

EVALUATION AND DEVELOPMENT OF DRINKING WATER SUPPLY SYSTEM (SPAM) IKK PERBAUNGAN SERDANG BEDAGAI REGENCY

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Abstract

The purpose of this study was to analyze the evaluation and development of SPAM IKK perbaungan, Serdang Bedagai Regency, North Sumatra. The method used in this research were preliminary study, data collection, data analysis, discussion, conclusions, and suggestions. Data collection was divided into primary data consisting of the existing condition of SPAM IKK Perbaungan, while secondary data consists of pipeline network, service data, and population data. At the same time, the data analysis was in the form of population projections, water demand projections, and evaluation of SPAM based on technical and institutional aspects. The questionnaire results showed that over 60% of the population who are not PDAM customers are interested in becoming customers and agreed to pay connection fees. SPAM IKK Perbaungan would serve four villages, namely Simpang Tiga Pekan, Batang Terap, Citaman Jernih, and Kota Galuh, with populations of 9,118, 3,352, 7,184, and 4,896, respectively. The implementation was divided into two stages, namely Phase I in 2022-2027, which served Simpang Tiga Pekan, Batang Terap, and Citaman Jernih with total water demand of 33.51 L/s, then Phase II in 2028-2032, which added to serve Kota Galuh with a total water demand of 42.41 L/s.

Keywords: Evaluation, Development, Drinking Water Supply System

INTRODUCTION

The provision of drinking water is one of the primary demands and socio-economic rights of the community that the Government must fulfil, both the regional Government and the central Government (Alamsyah, 2007; Amirullah et al., 2017). Availability of drinking water is one of the determinants of life in improving the welfare of the community, which is expected with the availability of drinking water can enhance the degree of public health so that there can be an increase in the economic growth of the community (Babbitt et al., 1962). Therefore, the provision of drinking water facilities and infrastructure is one of the keys to regional economic development (Enri et al., 1989).

The implementation of SPAM is a series of activities in developing and managing facilities and infrastructure that follow the basic process for providing

community drinking water (Kimpraswil, 2003). Following Government Regulation No. 122 of 2015 concerning the Development of a Drinking Water Supply System (SPAM), drinking water is the responsibility of Serdang Bedagai Regency, North Sumatra Province.

Seeing the condition of the drinking water supply system in Serdang Bedagai Regency in the past, where programs for the development of facilities and infrastructure for drinking water supply often overlapped, provides a study to solve these problems systematically (Purnama & Suhartono, 2018). On the other hand, the management of drinking water facilities and infrastructure that have been built is also still overlapping, and some are managed by the community, PDAM Tirta Deli, Deli Serdang Regency, and the Technical Implementation Unit (UPT) for Drinking Water Services under the District Housing

and Settlement Area (Rafiki, 2019). Serdang Bedagai. Low-income communities and water-insecure IKK still inhabits Serdang Bedagai Regency as a division of Deli Serdang Regency, so the Government should receive assistance in developing a Drinking Water Supply System (SPAM) as a priority (Riduan & Dhiaksa, 2020).

RESEARCH METHODS

Following the objectives to be achieved through the evaluation of this SPAM, the methodology for this preparation is carried out through a study and identification of technical, institutional, and financial aspects. The study and identification carried out were who would manage the SPAM that was built, how the human resources were, the organizational structure, billing forms, and customer registration. Also reviewed were customer structure, customer accounts, billing schedule, and customer registration. In carrying out the evaluation, first, develop a work methodology so that activities can run on time and achieve the desired results (Yustika & Astuti, 2018).

For this reason, implementation steps are arranged, which are implemented in a schematic and explained each step (Masduqi, 2018). Primary data was collected through interviews with PDAM Tirta Deli, Deli Serdang Regency, in the form of the existing condition of SPAM IKK Perbaungan and discussions with UPT Serdang Bedagai Water Supply Services and the Serdang Bedagai Regency Housing and Settlement Office. Meanwhile,

secondary data was obtained from a literature study in the form of population data and results of interviews with the Serdang Bedagai District UPT Drinking Water Services and the Serdang Bedagai District Housing and Settlement Service Office in the form of pipe networks and service data.

