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Analysis of Sungai Ular Water Quality Viewed from The Impact of Palm Oil Industry Activities And PDAM

Analisis Kualitas Air Sungai Ular Ditinjau dari Dampak Aktivitas Industri Kelapa Sawit dan PDAM

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ABSTRACT

This research aims to determine the effect of industry wastes of Palm Oil and PDAM to the river water quality use parameters of the water caracteristic, parameters that using to determine the water Pollution level as ; Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Mangan (Mn), Aluminium (Al), Besi (Fe), Timbal (Pb), turbidity, and water quality standards of Sungai Ular. This research was carried out in Sungai Ular to Serdang Bedagai Regency and Deli Serdang Regency and next in The Laboratorium Socfindo Seed Production & Laboratories (SSPL) in September - October 2020. The research method is used a Purposive sampling. At all the stations of Sungai Ular stations that have determined in this research are result of parameters from BOD are into to the class II all of stations, and concentration of COD all of stations into to the class, and another parameters are still below the threshold to all of stations so can said from averaged of parameters all of stations, the Water quality of Sungai Ular are still classified below the threshold in accordance with government regulation number 82 of 2001.

Keywords: Quality, River, Pollution, Industry.

INTRODUCTION

The Sungai Ular is one of the largest rivers in which is located upstream in two Regency, namely Simalungun Regency and Karo Regency while the downstream is in two districts as well, namely in Deli Serdang Regency and Serdang Bedagai Regency (the boundaries of the two regencies). Sungai Ular experiences a decreasing discharge every year, this situation demands rehabilitation of The Sungai Ular function and water quality and needs immediate repairs considering the increasingly severe damage to the ecosystem (Suroto, 2008). These conditions will affect the condition of the river and the quality of the water itself, as well as on the lives of the people living around The Sungai Ular. Around this river, there are many industrial activities, such as palm oil processing factories.

One of the industrial developments the palm oil industry has been very fast. Palm oil mills also participate in more and more so the waste that is produced is the same. The waste released by the industry polluted the river. The environmental impact of palm oil mills in managing fresh fruit bunches (FFB) into crude palm oil (CPO) is to produce liquid waste from oil palm processing which creates external costs for the community in the form of replacement costs for clean water and medical expenses (Utami et al, 2017). Environmental damage is caused by various factors, among others, pollution caused by humans, namely from the activities they carry out. The environment can be said to be polluted if contaminants entered or enter which can cause disturbance to the living things that are in it. There are disturbances that have an immediate effect and there are also things that can only be felt by the next generation. Environmental damage due to human activities starts from increasing in number population from year to year. The current condition of the river really depends on the activities of industries that make use or are around The Sungai Ular. In general, Sungai Ular water discharge shows a decreasing tendency, the decrease in discharge is not accompanied by a decrease in water use (Suroto, 2008).

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Humans must keep nature so that it can be used properly without destroying it.

Apart from the decreasing water flow of The Sungai Ular, the water quality has also been polluted due to human activities such as the industry of PDAM which uses The Sungai Ular water as a source of raw water. Expressed by Hafni (2012) that the water treatment process at PDAM also uses chemical substances such as alum (Al2 (SO4) 3 the use of the amount of alum is based on the turbidity of raw water, the amount of alum used depends on the high turbidity of the water. Lime causes the pH to rise and uses chlorine. The impact arising from various industrial-industrial activities can cause a decrease in the quality of water that does not meet quality standards and this standard is fit for consumption, which can cause various disturbances both to the river as a source of water and disturbance to living things (Effendi, 2003).

