Spatial Analysis Of Clean Water Availability Based On Quality Of Chemical Content In Flood ResistanceArea, Astambul Sub-District

Anugrah Nur Rahmat*, Husaini, Erida Wydiamala***, Eko Suhartono****, Adi Nugroho******, Lenie Marlinae******

* Department of Environmental Health, Public Health Study Program Faculty of Medicine, University of Lambung Mangkurat Banjarbaru
** Department of Environmental Health, Master Program in Public Health, University of Lambung Mangkurat Banjarbaru
*** Department of Microbiology and Parasitology, Faculty of Medicine, Lambung Mangkurat University, Banjarmasin
**** Department of Environmental Health, Master Program in Public Health, University of Lambung Mangkurat Banjarbaru
***** Department of Health Promotion, Public Health Study Program, Faculty of Medicine, Lambung Mangkurat University, Banjarbaru
****** Department of Environmental Health, Master Program in Public Health, University of Lambung Mangkurat Banjarbaru

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Abstract- Water is the main requirement in life so that every living thing can grow and develop properly on earth. According to WHO, each person requires between 60-120 liters of water/day, while in developing countries, including Indonesia, each person requires between 30-60 liters/day of water. The people of Astambul District mostly depend on the availability of well water and surface water. Th e number of dug wells owned by the community in 6 villages is 201 with an average of 33 dug wells with details of Sei Alat Village there are 36, Lok Gabang Village 24, Kelampaian Tengah 59, Kaliukan Village 21, Ulu Omission 31. Other causes of water shortage clean is th e low location of Banjar Regency from sea level causing the flow of water on the ground surface to be less sm ooth. As a result, some areas are always inundated (29.93%), some (0.58%) are inundated periodically. To find out how the Spatial analysis of the availability of clean water based on the quality of chemical content in flood-prone areas of Astambul District. This research includes quantitative research, descriptive study with a spatial analysis approach. To analyze the availability of clean water based on chemical quality in f lood-prone areas of Astambul District. The number of samples in the study were 15 points using a sampling technique to check the parameters of pH, Iron (Fe), Manganese (Mn) and Lead (Pb) in the laboratory. The results showed that from pH measurements in five villages of t he Astambul sub-district the highest pH was in Kelampaian Ulu Village with an average value of 6.667 with a standard deviation of 0.5774. The results of Fe measurements show that the highest average value of Iron (Fe) measurements is in Kaliukan Village of 1.0456 7 with a standard deviation of 0.783649. The results of the Mn measurements show that the highest average value of Manganese (Mn) measurements does not meet the standards, namely in Kaliukan Village and Kelampaian Ulu Village of 23.266 with a standard dev iation of 2.3437. The results of Pb (Lead) measurements show that the highest average Lead (Pb) measurement is in Sungai Alat Village of 46.2410 with a standard deviation of 4.64514.

Index Terms- Clean Water, Water Availability, Soil, Quality Standards, Chemistry

I. INTRODUCTION

Water is the main requirement in life so that every living thing can grow and develop properly on earth. The surface of the e arth consists of about 75% water. Most of the human body weight is water covering 50-70%. According to WHO, each person requires between 60-120 liters of water/day, while in developing countries, including Indonesia, each person requires between 30 -60 liters/day of water (Dukabain et al, 2019). The current problem is that the quality of groundwater and well water does not meet the requirements so that water that is not suitable for consumption by the community can have an adverse impact on the health of the community. Not to mention the swampy natural conditions that cause the water to become cloudy resulting in people using rainwater or continuing to use cloudy water for their daily needs. Groundwater can include deep well water or shallow well water. Dug wells are the most widely used form of wells by people with low economic levels and individual housing.

One of the contamination of well water can be influenced by the distance between the well and the pollutant source and environmental conditions such as flooding, and the construction of shallow wells and soil structure which causes the water to become turbid and unfit for consumption and further processing must be carried out using simple and environmentally friendly technology. The closer the

horizontal and vertical distances between wells and pollutant sources, the more likely the wells are polluted and the more frequent floods occur, the more likely the water quality of wells and drilled wells does not meet established standards (Dukabain et al, 2019).