Furthermore, data analysis was obtained from the projected population of IKK Perbaungan. The projected water demand is calculated based on the community's water needs in IKK Perbaungan, Citeman Jernih, and Kota Galuh. From the water demand calculation results, an analysis of the total pipe dimensions and types of distribution pipes is then carried out to develop the pipeline network considering the existing lines. Next, the water needs of the residents of the IKK Perbaungan District are calculated. Furthermore, the distribution pipeline analysis process is carried out with the EPANET 2.0 .

SPAM IKK Perbaungan serves 2 villages/kelurahan, namely Simpang Tiga Pekan and Batang Terap. Simpang Tiga Pekan consists of 7 hamlets/neighbourhoods. The Perbaungan Sub-District Office is located also in Simpang Tiga Pekan. The total population in Simpang Tiga Pekan in 2019 was 11,983 persons, which consists of 5,975 men and 6,008 women. Meanwhile, Batang Terap consists of 4 Hamlets/Neighborhoods. Batang Terap is 4,245 people, consisting of 2,109 men and 2,136 women (BPS Serdang Berdagai, 2021).

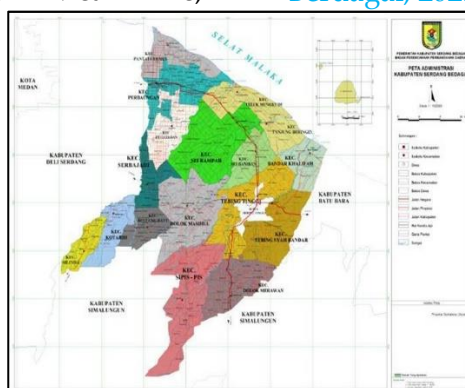


Figure 1. The administrative map of Serdang Bedagai Regency (Source: BPS Serdang Berdagai, 2021)

RESULTS AND DISCUSSION

Implementation of Evaluation of Drinking Water Supply System (SPAM) by Survey

To determine the magnitude of the need, constraints, and problems with drinking water for the people of Perbaungan District in Simpang Tiga Pekan Sub-District, Batang Terap Sub-District, Citaman Jernih Village, and Kota Galuh Village, researchers conducted a direct survey of the community by bringing questionnaires to be filled out in the field. Questionnaires were prepared for 50 respondents consisting of 20 respondents for PDAM Tirta Deli customers, which were divided into ten respondents in the Simpang Tiga Pekan Village and ten respondents for Batang Terap Village, 20 respondents for those who had not become PDAM Tirta Deli's subscribers were divided into ten respondents in Citaman Jernih Village and ten respondents in Kota Galuh Village. Meanwhile, another ten respondents used water sources from dug and shallow-drilled wells. The ten respondents who used water from wells were distributed to 2 in Simpang Tiga Pekan Village, 2 in Batang Terap Village, 3 in Citaman Jernih Village, and 3 in Kota Galuh Village. Total questionnaire for 50 respondents.

It can be concluded that 16 people (80%) of PDAM customer respondents stated that one family only occupied one house. In comparison, among non-PDAM customer respondents, 25 people (83%) and one family settled in one place. The main occupation of the head of the family varies. However, it can be concluded that the main work of PDAM customer family heads is small traders, with a total of 6 people (30%). While non-PDAM customers, the main job of the family head is a private employee, with ten respondents (33%).

There are 16 PDAM customers (80%) stating that the number of their families is 3-5 people, while non-PDAM customers with 3-5 families are 22 people (73%). For the last education of the head of the family, It can be concluded that for PDAM customers there

are 14 people (75%) stated that the previous education of the head of the family was high school. In contrast, non-PDAM customers say that the last education of the head of the family is D3, with a total of 12 people (40%). Condition of the building occupied Can it can be concluded that generally, the state of the house occupied is permanent for both PDAM customers and non-PDAM customers. There are 16 PDAM customers (80%) and 19 non-PDAM customers (63%). The status of home ownership is generally owned by the owner of the house, both PDAM customers and non-PDAM customers. PDAM customers are 15 people (75%), and non-PDAM customers are 19 (63%).

