6	<1.1 mpn	<1.1 mpn	120	PASSED	-
Sipat Elementary School	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
Poblacion	December, 6	<1.1 mpn	<1.1 mpn	70	PASSED	-
Lalangan Elementary School	December, 6	<1.1 mpn	<1.1 mpn	90	PASSED	-
Agnaya Daycare Center	December, 6	<1.1 mpn	<1.1 mpn	120	PASSED	-
Sta. Monica Subdivision	December, 6	<1.1 mpn	<1.1 mpn	80	PASSED	-

Limits:

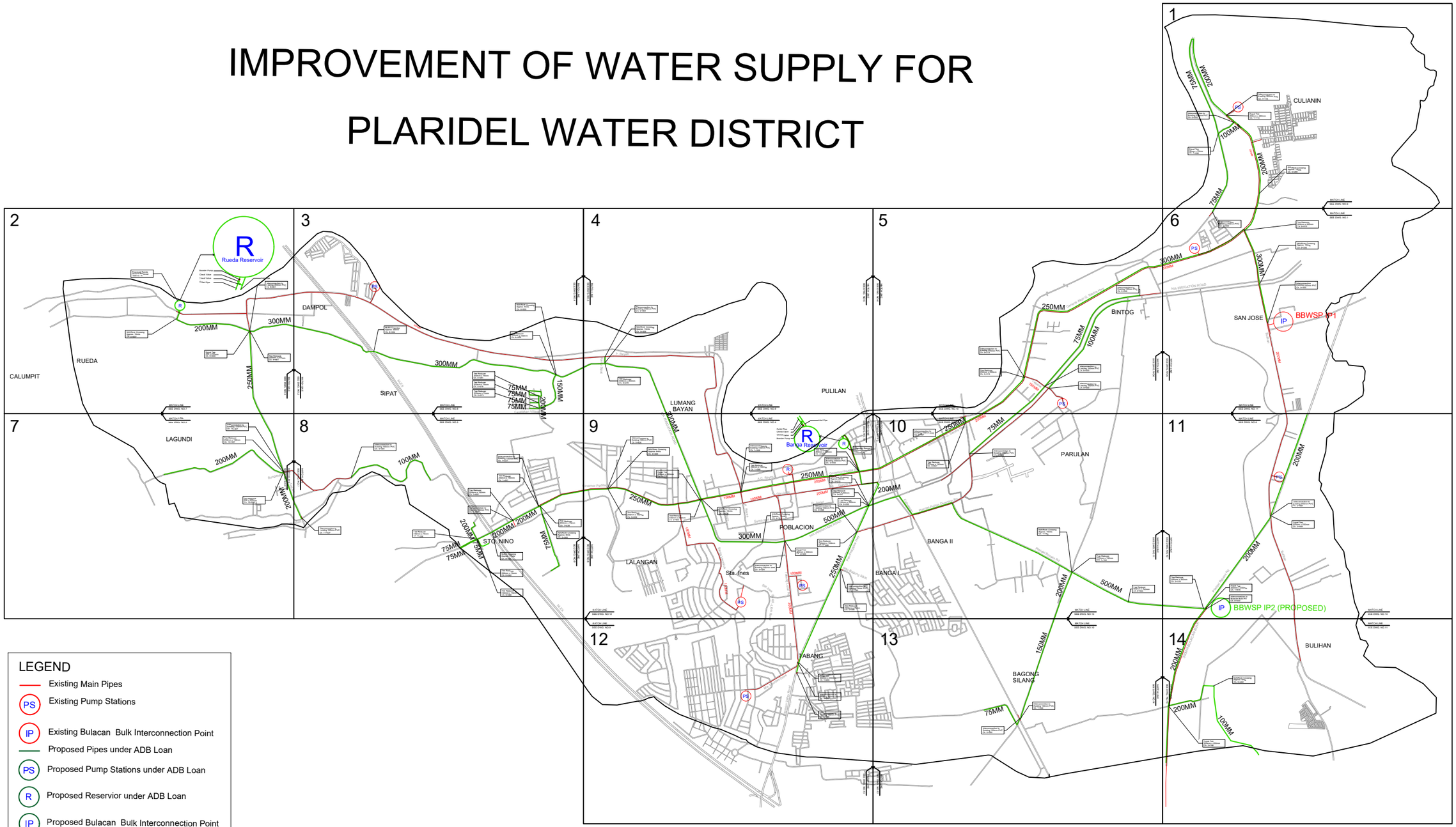
Total Coliform < 1.1 mpn / 100ml
Thermotolerant Coliform < 1.1 mpn / 100ml
HPC < 500 cfu / ml

ANNEX 11: PLAWD Water Supply Schematic Map



ANNEX 12: Proposed Water Supply Improvement

IMPROVEMENT OF WATER SUPPLY FOR PLARIDEL WATER DISTRICT



LEGEND

- Existing Main Pipes
- PS — Existing Pump Stations
- IP — Existing Bulacan Bulk Interconnection Point
- Proposed Pipes under ADB Loan
- PS — Proposed Pump Stations under ADB Loan
- R — Proposed Reservior under ADB Loan
- IP — Proposed Bulacan Bulk Interconnection Point
- Proposed Pipes In-House

Scale Bar 1:200

0 1 2 3 4 5

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
REVISION	: 02
CHECKED BY	: CHARLIE
DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