Astambul sub-district in five villages with a total of 8568 people with a poor, vulnerable and disabled population of 2796 people is one of the areas in the Banjar Regency which has a clean water crisis both in the rainy and dry seasons and is coupled with the occurrence

of floods every year even every time it rains which causes water quality becomes cloudy and does not meet the physical, chemical and bacteriological quality.

Data from the results of the 2020 river water quality inspection in Banjar district that of the 8 parameters exceeding the permissible threshold values, namely MPN coli 35000/100 ml of standard water, namely 100 ml/water, TSS, namely 846 mg/L of 50 mg/L, BOD 3 98 mg/L from 3 mg/L, COD 189.3 mg/L from 25 mg/L, DO 6 mg/L from 4 mg/L, pH 6-7 from 6-9. The data for 2021 are as follows: turbidity number 57.55, TDS 343.3, Ph 6.69, dissolved oxygen 15.13. Based on the data above, it states that the quality of surface water does not meet the requirements as clean water both physically, chemically and bacteriologically and needs to be treated both by filtration and coagulation with community empowerment (DLH, 2020).

Another factor causing the shortage of clean water is the low location of Banjar Regency from sea level which causes the flow of water on the ground surface to become less smooth. As a result, some areas are always inundated (29.93%), some (0.58%) are inundated periodically. In general, the soil in the Astambul sub-district has a granular structure, the consistency varies from sticky, non-sticky and slightly sticky, redish yellow, gray pinkish gray and brown in color, with plasticity variations from plastic, somewhat and non-plastic, this is fine textured (77.62%) which includes clay, loamy, sandy and dusty. While 14.93% had a medium texture, namely clay, dusty, sandy clay, the remaining 5.39% had a coarse texture, namely loamy sand, dusty sand. The Fe content in the soil in 6 villages was as high as 1.5 m -1.7 m exceeding the standard with an average of 45.398 and Mn of 28.70, C of 0.899, content of organic matter of 1.554 and permeability of 3.77 which allows has to do with the quality of water in wells and groundwater and rivers with high Fe and Mn values. Fe 79.61 mg/l in the village of ulu and mid-reaching 57.38 (standard 1.0 mg/l), Fe 36.36 mg/l Kaliukan, Fe 32.29 mg/l Lok Gabang village, Fe 66, 12 mg/l Sungai Alat village, Mn 23.80 mg/l (0.5 mg/l) kelampaian ulu village, kelampaian Tengah village Mn 28.70 mg/l , Mn 62.30 mg/l Kaliukan, Mn 16, 10 mg/l, Lok Gabang, Mn 46.20 mg/l Sungai Alat, pH 6 (standard 6.5 -9.5), MPN Coli > 1600/100 ml. The results of analysis of soil pH levels in Astambul District were Sungai Alat Village at 6.87, Keliukan Village at 7.28, Lok Gabang Village at 7.4, Kelampaian Ulu Village at 5.1, and Kelampaian Tengah Village at 4.08. Groundwater (Lok Gabang) Mn 0.036, (Lok Gabang) Fe 1.77, (Lok Gabang) turbidity 18.67, (Lok Gabang) ph 7.6 9 not yet (Syamsul A et al, 2021; Laily K et al, 2021; Waskito et al, 2021).

Water quality will decrease apart from pollution as well as natural conditions/disasters such as floods. Disaster risk assessment data for the province of South Kalimantan by BPBD in the 2015 analysis Banjar Regency has a flood hazard with an area of 232,219 H a with a high class of hazard. Meanwhile, the flash flood hazard in Banjar Regency is 5,832 Ha with a high hazard class. Data from the disaster risk assessment in 2016-2020 in Banjar Regency, sub-districts that have a high class of hazard are Aluh-Aluh, Lucky Baru, Peat, Kertak Hanyar, Tatah Makmur, Sungai Tabuk, Martapura, East Martapura, West Martapura, Astambul, Aranio, 4-way intersection. Astambul District was affected by flooding starting in 2015 as many as 9 villages, 985 families and 5392 people with a height of 1m, in 2016 4 vill ages, 223 families and 6616 people with a height of 20 cm, in 2017 2 villages, 59 families and 201 people in 2020 as many as 3 villages , 76 families and 238 people with a flood height of 52 cm, 2021 with a total of 128 families and 384 people which are coal mining areas wit h a flood height of 1-2 m, in 2021 there are 9 villages with 35313 people with a population density of 163 people per km2 with a flood height of 1 - 2.5 m. (BPBD, 2021; BPS, 2021).