All PDAM customers stated that they received only water for drinking/cooking from PDAM, with 20 respondents (100%). While non-PDAM customers, out of 30 respondents, 30 people (100%) stated that they came from dug and drilled wells. However, all PDAM customers noted that all 20 people (100%) used water for drinking/cooking more than 20 ltr/day (Nugraha et al., 2017). At the same time, 18 non-PDAM customers (60%) use water for cooking/drinking more than 20 ltr/day.

All PDAM customers stated that they received only water for drinking/cooking from PDAM, with 20 respondents (100%). At the same time, non-PDAM customers from 30 respondents 30 people (100%) asked for dug wells and drilled wells. Use of water for bathing/washing. All PDAM customers stated that the use of water for bathing/washing by all respondents, namely 20 people (100%), was more than 250 ltr/day. At the same time, 15 non-PDAM customers (50%) use water for bathing/washing more than 250 ltr/day.

Not only that, all PDAM customers stated they were satisfied with 20 respondents (100%). While there are 21 non-PDAM customers (70%), 93 said they were unsatisfied. This is because non-PDAM customers generally use water from drilled or dug wells where the water quality does

not meet health requirements. The water used is unsatisfactory because PDAM customers do not fill out the questionnaire because they are satisfied with subscribing to the PDAM. While non-PDAM customers, six people (20%) said they were not happy because their wells were coloured and 14 people (47%) said their wells smelled, and eight people (27%) stated that their healthy water smelled, maybe because of sewage pollution. Palm oil mill close to their village.

The water source used is dry/low tide, so that it is not enough PDAM customers do not fill out the questionnaire because they have enough water to subscribe to PDAM. Whereas 16 non-PDAM customers (53%) said yes because their water source was from shallow drilled wells and the water never ran dry, 14 people (47%) said no because their water source came from dug wells where the water recedes during the dry season. And some are completely dry because their depth is only a maximum of 5 meters.

PDAM customers do not fill out the questionnaire because subscribing to PDAM water is sufficient. While most non-PDAM customers, if the water is dry, they buy bottled water. Nine people (56%) stated that because it was more practical and easy to get.

Non-PDAM customers generally say 1-2 weeks, as many as 17 people (57%). 18. Table 5.18 Family income every month PDAM customers state that the income of the head of a family is generally IDR 2.500.000,- - IDR. 4.000.000,- as many as 13 people (65%). While non-PDAM customers also stated that Rp. 2.500.000,- - Rp. 4.000.000,- because most of them are traders.

Desire to get PDAM connection PDAM customers do not fill out the questionnaire because they have already subscribed to PDAM. While Non-PPDAM customers also stated that they wanted to become PDAM customers because it was more practical and comfortable. There were 26 people (87%) who said yes. 20. Ability to pay Per Month PDAM customers do not fill out the questionnaire because they

subscribe to PDAM. While there are seven non-PDAM customers (23%) who state that they are only able to pay Rp. 25.000,- - Rp. 50.000,- monthly, and 18 people (60%) state that they can pay Rp. 50,000 - Rp. 100.000,- and only five people (17%) can pay more than IDR 500,000.

As for the constraints on the affordability of PDAM water, 2 PDAM customers (25%) stated that the tariff was expensive, and 15 people (75%) commented that the water often recedes so that the water to the house is small and slow. While non-PDAM customers do not complete questionnaires, they generally have their wells.

Development of Drinking Water Supply System (SPAM) by Projection

1. Technical Aspect Development

A strategic program is needed to support and ensure the development of the SPAM Perbaungan, which will be handed over to the management of PDAM Tirta Deli to the Government of Serdang Bedagai Regency, the program will cover two sub-districts and two villages, namely Simpang Tiga Pekan, Batang Terap, Citaman Jernih, and Kota Galuh (David, 2011).

It is necessary first to calculate the population projections for each area to be developed. Then the amount of drinking water needed for each region will be determined after the next ten years of population projections. The basis for preparing this development program includes three aspects, namely the technical and institutional aspects.

The standards, service criteria, operation, and maintenance are first discussed in planning the development of the technical field. Drinking water quality standards must meet the health aspects related to the requirements of physics and chemistry following Permenkes No. 492/Menkes/Per/IV/2010. The operation and maintenance aspects of SPAM must be designed so that it can be operated and maintained by technicians. Meanwhile, the ability of the management institution to

form a management institution such as UPTD or PDAM will also be the product of analysis in this study.