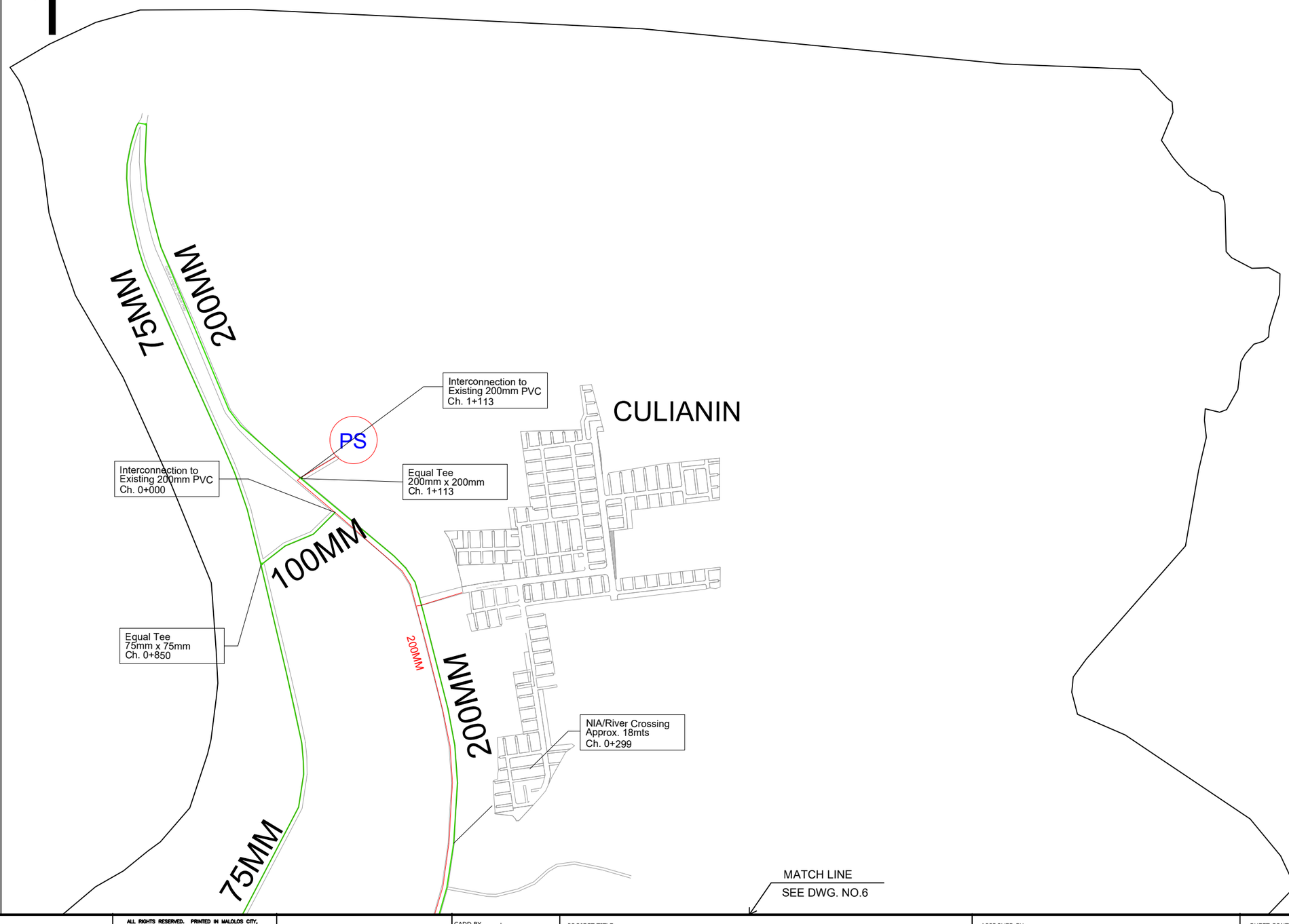
CONCEPT DESIGN

SHEET NO.

00

FILE NAME : PLAN
DATE 05/08/2020

1



OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
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DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

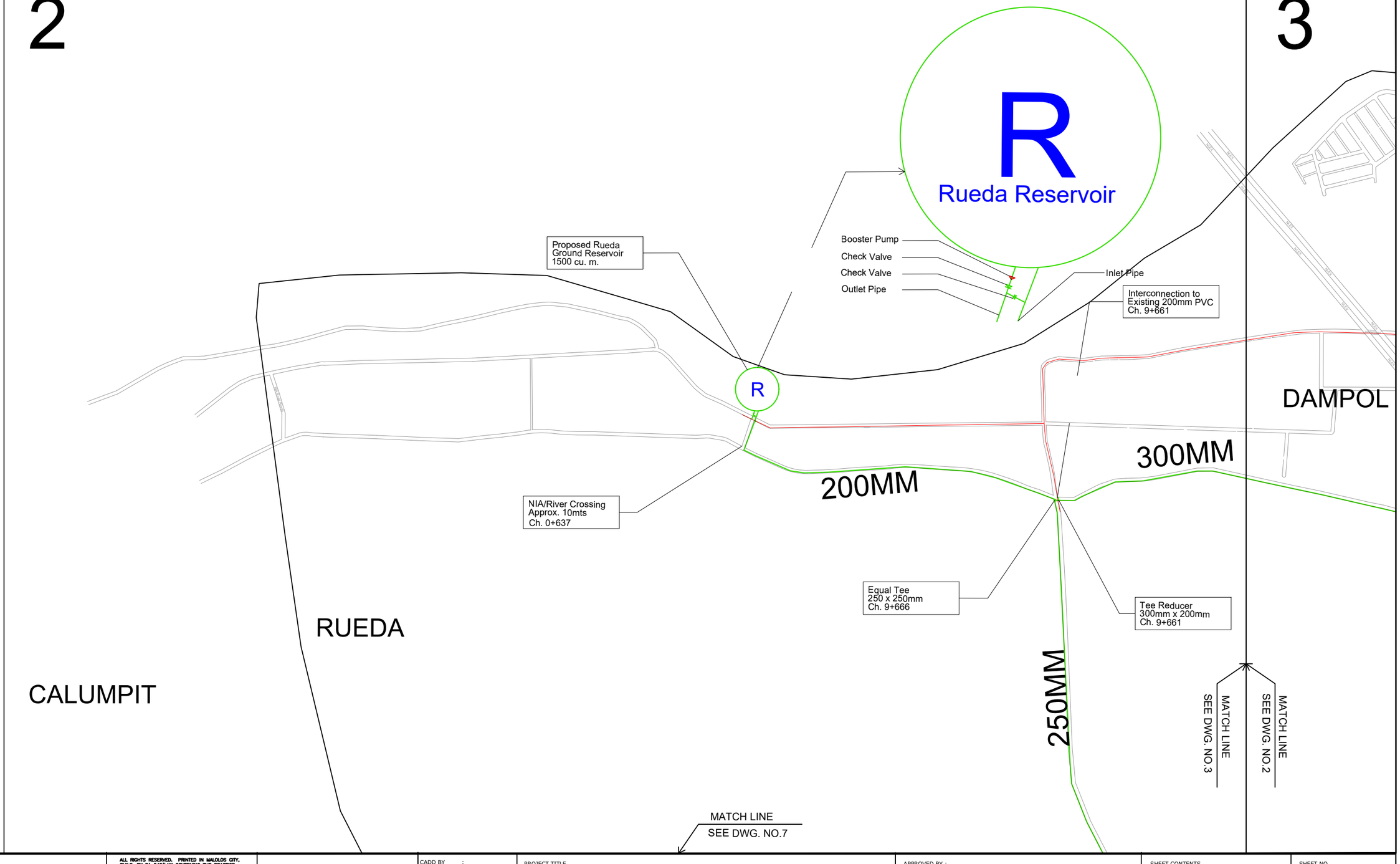
SHEET NO.