The water sanitation program, one of which is an integral part is the use of clean water as a whole for all people in Indonesia through the health sector community empowerment program to plan the need for clean water and distribute the use of clean water evenly for community needs by using natural materials from local areas that are cheap according to social conditions community economy. Community empowerment activities in the health sector are carried out after a mapping process is carried out regarding the condition of the land and clean water sources in the flood area. Making a multi-risk map for flood disasters in a disaster-prone area, especially mapping clean water sources and community empowerment activities in the health sector based on a geographic information system (GIS) using Quantum GIS open software.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

This research method includes quantitative research, descriptive study with a spatial analysis approach. To analyze the avail ability of clean water based on chemical quality in flood-prone areas in Astambul District, the sampling process using the pH parameter check technique, Iron (Fe) Manganese (Mn) and Lead (Pb) was checked in the laboratory.

III. RESULTS

A. Univariate

Sampling was carried out at fifteen (15) research points consisting of the Village of Kelampaian Tengah, the Village of Lok Gabang, the Village of Sungai Alat, the Village of Kaliukan and the Village of Kelampaian Ulu. The results of measuring the chemical parameters of pH, Iron (Fe), Manganese (Mn) and Lead (Pb) of water at all research points can be seen in the table below

Table 1. Tabel 1. Hasil pemeriksaan kualitas kimia air bersih di Desa Kelampaian Tengah

No	Sampel	pH (Kadar Normal = 6,5-8,5)		Besi (Kadar Maksimum=1mg/l)		Mangan (Kadar Maksimum=0,5mg/l)		Timbal (Kadar Maksimum=0,05mg/l)	
1	Titik 1	7,0	Sesuai	0,756	Sesuai	18,4	tidak sesuai	32,447pg/l	sesuai

2	Titik 2	6,3	tidak sesuai	1,03	tidak sesuai	21,2	tidak sesuai	31,596pg/l	sesuai
3	Titik 3	6,3	tidak sesuai	1,054	tidak sesuai	21,2	tidak sesuai	38,511pg/l	sesuai

Tabel 2. Hasil pemeriksaan kualitas kimia air bersih di Desa Lok Gabang

No	Sampel	pH (Kadar Normal = 6,5-8,5)		Besi (Kadar Maksimum=1mg/l)		Mangan (Kadar Maksimum=0,5mg/l)		Timbal (Kadar Maksimum=0,05mg/l)	
1	Titik 1	6,4	tidak sesuai	0,621	Sesuai	20,6	tidak sesuai	21,17pg/l	Sesuai
2	Titik 3	6,3	tidak sesuai	0,352	Sesuai	21,8	tidak sesuai	25,213pg/l	Sesuai
3	Titik 5	6,4	tidak sesuai	0,732	Sesuai	23	tidak sesuai	25,532pg/l	Sesuai

Tabel 3. Hasil pemeriksaan kualitas kimia air bersih di Desa Sungai Alat

No	Sampel	pH (Kadar Normal = 6,5-8,5)		Besi (Kadar Maksimum=1mg/l)		Mangan (Kadar Maksimum=0,5mg/l)		Timbal (Kadar Maksimum=0,05mg/l)	
1	Titik 1	6,5	Sesuai	0,549	Sesuai	24,4	tidak sesuai	40,957pg/l	sesuai
2	Titik 3	5,9	tidak sesuai	1,395	tidak sesuai	10,6	tidak sesuai	48,085pg/l	sesuai
3	Titik 6	6,3	tidak sesuai	0,491	Sesuai	19,6	tidak sesuai	49,681pg/l	sesuai

Tabel 4. Hasil pemeriksaan kualitas kimia air bersih di Desa Kaliukan

No	Sampel	pH (Kadar Normal = 6,5-8,5)		Besi (Kadar Maksimum=1mg/l)		Mangan (Kadar Maksimum=0,5mg/l)		Timbal (Kadar Maksimum=0,05mg/l)	
1	Titik 1	6,5	sesuai	0,698	Sesuai	25	tidak sesuai	32,021pg/l	sesuai
2	Titik 2	6,2	tidak sesuai	1,943	tidak sesuai	24,2	tidak sesuai	38,511pg/l	sesuai
3	Titik 3	6,4	tidak sesuai	0,496	Sesuai	20,6	tidak sesuai	44,255pg/l	sesuai