In planning, technical aspects will be developed from intake, raw water transmission pipes, processing, supporting buildings, clean water reservoirs, distribution, and service pipelines (Joko, 2010).

Based on the results of the DED Report on SPAM IKK Perbaungan, the raw water is planned to use the surface water of The Snake River. According to information from BWSS Sumatra II, The Snake River can be used as a water source sufficient for 50 L/s. Intakes with a free intake system are placed directly on its riverbank and are designed for a capacity of 100 L/s to anticipate the future needed (Permenkes RI, 2010). Because the intake is located 4 km from the Water Treatment Plant (WTP), the information is equipped with a pump housing and electrical panels situated around the dam of the Snake River. It is planned to use a single GIP transmission pipe of 250 mm in diameter (Krisdhiyanto & Sembiring, 2016).

2. Production Unit

The water from the source used for drinking at IKK Perbaungan is treated at the Perbaungan Water Treatment Plant (WTP). WTP is planned with a complete conventional water treatment system with steel construction (Peraturan Pemerintah RI, 2015). The system consists of coagulation-flocculation, sedimentation, and filtration. The coagulation unit is hexagon-shaped, with as much as 1 unit. The flocculation unit is hexagonal, composed of 6 compartments, and coagulant is injected. The sedimentation unit consists of 2 rooms, while the filtration unit consists of 4 cases which will then be injected with disinfectant before being piped into the reservoir. The reservoir is planned to be a reinforced concrete tub with a capacity of 600 m³, also equipped with a distribution pump and pump house.

3. Distribution Unit

As mentioned previously regarding the planning area, the areas to be served by the drinking water supply system for Perbaungan District include Simpang Tiga Pekan, Batang Terap, Citaman Jernih, and Kota Galuh (Kurniawan et al., 2014). The level of service is based on the results of socio-economic studies, especially regarding the interest and ability of the community to pay for drinking water and the power of the Serdang Bedagai Regency government to manage the facilities built. The results of the calculation of population projections are as follows:

1. Population to be served = 80% of the administrative population
2. Ability/willingness to pay for water = 100%
3. Residents will be filled with a hose connection
4. Water requirement = 100 L /person/day for house connection

Based on the results of the calculation of population projections and based on the results of direct surveys, it can be formulated as follows:

1. The level of drinking water service in 2032 is 80% of the total population of the service area, and according to the need for house connections
2. The population's water demand in 2032 is estimated to be 100 L /person/day
3. The planning stage is divided into two phases; namely, stage I is planned for 2022-2027, while stage II is scheduled for 2028-2032.

4. Population Projection

The need for drinking water in a service area is influenced by the number of people served. For the Perbaungan District, four service and development areas will be done, namely:

1. Simpang Tiga Pekan
2. Batang Terap
3. Citaman Jernih
4. Kota Galuh

The number of residents is obtained from a direct survey of houses per road, and it is assumed that one place consists of 5 people, according to the questionnaire results. As a basis for evaluating population projections, it is calculated based on the total population of each sub-district and village. The number of residents who have been assessed for 2021 is as follows:

1. Total population of Simpang Tiga Pekan in 2021 = 9,054 persons
2. Total population of Batang Terap in 2021 = 3,326 persons
3. Total population of Citaman Clear in 2021 = 7,141 persons
4. Total population of Kota Galuh in 2021 = 4,872 persons

In the following, the population projection calculations for Simpang Tiga Pekan, Batang Terap, Citaman Jernih, and

Kota Galuh are presented using the Arithmetic, Least Square, and Geometric methods of Simpang Tiga Pekan.