01

FILE NAME : PLAN
DATE 05/08/2020

2

3



OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
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DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

02

FILE NAME : PLAN
DATE 05/08/2020

3

4

ɔir

Inlet Pipe

Interconnection to
Existing 200mm PVC
Ch. 9+661

PS

DAMPOL

300MM

NLEX Crossing
Approx. 46mts
Ch. 8+534

200MM

NIA/River Crossing
Approx. 6mts
Ch. 6+930

Tee Reducer
300mm x 150mm
Ch. 6+939

MATCH LINE
SEE DWG. NO.4

MATCH LINE
SEE DWG. NO.3

Tee Reducer
300mm x 200mm
Ch. 9+661

300MM

Tee Reducer
200mm x 75mm
Ch. 0+481

Tee Reducer
200mm x 75mm
Ch. 0+419

Tee Reducer
200mm x 75mm
Ch. 0+373

75MM
75MM
75MM
75MM

A
B
C
D

200M

150MM

Kanlo Sipat

P

MATCH LINE
SEE DWG. NO.3

MATCH LINE
SEE DWG. NO.2

NLEX

SIPAT

MATCH LINE
SEE DWG. NO.8

Kagalakan Village

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO. 4833847 REG NO. 77419
DATE 02/26/2020 DATE 03/25/2021
PLACE PLARIDEL, BUL. TIN 908-505-748

CADD BY :
DATE : 05/08/2020
REVISION : 02
CHECKED BY : CHARLIE
DATE : 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

03

FILE NAME : PLAN
DATE 05/08/2020

4

5

MATCH LINE
SEE DWG. NO.3

MATCH LINE
SEE DWG. NO.4

MATCH LINE
SEE DWG. NO.4

MATCH LINE
SEE DWG. NO.5

Interconnection to
Existing 200mm PVC
Ch. 0+059

NIA/River Crossing
Approx. 10mts
Ch. 0+006

P. Reyes

Kanlo Sipat

Tee Reducer
300mm x 200mm
Ch. 6+472

150MM

LUMANG
BAYAN

PULILAN

Plaridel - Pul

MATCH LINE
SEE DWG. NO.9

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
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PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

04

FILE NAME : PLAN
DATE 05/08/2020

5

6

MATCH LINE
SEE DWG. NO.5

MATCH LINE
SEE DWG. NO.4

MATCH LINE
SEE DWG. NO.6

MATCH LINE
SEE DWG. NO.5

MATCH LINE
SEE DWG. NO.10

PS

300MM

200MM

NIA IRRIGATION

Interconnection to
Existing 100mm PVC
Ch. 2+048

250MM General Alejo G. Santos Hwy

BINTOG

75MM

100MM

Interconnection to
Existing 200mm PVC
Ch. 3+313

Tee Reducer
250mm x 200mm
Ch. 3+313

Interconnection to
Existing 150mm PVC
Ch. 0+000

Interconnection to
Existing 150mm PVC
Ch. 0+000

Lepana
150MM

PS

AN

Plaridel - Pul

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO. 4833847 REG NO. 77419
DATE 02/26/2020 DATE 03/25/2021
PLACE PLARIDEL, BUL. TIN 908-505-748

CADD BY	:
DATE	: 05/08/2020
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CHECKED BY	: CHARLIE
DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

05

FILE NAME : PLAN
DATE 05/08/2020

6

MATCH LINE
SEE DWG. NO.1

Interconnection
Existing 250mm PVC
Ch. 0+000

Tee Reducer
300mm x 200mm
Ch. 0+813

NIA/River Crossing
Approx. 10mts
Ch. 0+334

PS

300MM

200MM

300MM

NIA IRRIGATION ROAD

ction to
0mm PVC

Interconnection
Existing 250mm PVC
Ch. 0+000

OG

SAN JOSE

IP

BBWSP IP1

Bulihan

200MM

MATCH LINE
SEE DWG. NO.6

MATCH LINE
SEE DWG. NO.5

MATCH LINE
SEE DWG. NO.11

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
REVISION	: 02
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DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