Khairunisa, (2017) explains that wastewater consists of hazardous, toxic substances and germs that can cause water-borne diseases. Wastewater is very dangerous to human health considering that many diseases can be transmitted through wastewater. It is very dangerous for the health of living things in a long time. Effect of waste from the palm oil industry and the PDAM industry on river water quality, So it is necessary to look at the water quality of The Sungai Ular with the parameters of water properties, the parameters used to determine the level of water pollution such as; BOD, COD, Mn, Al, Fe, Pb and Turbidity with three sampling points taken near the three industries directly so that it is expected that the samples taken are as desired, and previously someone has examined The Sungai Ular with parameters namely Total Suspended Solid (TSS), BOD, COD, Potential Hydrogen (pH), Temperature, Total Dissolved Solid (TDS), Dissolved Oxygen (DO), with three sampling locations, namely in the upstream, middle and downstream of The Sungai Ular, the conclusions were made at the upstream point of The Sungai Ular, entered into class II quality standards, at the midpoint III and the downstream point of The Sungai Ular enter the class IV quality standard which was examined by Ismail (2017). Thus this study intends to analyze the water quality of The Sungai Ular in terms of the impact of the oil palm industry and the PDAM industry with different water parameters. Based on this description, this research is important to do as a form of concern for the environment, in this case rivers, from industrial activities so that the business carried out by the industry does not gradually damage the environment. The objectives of this study are:

1. To determine the impact of the oil palm industry and PDAM on the quality of river water at this time in terms of parameters; BOD, COD, Mn, Al, Fe, Pb, Turbidity.
2. To determine the effect of oil palm and PDAM industrial activities on river water quality.
3. To determine the quality of Sungai Ular water, it still meets the quality standards for domestic wastewater.

MATERIAL AND METHOD

This research was conducted in Sungai Ular in Serdang Bedagai and Deli Serdang Regency (administrative boundaries of the two districts) and continued at the Laboratory of Socfindo Seed Production & Laboratories (SSPL). The research was started in September - October 2020. The tools used in this study were bottles that could contain 1.5 L of water for the sample container, GPS (Global Positioning System) to record the coordinates of the predetermined sampling area, markers to mark the sample bottles of stationery are used to record observations, and the Mobil Phone is used for taking pictures. Atomic Absorption Spectophotometer (AAS), heating device, 100 cup and erlemeyer glass and 25 mL digital burette, volumetric pipette, volumetric flask, glass funnel, 5 cm diameter watch glass, membrane filter with 0.45 µm pore size, spray flask, lamp hollow cathode, electric heater, vacuum filter kit, analytical balance with accuracy of 0.0001 g, glass or magnetic stirring, tissue paper cup, thermometer, Winkler bottle, magnetic stirrer, incubation cabinet, shaker, blender, oven, nephelometer and spray bottle. The materials used are mineral-free water, phosphate buffer nutrient solution, magnesium sulfate, classium chloride, ferric clotide, microbial suspension, diluent water, glucose

glutamic acid, acid and base1 N, sodium sulfite, Allythuourea inhibitor (ATU), acetic acid. , 10% potassium iodide, starch indicator, organic free water, digestion solution in the range of high and low concentrations, sulfuric acid reagent solution, standard solution of potassium hydrogen phthalate, Manganese Sulfate, distilled water, sodium hydroxide, NaOH Na losisa, potassium lodida, sodium azide, salicylic acid, potassium bi-iodate, potassium dichromate, metal hydrochloric acid free water, Al 1000 mg / L mains standard solution, acetylene gas, nitrous oxide gas, Fe metal standard solution, lead metal standard solution, distilled water which has power electrical conductivity less than µS / cm. Determination of the location for river water sampling in the Sungai Ular which is divided into stations in this study was carried out using purposive sampling method or a sampling unit selected based on certain considerations with the aim of obtaining a sampling unit that has the desired characteristics and is based on the ease of time, the ease of use of infrastructure and facilities as well as funds in this study. According to Cahyani et al, (2012) that all stations are determined based on the consideration that the place is a potential source of pollution. Where the researcher determines the sampling by purposive sampling is by determining specific characteristics that are in accordance with the research objectives so that it is expected to be able to answer the research problem, the stations are divided into 3 sampling points:

Station A: Near the PDAM Titanadi Deli Serdang branch. Coordinate: N 3º33'55.5804" E 98º56'02.3568"

Station B: Near the PTPN II Pagar Merbau Industry. Coordinate: N 3º32'28.2264" E 98º55'43.0788"

Station C: Near the PTPN IV Adolina Industry Coordinate: N 3º36'33.1812"