5. Water Demand Projection

The calculation of projected water demand for Perbaungan IKK is based on an estimate of the correct service to meet drinking water demand from the beginning until the end of the planning year (2035). According to the survey results, the service target for 2027 is 70% of the entire population who will be served. While the service target until the end of year planning (2035) is 80%, following the minimum standards of the Ministry of PUPR. The complete calculation of the projected drinking water demand of SPAM IKK Perbaungan for Simpang Tiga Pekan, Batang Terap, Citaman Jernih, and Kota Galuh can be seen in the table below:

Table 3. Population Projection of Simpang Tiga week based on various projection methods in 2011 - 2032

Year	Population Data Beginning	Method Arithmetic	Geometry Method	Least Square Method
2011	8.412	8.412	8.412	8.412
2012	8,476	8,476	8,474	8,480
2013	8,542	8,540	8,537	8,549
2014	8,612	8,605	8,600	8.617
2015	8,685	8,669	8,664	8,686
2016	8,761	9,733	8,728	8,755
2017	8.838	8,797	8,793	8.823
2018	8,904	8.862	8.858	8.892
2019	8,983	8.926	8.924	8.960
2020	8,990	8,990	8,990	9.029
2021		9.054	9.057	9.097
2022		9.118	9.193	9.166
2023		9.183	9,333	9,235
2024		9,247	9.480	9,303
2025		9,311	9,631	9,372
2026		9.375	9.787	9,440
2027		9,440	9.946	9.509
2028		9.504	10,095	9.577

Table 4. Projection of water demand in Simpang Tiga Pekan

No.	Description	Unit	Year					
			2022	2024	2026	2027	2030	2032
I.	Number Of Served Population							
1.	Total Service Population	Persons	9.118	9,247	9.375	9,440	9,632	9,761
	- Population served	Persons	986	986	986	986	986	986
	- Population Who Will Be Served	Persons	8.132	8,261	8.389	8,454	8,646	8,775
	Total Number of Residents to be Served	Persons	8.132	8,261	8.389	8,454	8,646	8,775
II.	Domestic Drinking Water Demand							
	Water Demand for House Connection							
1.	Service Level Plan	%	80	80	80	80	80	80
2.	Assumed Number of Person per House	Persons	5	5	5	5	5	5
3.	Residents to be Served	Persons	6.506	6.609	6,711	6.763	6.917	7.020
4.	Number of House Connections	Unit	1.301	1.322	1.342	1.353	1.383	1,404
5.	Drinking Water Usage Rate	L/org/hr	100	100	100	100	100	100
6.	Drinking Water Demand	L/s	7.53	7.65	7.77	7.83	8.01	8.12
	Total Domestic Water Demand	L/s	7.53	7.65	7.77	7.83	8.01	8.12
III.	Non-Domestic Drinking Water Demand	L/s	0.75	0.76	0.78	0.78	0.80	0.81
	Total Domestic and Non-Domestic Water Demand	L/s	8.28	8.41	8.54	8.61	8.81	8.94
1.	Water Loss 15%	L/s	1.51	1.53	1.55	1.57	1.60	1.62
2.	Average Demand	L/s	9.79	9.94	10,10	10.18	10.41	10.56
3.	Maximum Requirement 1.1 x Average Requirement	L/s	10.77	10.94	11.11	11.19	11.45	11.62
4.	Peak Requirement 1.5 x Average Requirement	L/s	14.68	14.92	15,15	15.26	15.61	15.84
	Total Demand for Drinking Water	L/s	14.68	14.92	15,15	15.26	15.61	15.84

Source: (Analysis, 2022).

Table 5. Projection of water demand in Batang Terap

No.	Description	Unit	Year					
			2022	2024	2026	2027	2030	2032
I.	Number of Served Population							
1.	Total Service Population	Persons	3.352	3,403	3.455	3,481	3.559	3,611
	- Population served	Persons	492	492	492	492	492	492
	- Population Who Will Be Served	Persons	2,860	2,911	2,963	2,989	3.067	3.119
	Total Number of Residents to be Served	Persons	2,860	2,911	2,963	2,989	3.067	3.119
II.	Domestic Drinking Water Demand							
	Water Demand for House Connection							
1.	Service Level Plan	%	80	80	80	80	80	80
2.	Assumed Number of Person per House	Persons	5	5	5	5	5	5
3.	Residents to be Served	Persons	2.288	2,329	2,371	2,391	2.453	2.495
4.	Number of House Connections	Unit	458	466	474	478	491	499
5.	Drinking Water Usage Rate	L/org/hr	100	100	100	100	100	100
6.	Drinking Water Demand	L/s	2.65	2.70	2.74	2.77	2.84	2.89
	Total Domestic Water Demand	L/s	2.65	2.70	2.74	2.77	2.84	2.89
III.	Non-Domestic Drinking Water Demand	L/s	0.26	0.27	0.27	0.28	0.28	0.29
	Total Domestic and Non-Domestic Water Demand	L/s	2.91	2.97	3.02	3.04	3.12	3.18
1.	Water Loss 15%	L/s	0.53	0.54	0.55	0.55	0.57	0.58
2.	Average Need	L/s	3.44	3.50	3.57	3.60	3.69	3.75
3.	Maximum Requirement 1.1 x Average Requirement	L/s	3.79	3.85	3.57	3.60	4.06	4.13
4.	Peak Requirement 1.5 x Average Requirement	L/s	5.16	5.26	5.35	5.40	5.54	5.63
	Total Need for Drinking Water	L/s	5.16	5.26	5.35	5.40	5.54	5.63