06

FILE NAME : PLAN
DATE 05/08/2020

7

8

MATCH LINE
SEE DWG. NO.2

LAGUNDI

Interconnection to
Existing 100mm PVC
Ch. 10+907

Tee Reducer
250mm x 100mm
Ch. 10+907

200MM

Bungahan

MATCH LINE
SEE DWG. NO.8

MATCH LINE
SEE DWG. NO.7

Lugam

200MM

Tee Reducer
250 x 200mm
Ch. 10+910

Pinahan

Interconn
Existing 1
Ch. 11+32

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
REVISION	: 02
CHECKED BY	: CHARLIE
DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

07

FILE NAME : PLAN

DATE 05/08/2020

8

9

MATCH LINE
SEE DWG. NO.3

Interconnection to
Existing 100mm PVC
Ch. 0+000

100MM

Interconnection to
Existing 100mm PVC
Ch. 1+441

Tee Reducer
250mm x 150mm
Ch. 1+441

Tee Reducer
200mm x 100mm
Ch. 1+691

Interconnection to
Existing 100mm PVC
Ch. 1+691

Tee Reducer
250mm x 75mm
Ch. 1+438

NIA/River Crossing
Approx. 6mts
Ch. 0+065

MATCH LINE
SEE DWG. NO.8

MATCH LINE
SEE DWG. NO.7

200MM

Bungahan

Lugam

Governor Padilla Rd

Pinahan

Interconnection to
Existing 100mm PVC
Ch. 11+327

Tee Reducer
200mm x 75mm
Ch. 0+396

200MM

200MM

200MM

75MM

75MM

75MM

75MM

STO. NINO

NLEX Crossing
Approx. 77mts
Ch. 0+195

MATCH LINE
SEE DWG. NO.9

MATCH LINE
SEE DWG. NO.8

Tee Reducer
200mm x 75mm
Ch. 0+382

Tee Reducer
200mm x 75mm
Ch. 0+388

NLEX

MATCH LINE
SEE DWG. NO.12

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
REVISION	: 02
CHECKED BY	: CHARLIE
DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

08

FILE NAME : PLAN

DATE 05/08/2020

9

10

MATCH LINE
SEE DWG. NO.4

MATCH LINE
SEE DWG. NO.10

MATCH LINE
SEE DWG. NO.9

MATCH LINE
SEE DWG. NO.9

MATCH LINE
SEE DWG. NO.8

MATCH LINE
SEE DWG. NO.12

Inlet Pipe
Outlet Pipe
Check Valve
Check Valve
Booster Pump

R
Banga Reservoir

R

Proposed Banga I
Ground Reservoir
1500 cu. m.

Interconnection to
Existing 150mm PVC
Ch. 0+826

NIA/River Crossing
Approx. 6mts
Ch. 0+820

Equal Tee
250mm x 250mm
Ch. 0+010

Tee Reducer
250mm x 150mm
Ch. 0+826

Tee Reducer
250mm x 75mm
Ch. 1+438

NIA/River Crossing
Approx. 6mts
Ch. 0+065

Interconnection to
Existing 150mm PVC
Ch. 1+398

Tee Reducer
250mm x 150mm
Ch. 1+398

Tee Reducer
250mm x 200mm
Ch. 4+937

Interconnection to
Existing 200mm PVC
Ch. 4+956

NIA/River Crossing
Approx. 20mts
Ch. 0+010

Tee Reducer
500mm x 200mm
Ch. 3+231

Tee Reducer
500mm x 250mm
Ch. 3+232

Interconnection to
Existing 100mm PVC
Ch. 0+248

Tee Reducer
300mm x 250mm
Ch. 4+933

NIA/River Crossing
Approx. 16mts
Ch. 0+334

NIA/River Crossing
Approx. 12mts
Ch. 4+163

Tee Reducer
250mm x 100mm
Ch. 0+248

Equal Tee
300mm x 300mm
Ch. 4+026

Interconnection to
Existing 300mm steel
Ch. 4+026

Interconnection to
Existing 75mm PVC
Ch. 0+585

Tee Reducer
250mm x 75mm
Ch. 0+585

250MM
200MM
150MM
100MM
500MM
300MM

Governor Padilla Rd
A.C. Reyes
Garcia St
P. Javier
P. Reyes
Santa Ines
Santa Veronica
Sta. Ines
Tabang Local Rd
Bukid - Libis Road
Sitio Bagong Sikat
Pan-Philippine Hwy
NIA IRRIGATION ROAD
NLEX

POBLACION
LALANGAN
Sta. Ines
BANGA I

PS
PS

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT
PTR NO. 4833847 REG NO. 77419
DATE 02/26/2020 DATE 03/25/2021
PLACE PLARIDEL, BUL. TIN 908-505-748

CADD BY :
DATE : 05/08/2020
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DATE : 05/08/2020

PROJECT TITLE
PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :
ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS
CONCEPT DESIGN

SHEET NO.
09
FILE NAME : PLAN
DATE 05/08/2020

10

11

MATCH LINE
SEE DWG. NO.10

MATCH LINE
SEE DWG. NO.9

MATCH LINE
SEE DWG. NO.5

250MM

200MM

75MM

Interconnection to
Existing 100mm PVC
Ch. 3+947

General Alejo G. Santos Hwy

R

Proposed Banga I
Ground Reservoir
1500 cu. m.