Sampling of river water is taken in the morning and immediately taken to the laboratory by taking into account the conditions that are not raining, let alone flooding, by means of taking a momentary sample (grab sample), instant sample or grab sample, namely samples taken directly from the water body being monitored, taking samples by preparing sample bottles and rinsing sample bottles
3 (three) times with the water sample to be taken, then taking the water sample with the sample bottle that has been prepared and naming the sample and bringing it to the laboratory to be tested with predetermined parameters (SNI 6989.59: 2008), the sample was taken in the middle of river body. The process of taking water samples at each station is 1 sample bottle with predetermined parameters, namely BOD, COD, Mn, Al, Fe, Pb, Turbidity, with a point adjacent to industrial-industrial waste disposal by looking at the direction of water flow, entering into sample bottles against the water current. For rivers with a discharge between 5-150 m3 / second, the sample is taken in the middle of the river's width, with a combination using simple tools (SNI 6989.59: 2008). It is hoped that the samples taken are in accordance with the desired and then immediately taken to the Socfindo Seed Production & Laboratories (SSPL) Laboratory for testing and analysis. Observations were started by collecting samples at each station in the amount of 1 bottle per station, namely 1 bottle containing 1.5 L for samples of BOD, COD, Mn, Al, Fe, Pb and Turbidity. Samples were taken by looking at the flow of river water, samples were taken using a
1.5 mL bottle container, the point of taking at the station was by looking at the industry, thus it is hoped that the results obtained are appropriate, so that samples containing waste / waste from the industry are obtained. . Then the samples were taken to the Socfindo Seed Production & Laboratories (SSPL) Laboratory to be analyzed and tested.

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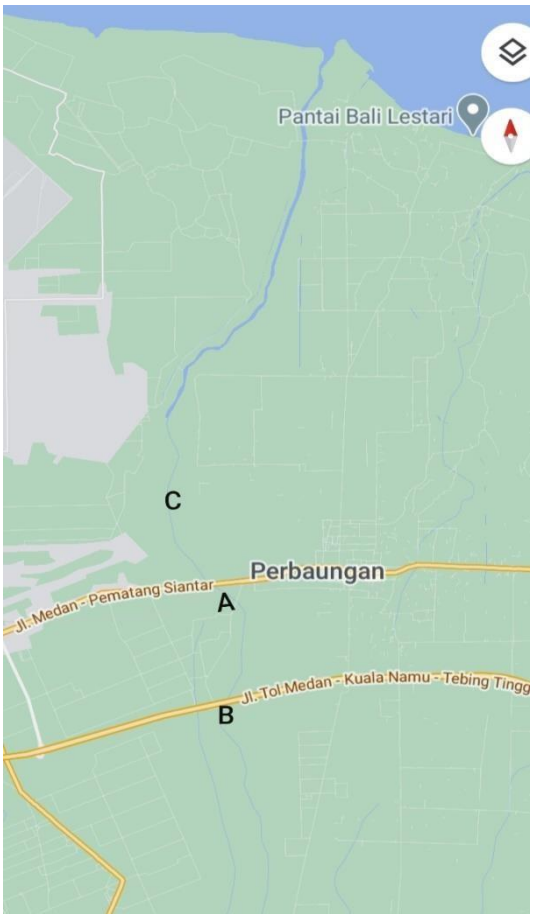

Sungai Ular Maps

RESULTS AND DISCUSSION

Results of Analysis and Discussion of Sungai Ular Water Quality

In general, the shape of The Sungai Ular is the main source of water supply for farming communities, many people rice fields as a source of sustenance for the surrounding community who use water for washing and bathing, as well as industrial (company) needs. Water is also very important as a gift of natural resources which has a very important function for the survival of humans and other creatures and environmental elements that must be maintained, to maintain and care for the function of water it is necessary to manage water quality and control water pollution wisely by taking into account the interests. The future of ecological balance (PPRI-82, 2001). Do not let The Sungai Ular become like the Bengawan Solo River which is reddish black and has a bad smell (Ramadhani, 2015).