Source: (Analysis, 2022).

Table 6. Projected water demand in Citaman Jernih

No.	Description	Unit	Year					
			2022	2024	2026	2027	2030	2032
I.	Number of Served Population							
1.	Total Service Population	Persons	7,814	7.271	7.357	7,400	7.529	7.616
	Total Number of Residents to be Served	Persons	7,814	7.271	7.357	7,400	7.529	7.616
II.	Domestic Drinking Water Demand							
	Water Demand for House Connection							
1.	Service Level Plan	%	80	80	80	80	80	80
2.	Assumed Number of Person per House	Persons	5	5	5	5	5	5
3.	Residents to be Served	Persons	5.748	5.817	5.886	5,920	6.023	6.092
4.	Number of House Connections	Unit	1.150	1.163	1.177	1.184	1,205	1.218
5.	Drinking Water Usage Rate	L/org/hr	100	100	100	100	100	100
6.	Drinking Water Demand	L/s	6.65	6.73	6.81	6.85	6.97	7.05
	Total Domestic Water Demand	L/s	6.65	6.73	6.81	6.85	6.97	7.05
III.	Non-Domestic Drinking Water Demand	L/s	0.67	0.67	0.68	0.69	0.70	0.71
	Total Domestic and Non-Domestic Water Demand	L/s	7.32	7.41	7.49	7.54	7.67	7.76
1.	Water Loss 15%	L/s	1.00	1.01	1.02	1.03	1.05	1.06
2.	Average Need	L/s	8.32	8.42	8.51	8.56	8.71	8.81
3.	Maximum Requirement 1.1 x Average Requirement	L/s	9.15	9.26	9.37	9.42	9.59	9.70
4.	Peak Requirement 1.5 x Average Requirement	L/s	12.47	12.62	12.77	12.85	13.07	13.22
	TOTAL NEED FOR DRINKING WATER	L/s	12.47	12.62	12.77	12.85	13.07	13.22

Source: (Analysis, 2022).

Table 7. Projection of Water Demand in Kota Galuh

No.	Description	Unit	Year					
			2022	2024	2026	2027	2030	2032
I.	Number of Served Population							
1.	Total Service Population	Person	4.896	4.942	4.989	5.012	5.082	5.129
	Total Number of Residents to be Served	Person	4.896	4.942	4.989	5.012	5.082	5.129
II.	Domestic Drinking Water Demand							
	Water Demand for House Connection							
1.	Service Level Plan	%	80	80	80	80	80	80
2.	Assumed Number of Person per House	Person	5	5	5	5	5	5
3.	Residents to be Served	Person	3.917	3.954	3,991	4.010	4.066	4.103
4.	Number of House Connections	Unit	783	791	798	802	813	821
5.	Drinking Water Usage Rate	L/org/hr	100	100	100	100	100	100
6.	Drinking Water Demand	L/s	4.53	4.58	4.62	4.64	4.71	4.75
	Total Domestic Water Demand	L/s	4.53	4.58	4.62	4.64	4.71	4.75
III.	Non-Domestic Drinking Water Demand	L/s	0.45	0.46	0.46	0.46	0.47	0.47
	Total Domestic and Non-Domestic Water Demand	L/s	4.99	5.03	5.08	5.11	5.18	5.22
1.	Water Loss 15%	L/s	0.68	0.69	0.69	0.70	0.71	0.71
2.	Average Need	L/s	5.67	5.72	5.77	5.80	5.88	5.94
3.	Maximum Requirement 1.1 x Average Requirement	L/s	6.23	6.29	6.35	6.38	6.47	6.53
4.	Peak Requirement 1.5 x Average Requirement	L/s	8.50	8.58	8.66	8.70	8.82	8.90
	TOTAL NEED FOR DRINKING WATER	L/s	8.50	8.58	8.66	8.70	8.82	8.90

Source: (Analysis, 2022).