Interconnection to
Existing 150mm PVC
Ch. 0+000

PARULAN

Tee Reducer
250mm x 150mm
Ch. 3+947

nor Padilla Rd

er Crossing
20mts
10

Garcia St

200MM

Reducer
m x 200mm
+231

Tee Reducer
500mm x 250mm
Ch. 3+232

Cabyawan

Plaridel-Pulilan Diversion Rd

MM

AD

NIA/River Crossing
Approx. 10mts
Ch. 1+189

BANGA II

Pan-Philippine Hwy

Plaridel Bypass Rd

MATCH LINE
SEE DWG. NO.11

MATCH LINE
SEE DWG. NO.10

Tee Reducer
500mm x 150mm
Ch. 1+184

Sitio Bagong Sikat

BANGA I

Interconnection to
Existing 75mm PVC
Ch. 0+585

200MM

500MM

Tee Reducer
500mm x 200mm
Ch. 0+644

Tee Reducer
500mm x 200mm
Ch. 0+015

Tee Reducer
250mm x 75mm
Ch. 0+585

MATCH LINE
SEE DWG. NO.13

OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044–795 – 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
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PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

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ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

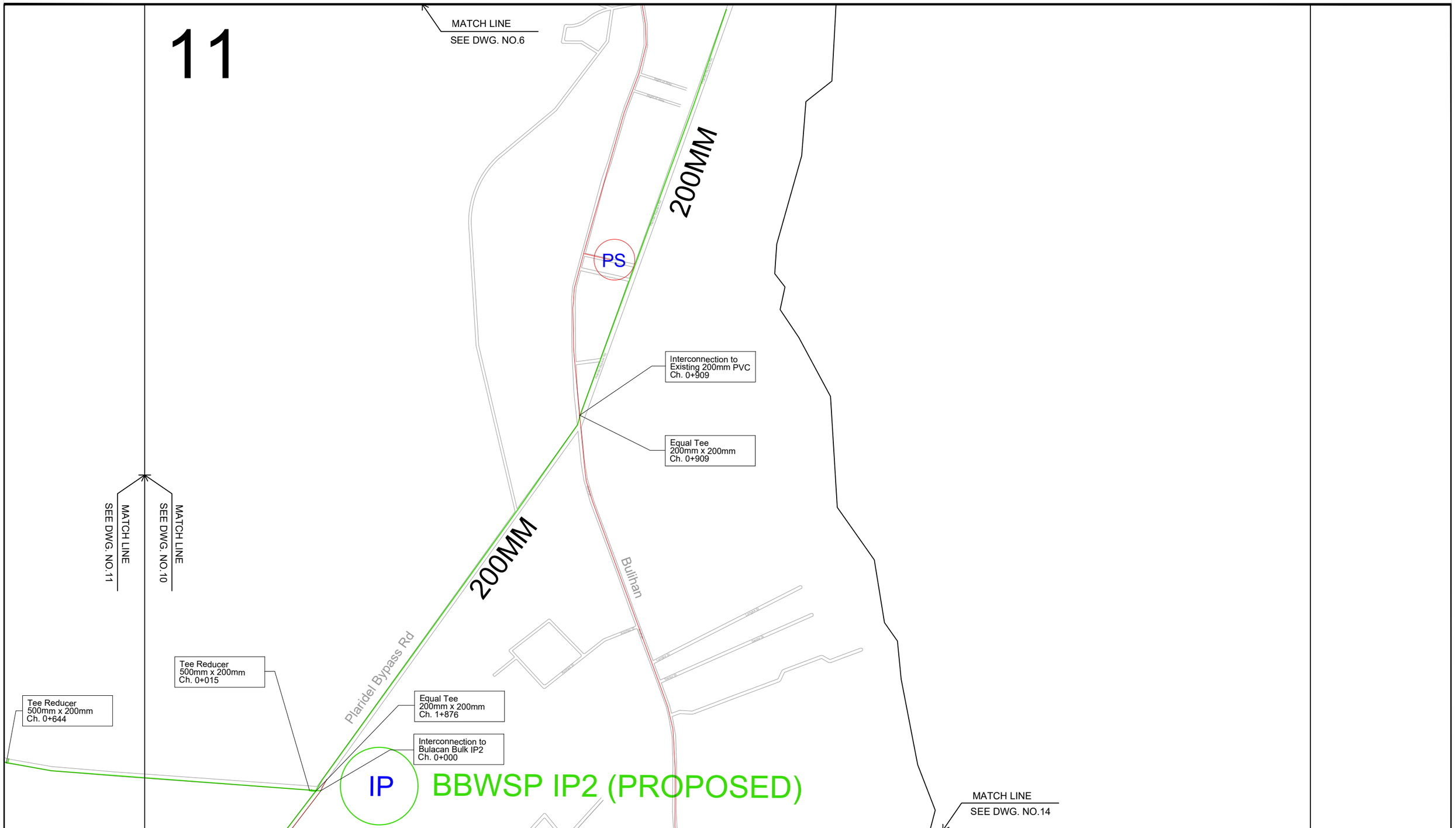
SHEET NO.

10

FILE NAME : PLAN

DATE 05/08/2020

11



OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
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PLARIDEL WATER DISTRICT PIPELINES
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LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