Tabel 5. Hasil pemeriksaan kualitas kimia air bersih di Desa Kelampaian Ulu

No	Sampel	pH (Kadar Normal = 6,5-8,5)		Besi (Kadar Maksimum=1mg/l)		Mangan (Kadar Maksimum=0,5mg/l)		Timbal (Kadar Maksimum=0,05mg/l)	
1	Titik 1	7,0	sesuai	0,400	Sesuai	12,0	tidak sesuai	61,277pg/l	sesuai
2	Titik 2	6,2	tidak sesuai	0,809	Sesuai	25,0	tidak sesuai	53,936pg/l	sesuai
3	Titik 3	6,3	tidak sesuai	1,496	tidak sesuai	19,6	tidak sesuai	60,532pg/l	sesuai

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IV. DISCUSSION

1. Ph level

The value of the degree of acidity or pH from the test results from 15 points spread across Astambul District averaged 6.29 mg/l so that most of the water sources in Astambul District were acidic. This figure is below the standard for water used for sanitary hygiene purposes. The pH value is an important factor in waters because the pH value in water will determine the nature of the water to be acidic or alkaline which will affect biological life in the water (Djoharam, 2018). According to Permenkes Number 32 of 2017 it states that the pH standard or degree of acidity for water used for sanitary hygiene is in the range of 6.5-8.5.

The degree of acidity (pH) with a value of 7 is a neutral pH and this prevents the dissolution of heavy metals and corrosion. Water is an excellent solvent so that its non-neutral pH can dissolve the chemical elements in its path. In addition, water with a high pH (alkaline) is not suitable for use in food processing, damages plumbing and also interferes with digestion. Likewise, water with a low pH (acid) is feared to cause iron pipes to rust quickly and be corrosive to steel. A pH lower than 6.5 can cause an unpleasant taste and cause some chemical compounds to turn into poisons that are detrimental to health (Earnestly, 2018).

2. Iron (Fe)

The content of iron (Fe) in water from the test results of 15 points in Astambul District obtained an average of 0.85 mg/l. The content of this amount is still below the maximum threshold for water used as a means of sanitation hygiene. However, there were 5 points (33.33%) which had a high iron content that exceeded the standard.

The results of Fe measurements show that the highest average value of Iron (Fe) measurements is in Kaliukan Village of 1.04567 with a standard deviation of 0.783649 and for the lowest average value of Iron (Fe) measurements, namely in Lok Gabang Village of 0.56833 with a standard deviation of 0.195398. the highest Fe measurement in Kelampaan Ulu Village was due to the low dissolved oxygen content. The increasingly acidic pH will further dissolve metals, including iron. Dissolved oxygen at neutral pH conditions will oxidize and then form precipitates, so the lower the dissolved oxygen concentration, the greater the dissolved iron concentration.

3. Manganese (Mn)

The results of testing water samples to see the manganese or Mn content in the water obtained an average of 18.87 mg/l. Very far beyond the maximum threshold set for water used for sanitary hygiene by the community. There are no points that have standard Mn content. this makes the quality of the water unfit for use or consumption from examination of chemical factors according to the Regulation of the Minister of Health of the Republic of Indonesia Number 32 of 2017 concerning drinking water quality standards stating that the concentration of Mn in drinking water should not be more than 0.1 mg/L and in clean water should not be more than 0.5 mg/L.

The results of the Mn measurements show that the highest average value of Manganese (Mn) measurements does not meet the standards, namely in Kaliukan Village and Kelampaian Ulu Village of 23,266 with a standard deviation of 2.3437 and for the lowest average value of Manganese (Mn) measurements that do not meet the standards, namely in the Village Sungai Alat is 10.6 with a standard deviation of 7.0057.

4. Lead (Pb)

The results of Pb (Lead) measurements show that the highest average Lead (Pb) measurement is in Sungai Alat Village of 46.2410 with a standard deviation of 4.64514 and the lowest average Lead (Pb) measurement is in Lok Gabang Village of 23.9717 with a standard deviation of 2.43155 .