Biochemical Oxygen Demand (BOD) Concentration Measurement

Measurement of the concentration of the biochemical oxygen demand test is to determine the amount of dissolved oxygen needed by microorganisms or aerobic microbes to oxidize carbon organic matter, so what if the BOD test gets a higher value or exceeds the water quality standard, it means that the higher the amount of BOD needed Aerobic microbes to oxidize organic matter means a lot of carbon organic matter, so it can be seen that the amount of waste pollution is also high. The greater the BOD value detected by the laboratory dialate, namely the atomic absorption spectrophotometer, the greater the level of water pollution caused by organic compounds. According to Saksena et al (2008), a low BOD content indicates that the river is free from organic matter contamination. The results of the analysis of the water quality of the Snake River with parameters BOD, COD, Turbidity, Al, Fe, Mn, Pb can be seen in the following table:

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Table 1. Results of the Ular River Water Quality Analysis

Parameter	Class				Results		
	I	II	III	IV	A	B	C
BOD	2	3	6	12	2.10	2.30	2.40
COD	10	25	50	100	4.30	4.40	5.30
Turbidity	(-)	(-)	(-)	(-)	10.88	8.43	9.14
Al	(-)	(-)	(-)	(-)	0.12	0.12	0.12
Fe	0.3	(-)	(-)	(-)	0.19	0.17	0.19
Mn	0.1	(-)	(-)	(-)	<0.01	<0.01	<0.01
Pb	0.03	0.03	0.03	1	<0.01	<0.01	<0.01

Source: Laboratorium Socfindo Seed Production & Laboratories (2020)

From the data in Table 1, the results of the analysis at station A show a BOD of 2.10 mg/L, then at the point of taking station B of The Sungai Ular the BOD concentration is 2.30 mg/L, and at the point of taking station C Sungai Ular the concentration results are obtained. BOD of 2.40 mg/L. It can be seen that the measurement results of BOD concentration parameters at all stations are still in class I water quality standards, are still in very good water condition and can be designated for drinking water standards and / or other uses requiring the same water quality as these uses (PP No. 82 tahun 2001). When viewed from previous research by Ismail (2018) who examined The Sungai Ular water in the upstream, middle and upstream parts, it obtained BOD of 2.4 mg/L, 3.4 mg/L and 6.4 mg/L, this shows that in the downstream The Snake River is more polluted than other parts of the river, which has passed the Class III quality standard.

Chemical Oxygen Demand (COD) Concentration Measurement

Measurement of COD concentration from the data in Table 1, the results of the analysis at station A show COD of 4.30 mg/L, then at the point of collection at Station B Sungai Ular the results of COD concentration are 4.40 mg/L, and at the point of collection at station C Sungai Ular the results obtained were the COD concentration of 5.30 mg/L. Pollution caused by COD still has not exceeded the water quality of PP-82-2001, but it must be able to maintain water quality standards so that it does not become more polluted. The increase in COD could occur due to the activity of the oil palm industry near river bodies (Jamiah, 2012).

When viewed from previous research by Ismail (2018) who examined The Sungai Ular water in the upstream, middle and downstream parts which obtained COD of 4.1 mg/L, 7.5 mg/L and 19.2 mg/L, this shows that downstream of The Sungai Ular which is more polluted than other parts of the river. It can be taken to conclude that the downstream part of The Sungai Ular is more polluted, because of the last point of the river or the last part of the river water before the dry season and then the sea where all the contents that flow from upstream, middle to downstream are collected, of which there are several industries near the river. and some directly take river water for industrial processes, which also has the potential to contribute to the pollution of The Sungai Ular water.

Turbidity Concentration Measurement

Measurement of turbidity concentration from the data in Table 1, the results of the analysis at station A show that the turbidity is 10.88 NTU, then at the point of grabbing station B Sungai Ular the turbidity concentration is 8.43 NTU and at the point of taking station C Sungai Ular the results of the turbidity concentration are obtained. amounted to 9.14 NTU. In PP-82-2001.

There is no water quality standard on the turbidity parameter, but it should not be ignored. Due to high turbidity, it can inhibit sunlight from entering the water (Efendi, 2003).