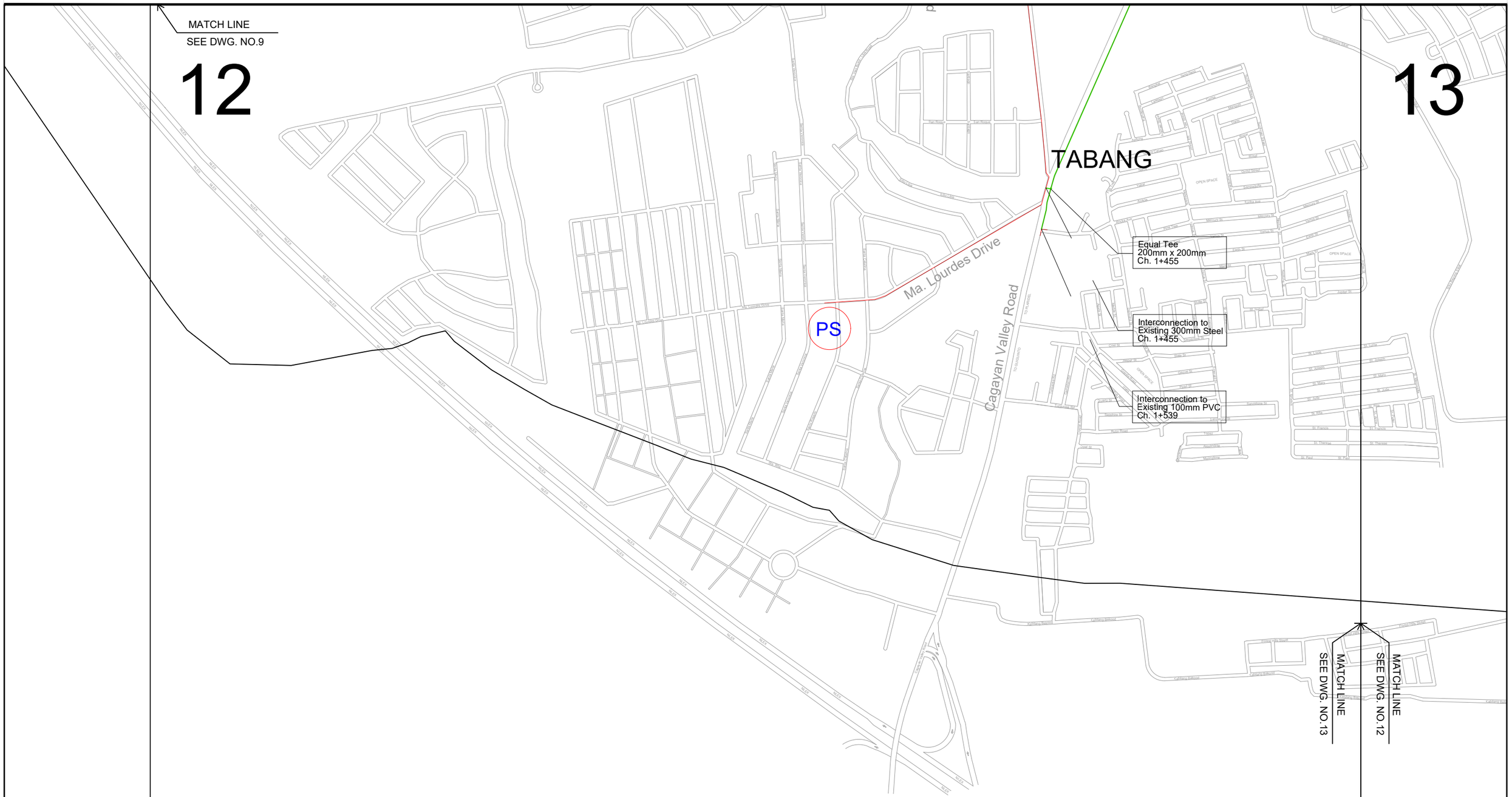
SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

11

FILE NAME : PLAN
DATE 05/08/2020



OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044–795 – 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
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PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

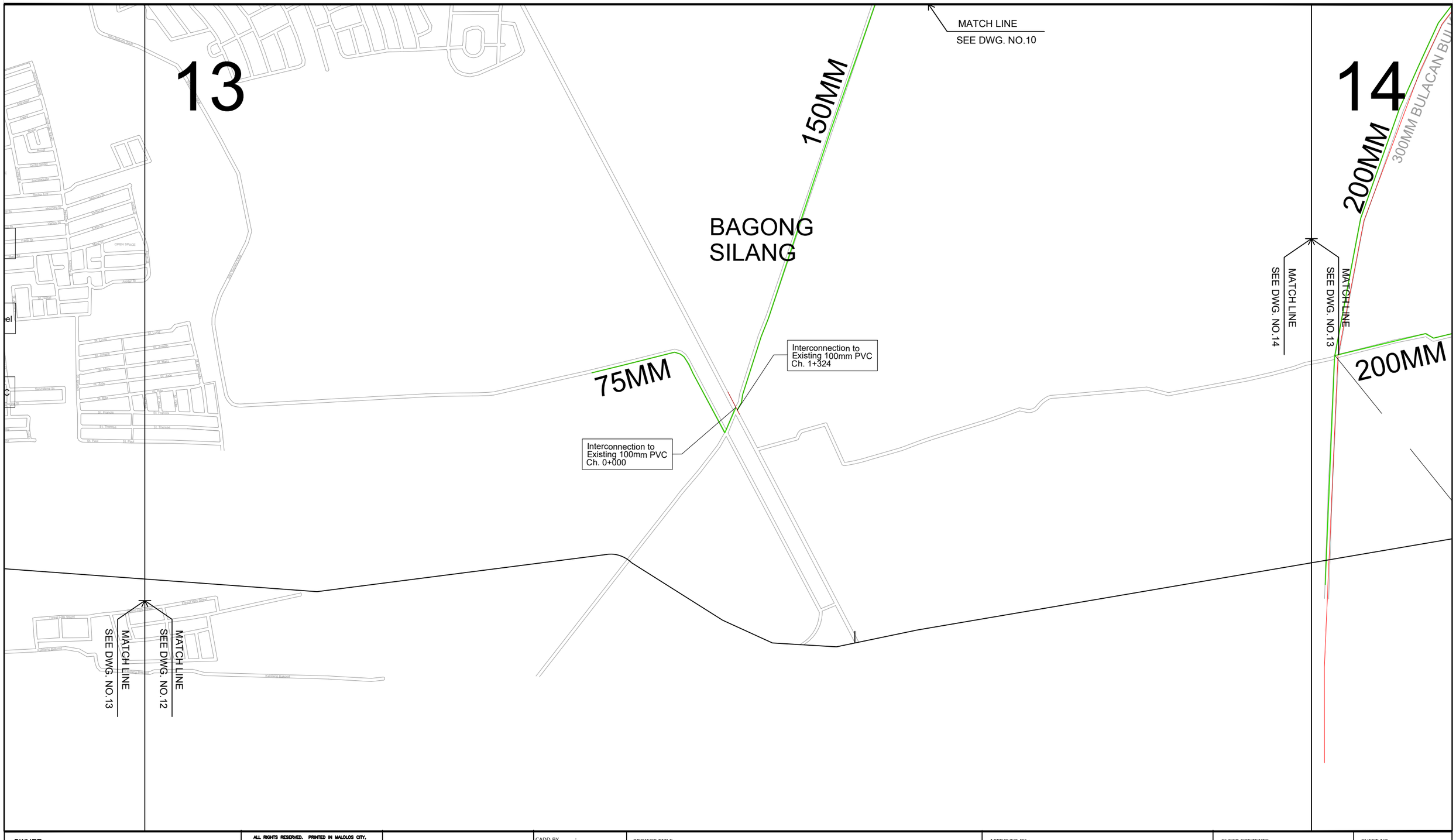
SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