Lead (Pb) levels from the test results obtained an average of 58.58pg/l. This amount is very low compared to the maximum limit set for sanitation hygiene needs. There are no points that have Pb content exceeding the maximum threshold.

Chemical Parameter Contour Map

a. pH Parameter Contour Map

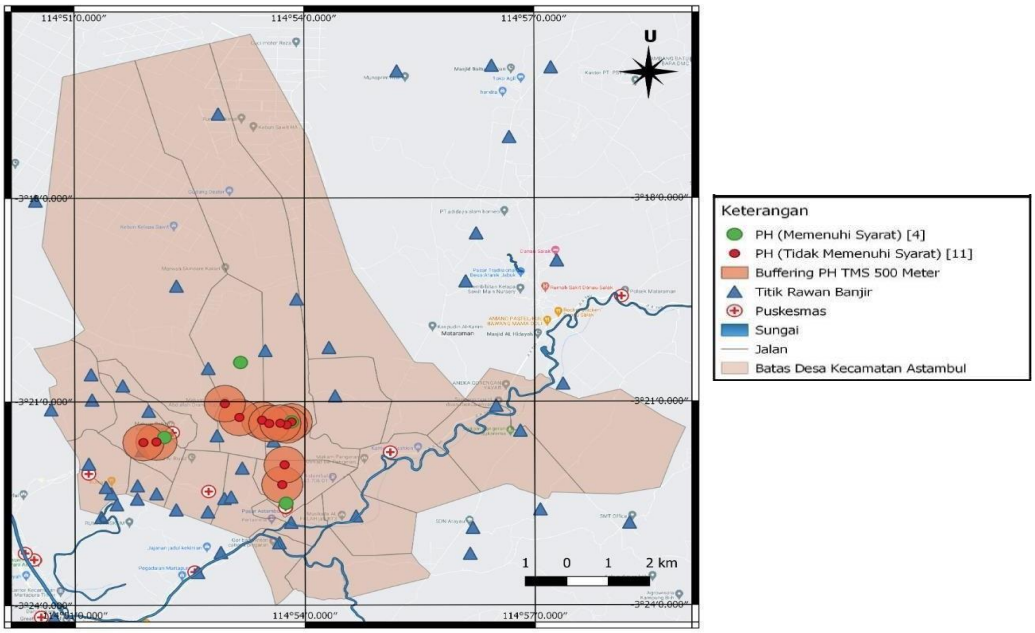

Figure 1. Contour Map of pH Parameters

From Figure 1. The contour map for the pH parameters above, there are four points that meet the standard pH values, namely at point 1 Village, the middle stretch with the coordinates point Easting (X) 263275,986084 Northing (Y) 9628492,889274 with a pH level of 7, point 1 Village Alat River with Easting (X) 266218.396636 Northing (Y) 9626705.627980 with pH level 7 , point 1 Kaliukan Village with Easting (X) 266350.912037 Northing (Y) 9628916.764372 with pH 6, 5 , point 1 in Kelampaian Ulu Village with the coordinates of Easting (X) 265114,545654 Northing (Y) 9630529,664561 with a pH level of 7. And the lowest pH value that does not meet the standard, namely with a pH level of 5.9 is at point 2 Village Alat River with coordinates Easting (X) 266124.043320 Northing (Y) 9627210.243440. Judging from the contour color, the pH parameter is relatively low or tends to be acidic.