Measurement of Aluminum (Al)

Measurement of Al ari concentration of data Table 1, the results of the analysis at stations A, B and C show the results of the same Al concentration, namely 0.12 mg / L. It is suspected that the drinking water processing industry uses alum as raw material for the raw water purification process. The presence of alum or alum makes researchers want to examine the Al parameter. However, as Mirwan disclosed in 2012, the waste can be used as liquid alum through the process of recovering alumunia to purify and reduce the turbidity level of water from rivers. There is a possibility that the PDAM will generate waste because the purification process besides that the waste produced can also be used as purifier again. Therefore, it can be seen in Table 1 that the results of the analysis are good.

Measurement of Iron (Fe)

Measurement of the concentration from the data in Table 1, the results of the analysis at station A show Fe of 0.19 mg/L, then at the point of taking station B Sungai Ular the results of Fe concentration are 0.17 mg/L and at the point of taking station C Sungai Ular the results obtained were 0.19 mg/L of Fe concentration. It can be seen that the results are still below the threshold, meaning that The Sungai Ular has not been polluted with Fe, it is still safe to be used as raw material for drinking water for humans. However, as according to Supriyantini and Endrawati (2015), Fe is needed by living things, an essential metal that is needed according to a certain amount if it causes a lot of toxic danger. And as stated by Parulian, (2009) if the iron content is high, it will have an impact on human health, including causing insomnia, poisoning, damaged intestines, prematurity, arthritis, birth defects, diabetes, cancer and sudden death. So from activities to monitor or analyze must tightened up.

Measurement of Manganese (Mn)

Measurement of Mn concentration from the data in Table 1, the results of the analysis at stations A, B and C show the same Mn concentration, which is > 0.01 mg/L. It can be seen that the results are still below the threshold, meaning that Sungai Ular has not been polluted. Mn is still safe to be used as raw material for drinking water for humans. Even so, effort to keep the water from being contaminated with Mn must still be done so that there is no increase in the intensity of the Mn metal content, given the research by Febrina and Ayuna (2014) that there is an allegation that water has been contaminated with Mn when used for bathing, the skin becomes dry as a result of this. Contain substances which are quite high in Mn and Fe. Therefore, activities to monitor must be tightened. Water that contains excess Mn causes taste, color (brown/purple/black) and cloudy (Fauziah, 2010).

Measurement of Lead (Pb)

Measurement of concentration from the data in Table 1, the results of the analysis at stations A, B and C show the same Pb concentration, which is <0.01 mg/L. It can be seen that the results are still below the threshold, meaning that The Sungai Ular has not been polluted. Pb is still safe to be used as raw material for drinking water for humans. Even so, efforts to keep the water from being polluted with Pb must still be made to prevent an increase in the intensity of Pb metal content.

This result is possible that the metals detected in the water get almost no results. We must not assume that the metal content is not present, it could be that the metals have sunk and combined with the sediment. According to Yulis and Desti (2009), although small amounts of heavy metal Pb are detected, Pb is in the water because of an indication of pollution because lead is included in the dangerous and toxic heavy metal class. And if the status of water quality shows good condition, then the government, in accordance with their respective authority, will maintain and / or improve water quality (PP NO 82 2001).

CONCLUSION

At all Sungai Ular stations that have been determined in this study the results of the BOD parameters enter the class II quality standard at each station determined on The Sungai Ular, the COD concentration of each station is included in class I and the other parameters are still below the threshold at each station means that it can be said From the average parameter of all stations, the water quality of Sungai Ular is still below the threshold according to government regulation No. 82 of 2001.