From the water demand projection table above, the planning stages are planned, whereas the second planning stage is planned. Phase I is scheduled for 2022 – 2027 for Simpang Tiga Pekan, Batang Terap, and Citaman Jernih. Meanwhile, Phase II is expected in 2028 – 2032 for Kota Galuh. For more details, see the following:

a). Phase I 2022 – 2027

- 1) Water demand in Simpang Tiga Pekan in 2027 = 15.26 L/s
- 2) Water demand in Batang Terap in 2027 = 5.40 L/s
- 3) Citaman Jernih water demand in 2027 = 12.85 L/s
- 4) Total water demand in 2027 = 33.51 L/s

a. Phase II in 2028 – 2032

- 1) Water demand in Kota Galuh in 2032 = 8.90 L/s
- 2) Total water demand in 2027 = 33.51 L/s
- 3) Then the total water demand in 2032 = 42.41 L/s
- 4) For more details, the stages of service can be seen in Figures 8 and 9 below:

6. Service Unit

Service units in Serdang Bedagai Regency can be divided into two categories, namely:

- a. Variety of urban services using house connections.
- b. Service units with house connections must be equipped with a water meter to ensure the accuracy of the water meter reading. The primary function of the house connection is to carry water from

the distribution pipe to the customer's house connection.

- c. Rural category by using Public Hydrant or Public Faucet.
- d. In public hydrants or faucets, water meters must also be installed so water use can be managed jointly between water users (Rivai et al., 2006).

The service unit planned for Phase I uses HDPE PN10 pipe with different diameters ranging from 100 mm for 1,700 m, 75 mm for 1000, and 50 mm for 3,350 m. Phase II uses HDPE PN10 pipes with different diameters ranging from 100 mm for 200 m and 50 mm for 1000 m.

7. Drinking Water Quality Standard

In general, the criteria for planning a proper drinking water supply system must meet the following requirements:

- a. Meet the health aspects
- b. Fulfil operations and maintenance
- c. Management institutional capabilities

8. Operation And Maintenance

The planned WTP must be designed so that it can be operated. For this reason, it is required to compile the operational manual. This can also be implemented by training prospective operators who will manage and use the system. The drinking water supply system must be well maintained and can be developed according to the plan. Maintenance of the built system must be carried out regularly and handled by reliable personnel.

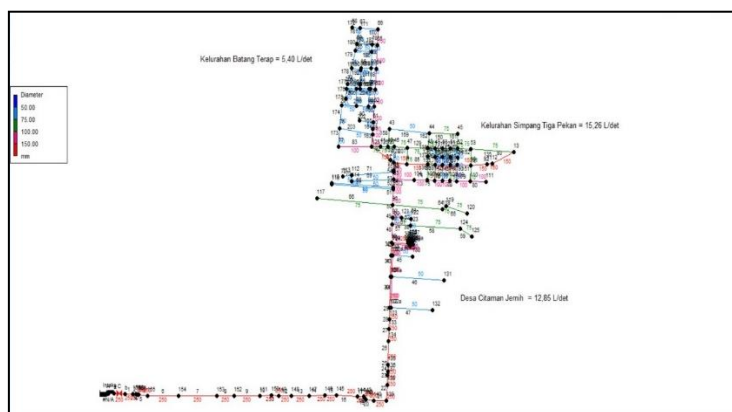


Figure 8. Service planning phase I (Source: BPS Serdang Berdagai, 2021)