b. Iron (Fe) Parameter Contour Map

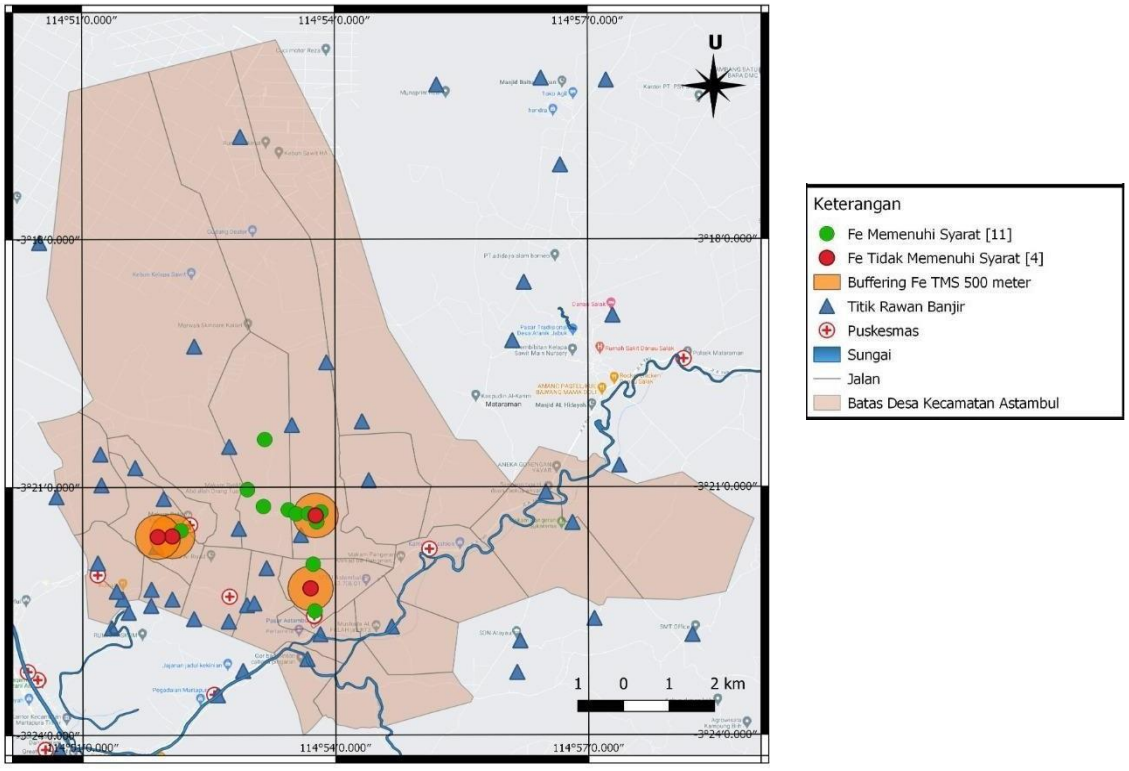

Figure 2. Parameter Contour Map

From Figure 2. The contour map for the Iron (Fe) parameter above, the highest Iron (Fe) value meets the standard of 0.809 mg/l at point 2 of Kelampaian Ulu Village with coordinates Easting (X) 266077.091914 Northing (Y) 9628879 .342827 and the lowest value

meets the standard at point 1 the sample measurement value of 0.400 mg/l is in Kelampaian Ulu Village with the coordinates of Easting (X) 265114.545654 Northing (Y) 9630529.6645619. And the lowest Iron (Fe) value that does not meet the standard is 1.943 mg/l at point 2 Sungai Kaliukan Village with the coordinates Easting (X) 266234.368174 Northing (Y) 9628835.326934 and the highest does not meet the standard with a value of 1.054 mg/l is at point 3 of Central Kelampaan Village with coordinates Easting (X) 262766.944411 Northing (Y) 9628353.072175.

c. Manganese Parameter Contour Map (Mn)