12

FILE NAME : PLAN
DATE 05/08/2020



OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

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DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

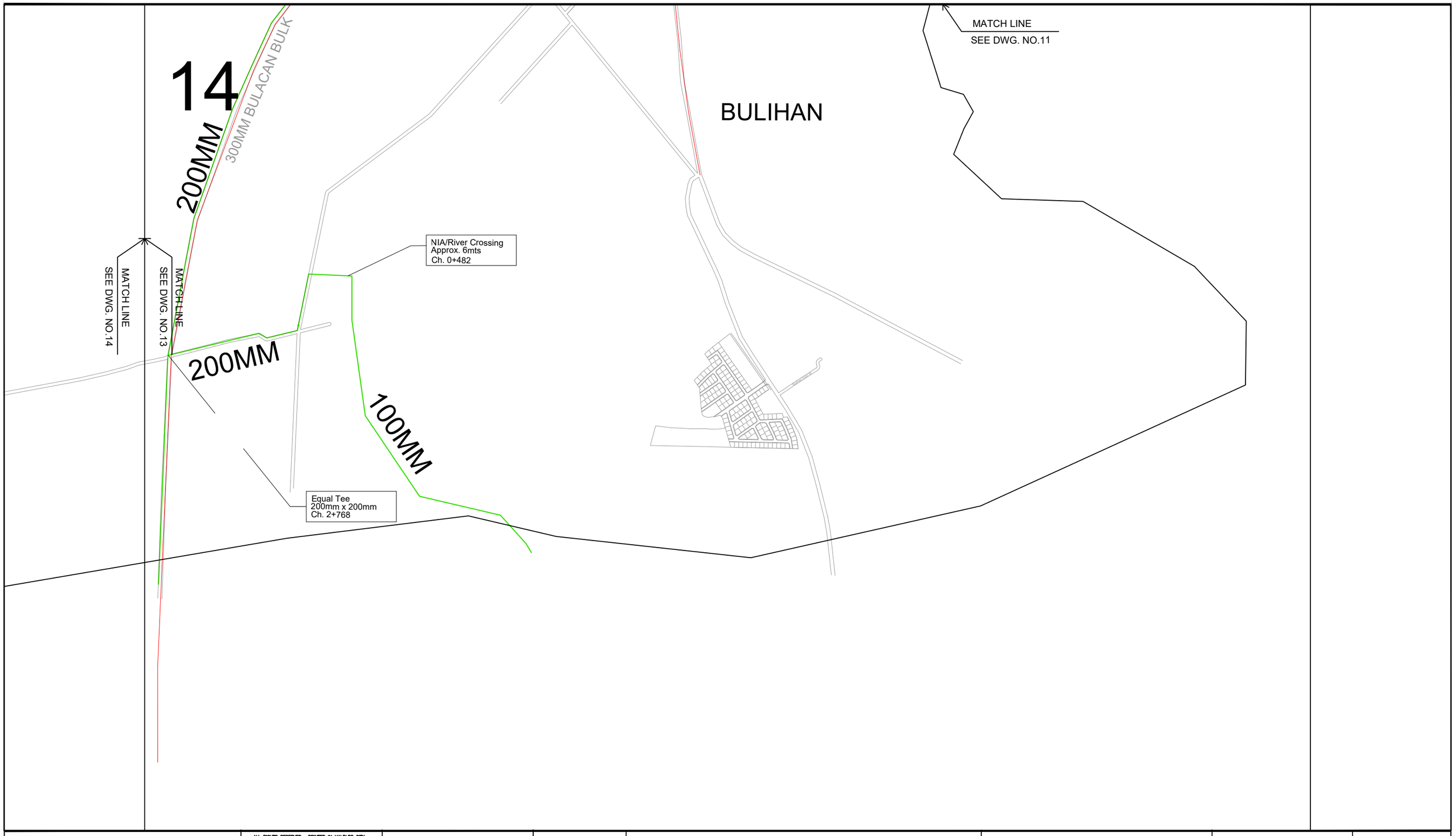
SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

13

FILE NAME : PLAN
DATE 05/08/2020



OWNER :

PLARIDEL WATER DISTRICT

POBLACION, PLARIDEL, BULACAN TEL. 044-795 - 0102

ENGR. RONALDO C. PICAR
SR. ENGINEER A - PLARIDEL WATER DISTRICT

PTR NO.	4833847	REG NO.	77419
DATE	02/26/2020	DATE	03/25/2021
PLACE	PLARIDEL, BUL.	TIN	908-505-748

CADD BY	:
DATE	: 05/08/2020
REVISION	: 02
CHECKED BY	: CHARLIE
DATE	: 05/08/2020

PROJECT TITLE

PLARIDEL WATER DISTRICT PIPELINES
CONCEPT DESIGN

LOCATION: PLARIDEL, BULACAN

APPROVED BY :

ENGR. REYNANTE DC. FRANCISCO
DIVISION MANAGER - ENGINEERING
PLARIDEL WATER DISTRICT

SHEET CONTENTS

CONCEPT DESIGN

SHEET NO.