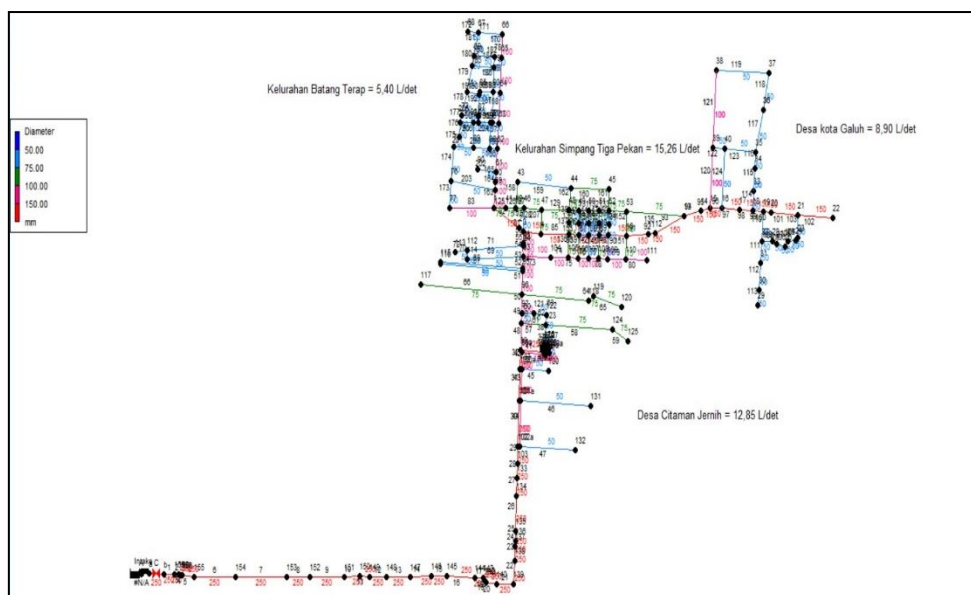


Figure 9. Service planning phase II (Source: BPS Serdang Bedagai, 2021)

9. Managing Institution

For this, SPAM management institutions are needed, which can be in the form of UPTD, UPTD-BLUD, and PDAM. For Perbaungan IKK, which PDAM Tirta Deli, Deli Serdang Regency, has managed. The UPT for Drinking Water Services in Serdang Bedagai Regency is under the Department of Housing and Residential Areas of Serdang Bedagai Regency. It has been operating since 2016, managing several SPAMs in Serdang Bedagai Regency. Furthermore, this UPT is trying to improve services by forming UPTD-BLUT with the direction of the Ministry of PUPR. If the SPAM has been built, then the SPAM can immediately operate with the existing connection service from the delivery of assets by PDAM Tirta. This district was expanded in 2004 with its capital Sei Rampah, previously the district's capital. Meanwhile, Perbaungan District is one of the sub-districts in Serdang Bedagai Regency, with an area of 111.62 km². Perbaungan District is one of 17 sub-districts in Serdang Bedagai Regency. The capital of Perbaungan District is Perbaungan City. The total population reaches 105,177 persons, the largest population in Serdang Bedagai Regency. Perbaungan City is located on the crossroads of Medan - Tebing Tinggi, a

bustling road with vehicles and rapid population growth.

In 2004, Deli Serdang Regency was divided into two Regencies: Deli Serdang Regency as the Parent Regency and Serdang Bedagai Regency as the Expansion Regency. In 1986, the management of SPAM in Perbaungan City was carried out by PDAM Tirtanadi, North Sumatra Province, a KSO with PDAM Tirta Deli, until 1999. The drinking water supply system in Perbaungan City was sourced from the WTP PDAM Tirta Deli from The Snake River with a capacity of 50 L/s. The number of house connections has reached 1,478 units, potentially adding 1000 units more (Fauzi, 2018).

CONCLUSION

A needs survey was conducted to determine the magnitude of the need for SPAM, constraints, and community drinking water problems. The results of these findings stated that 87% of the community wanted SPAM. There are two stages of the implementation SPAM development, namely Phase I (2022-2027) would serve Simpang Tiga Pekan, Batang Terap, and Citaman Jernih with a total water demand of 33.51 L/s, while Phase II (2028-2032) would serve addition of SR Kelurahan/Village in Phase I plus Kota

Galuh with a total water demand of 42.41 L/s. UPT Drinking Water Services could develop well and be upgraded to become UPTD-BLUD which could manage its finances and have its employees following their scientific disciplines.

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