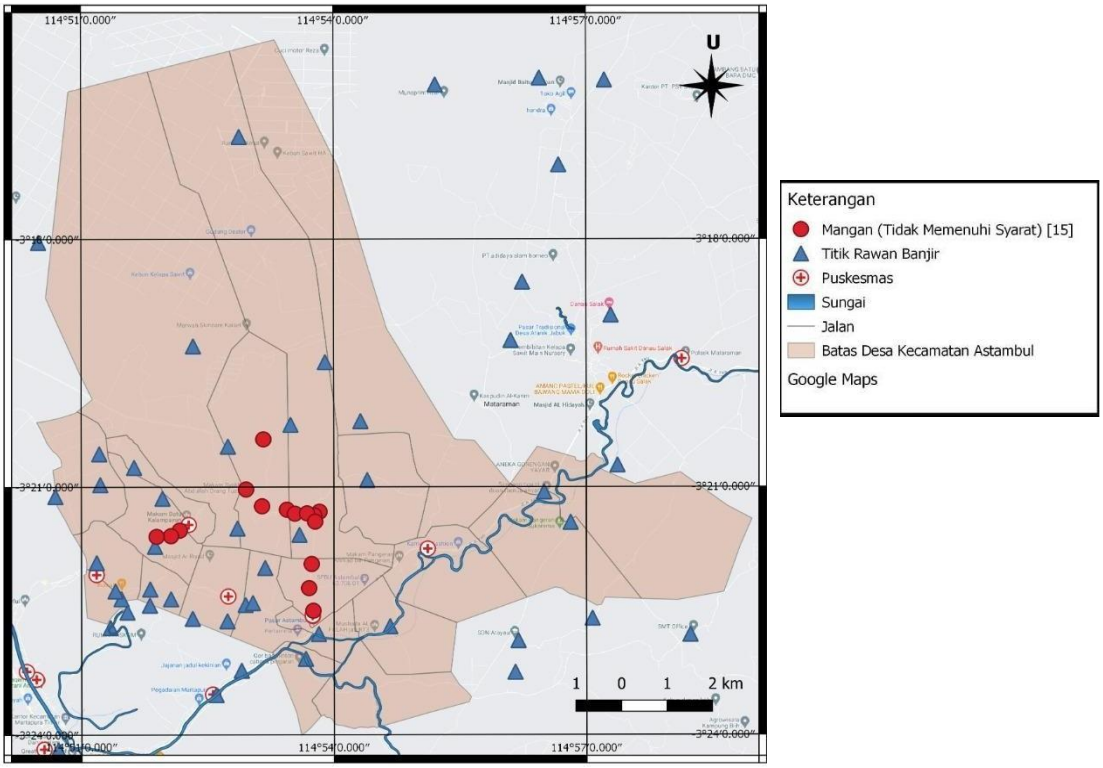

Figure 4. Contour Map of Manganese Parameters (Mn)

From Figure 4.5 the contour map for the Manganese (Mn) parameter above, the highest Manganese (Mn) value that does not meet the standards of 25.0 mg/l is at point 2 point 2 of Kelampaian Ulu Village with Easting (X) coordinate point 266077,091914 Northing (Y) 9628879.342827 and the lowest value that does not meet the standard at point 2 is the sample measurement value of 10.6 mg/l in Sungai Alat Village with coordinates Easting (X) 266124.043320 Northing (Y) 9627210.243440. Manganese levels at 2 locations in Kelampaian Tengah Village with the same content value of 21.2 with UTM coordinates Easting (X) 263081.945452 Northing (Y) 9628368.471286 and Easting (X) 262766.944411 Northing (Y) 9628353.072175 because the well water located at that point was affected by flooding which allowed the overflow of river water to enter the residents' wells.