14

FILE NAME : PLAN
DATE 05/08/2020

ANNEX 13: Cost Estimate Details

TABLE 5
DETAILS OF COST ESTIMATES
(Reference: 2018 LWUA In-Place Costs)
PLARIDEL WATER DISTRICT
PLARIDEL, BULACAN
Apr-20

I. ENGINEERING BASIC COST ITEMS

DESCRIPTION	WATER DISTRICT LOAN					WATER DISTRICT EQUITY					TOTAL COST (Php)
	QTY	UNIT	UNIT COST (Php)	COST (Php)	AMOUNT (Php)	QTY	UNIT	UNIT COST (Php)	COST (Php)	AMOUNT (Php)	
A. POWER GENERATING SET (EXISTING PUMP STATION)											-
1. 60 Kva Generating set, 230 VAC, diesel engine drive,											
silent type complete with breaker type manual											
transfer switch, cables and earthing materials											
for the existing three (3) pumping stations	3	sets									
B. STORAGE FACILITIES WITH BOOSTER											-
1. Proposed Banga II Reinf. Concrete Ground Reservoir						1,500	cum				
- 30 Hp Vertical Multistage Centrifugal Pump and motor											
with Variable Frequency Drive (VFD) motor control,											
discharge piping assembly, column pipes and											
other electrical works						1	lot				
- 60 Kva Generating set, 230 VAC, diesel engine drive,											
silent type complete with breaker type manual											
transfer switch, cables and earthing materials						1	set				
- 15 Kva Distribution transformer and its protective											
devices and metering facilities						3	sets				
- Power line extension						525	m				
- Construction of 20 sqm climate proof pump house						1	lot				
- Perimeter/Security fence						1	lot				
2. Proposed Rueda Reinf. Concrete Ground Reservoir	1,500	cum									
- 30 Hp Vertical Multistage Centrifugal Pump and motor											
with Variable Frequency Drive (VFD) motor control,											
discharge piping assembly, column pipes and											
other electrical works	1	lot									
- 60 Kva Generating set, 230 VAC, diesel engine drive,											
silent type complete with breaker type manual											
transfer switch, cables and earthing materials	1	set									
- 15 Kva Distribution transformer and its protective											
devices and metering facilities	3	sets									
- Power line extension	525	m									
- Construction of 20 sqm climate proof pump house	1	lot									
- Perimeter/Security fence	1	lot									
C. TRANSMISSION/DISTRIBUTION PIPELINE										-	-
1. 500 mmØ x 6.0m Steel Pipe	4,026	lm									
2. 300 mmØ x 6.0m uPVC Pipe, Series 10	7,164	lm									
3. 250 mmØ x 6.0m uPVC Pipe, Series 10	9,342	lm									
4. 200 mmØ x 6.0m uPVC Pipe, Series 10	9,438	lm									
5. 150 mmØ x 6.0m uPVC Pipe, Series 10	1,542	lm									
6. 100 mmØ x 6.0m uPVC Pipe, Series 10	3,522	lm									
7. 75 mmØ x 6.0m uPVC Pipe, Series 10	5,490	lm									
8. 300 mmØ FM & PRV assembly	1										
9. 250 mmØ FM & PRV assembly	1										
10. Concrete pavement demolition	12,485	sqm									
11. Concrete pavement restoration	1,059	cum									
12. Valves and fittings (including Gate/Butterfly Valves, Air Valves, Hydrant, Wash-out)	5% of Cost of Pipelines (Items 1 - 7)			-							
D. BULACAN BULK WATER SUPPLY INTERCONNECTION	1									-	-
E. OFFICE BUILDING/MOTORPOOL/WAREHOUSE										-	-
1. Construction of Plaridel Water District Office Building,											
Motorpool and Warehouse Including land											
development and parking	1,365	sq.m									
F. DETAILED ENGINEERING DESIGN					-					-	-
1. Preparation of DED and securing of necessary											
documents related to project implementation											
(Permits, Right-Of-Way, ECC, Water Rights etc.)	3% of Items A - D			-							
Sub-total I					-					-	-
Price and Physical Contingencies, PPC					-						-
Engineering Studies, ES											-
Construction Monitoring, CM											-
Total Cost I					-					-	-

II. NON-ENGINEERING BASIC COST ITEMS

Description	WATER DISTRICT LOAN					WATER DISTRICT EQUITY					TOTAL COST (Php)
	QTY	UNIT	UNIT COST (Php)	COST (Php)	AMOUNT (Php)	QTY	UNIT	UNIT COST (Php)	COST (Php)	AMOUNT (Php)	
A. LOT ACQUISITION											-
1. Proposed Office Building in Bintog						1,100	sqm				
2. Proposed Banga I Reinf. Concrete Ground Reservoir						500	sqm				
3. Proposed Rueda Reinf. Concrete Ground Reservoir						500	sqm				
B. SERVICE VEHICLE											-
1. Toyota Commuter	1	units									
2. Suzuki Super Carry						1	units				
1. Isuzu Boom Truck						1	units				
Total Cost II										-	-

Total Project Cost					-					-	-