d. Lead (Pb) Parameter Contour Map

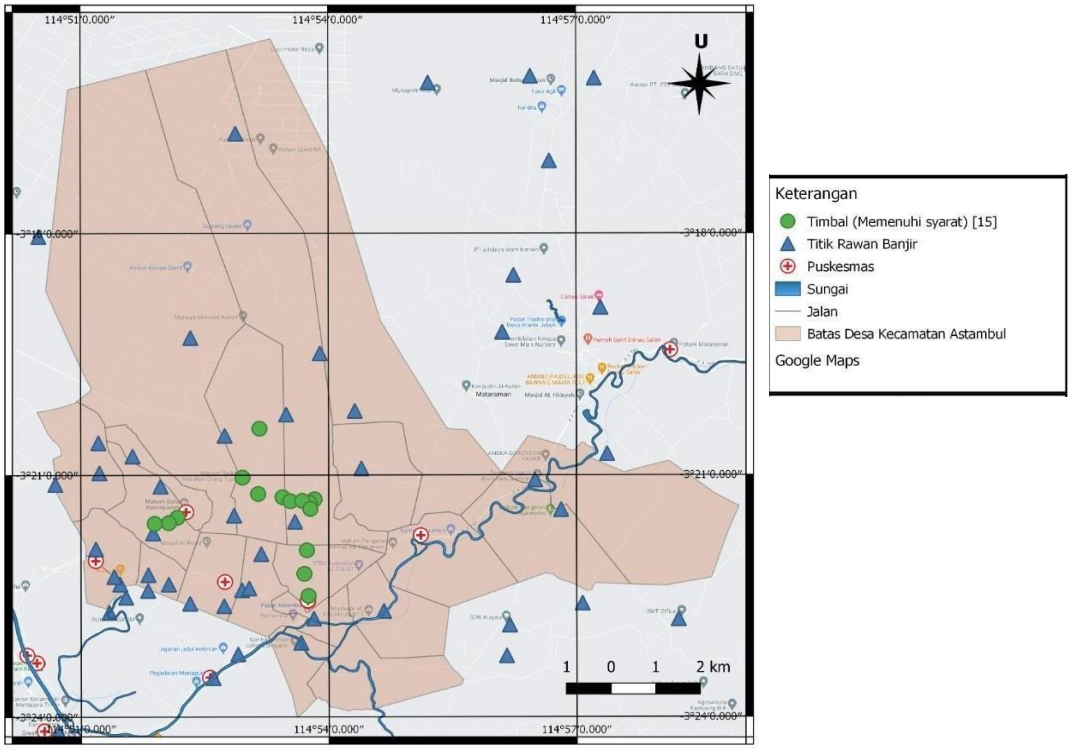

Figure 4. Contour Map of Lead (Pb) Parameters

From Figure 4. The contour map for the Lead (Pb) parameter above, the highest Lead (Pb) value that meets the standards is 61.277 pg/l at point 1 of Kelampaian Ulu Village with coordinates Easting (X) 265114.545654 Northing (Y) 9630529 ,664561 the location is near a river where at any time the water from the river overflows which results in contamination between river water and well water due to physical changes in water between the rainy season and the dry season due to the influence of the soil texture which is dominated by sand will have large pores (more porous) and the lowest value that meets the standard at point 1 sample measurement value of 21.17 pg/l is in Lok Gabang Village with coordinates Easting (X) 265635.161164 Northing (Y) 9628961.126828. Where the location is far from the river flow which allows stable well water conditions.

V. CONCLUSION

Based on the results and discussion obtained, it can be concluded as follows:

1. Based on the results of testing the degree of acidity Potential Hydrogen (pH) of water in the research area in neutral conditions it is in Kelampaian Tengah Village at point 1 sampling with coordinates Lat -3.358769 Long 114.869476 and in Kelampaian Ulu Village at point 1 sampling with Lat coordinates - 3.340391 Long 114.886055.
2. Based on the results of research on determining the levels of Iron (Fe) in well water in the study area under standard conditions in Kelampaian Tengah Village with a value of 0.94 mg/l Lok Gabang Village with a value of 0.57 mg/l, Sungai Alat Village with a value of 0.810 mg/l, Kelampaian Ulu Village with a value of 0.94 mg/l and under non-standard inspection conditions in Kaliukan Village with a value of 1.04 mg/l.
3. Based on the results of research on determining levels of Manganese (Mn) in well water in the study area, the conditions were not up to standard in all the villages studied, including Central Kelampaian Village. Lok Gabang Village with a value of 21.8 mg/l. Sungai Alat Village with a value of 18.2 mg/l. Kaliukan Village with a value of 23.26 mg/l and Kelampaian Ulu Village with a value of 18.86 mg/l.
4. Based on the results of research on the determination of Lead (Pb) levels in well water in the study area under standard conditions in all the villages studied including Kelampaian Tengah Village with a value of 34.18 pg/l. Lok Gabang Village with a value of 23.97 pg/l. Sungai Alat Village with a value of 46.24 pg/l. Kaliukan Village with a value of 38.26 pg/l and Kelampaian Ulu Village with a value of 58.58 pg/l.
5. For future researchers, it is hoped that they can further examine other metal elements.
6. Clean water from wells that meet the water quality requirements based on the chemical parameters pH, Iron (Fe), Manganese (Mn)

and Lead (Pb) should be maintained so that they are not polluted by paying attention to the cleanliness of the surrounding environment.

7. There needs to be periodic monitoring and counseling from environmental health officers on duty at the Astambul sub-district health center. So that environmental health officers can know the dangers of using water that does not meet health requirements in terms of chemical water quality.
8. There needs to be cooperation between health workers and the local government and related agencies to be able to improve or determine the best way to deal with the quality of well water in the Astambul sub-district.

9. Empowering the community to be able to carry out simple clean water treatment by utilizing local natural resources, such as rice husks, water hyacinth and coconut shells.

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