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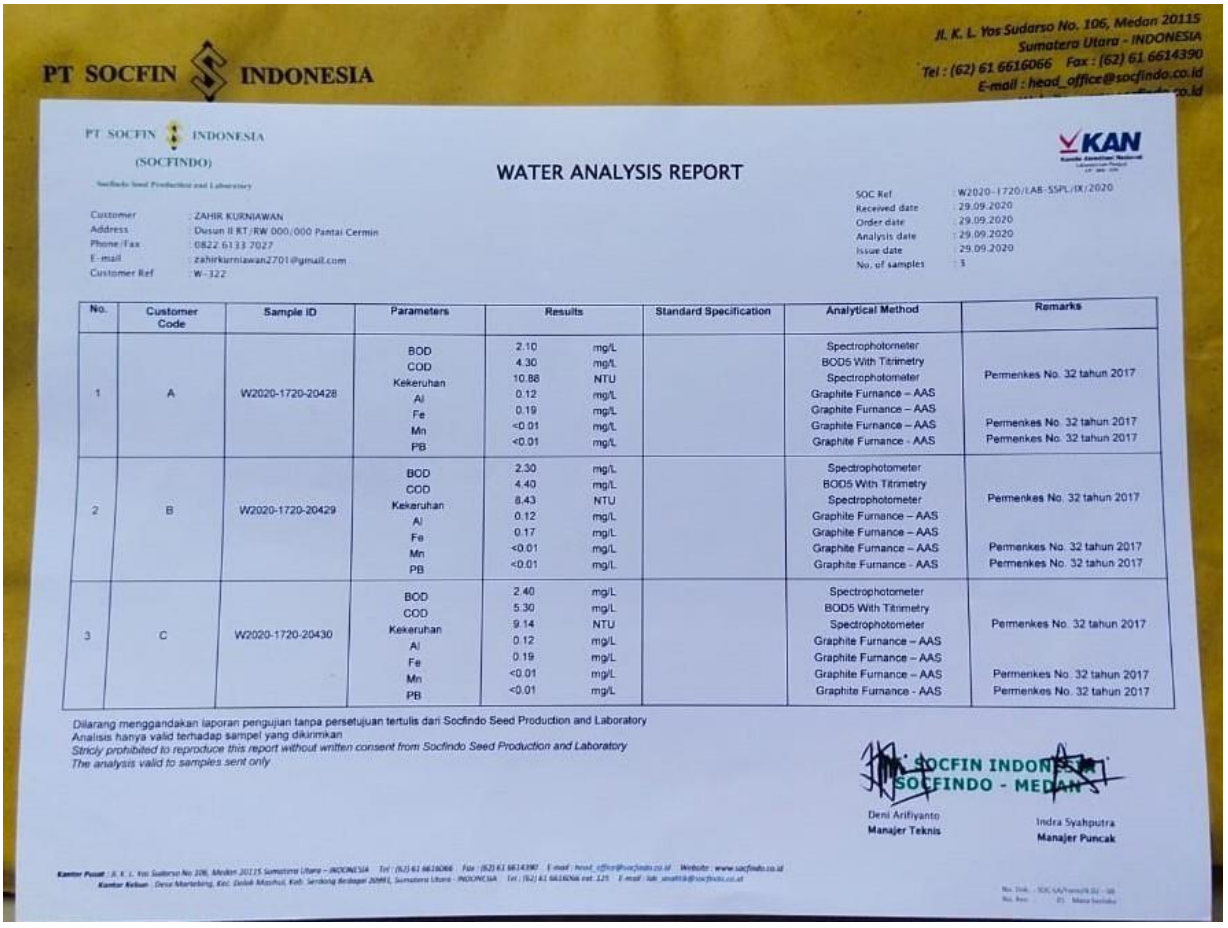
ATTACHMENT

WATER ANALYSIS REPORT



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PT SOCFIN INDONESIA
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KAN

WATER ANALYSIS REPORT

Customer : ZAHIR KURNIAWAN
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Phone/Fax : 0822 6133 7027
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Customer Ref : W-322

SOC Ref : W2020-1720/LAB-SSPL/IX/2020
Received date : 29.09.2020
Order date : 29.09.2020
Analysis date : 29.09.2020
Issue date : 29.09.2020
No. of samples : 3

No.	Customer Code	Sample ID	Parameters	Results		Standard Specification	Analytical Method	Remarks
1	A	W2020-1720-20428	BOD	2.10	mg/L		Spectrophotometer	
			COD	4.30	mg/L		BOD5 With Titrimetry	
			Kekeruhan	10.88	NTU		Spectrophotometer	Permenkes No. 32 tahun 2017
			Al	0.12	mg/L		Graphite Furnance – AAS	
			Fe	0.19	mg/L		Graphite Furnance – AAS	
			Mn	<0.01	mg/L		Graphite Furnance – AAS	Permenkes No. 32 tahun 2017
			PB	<0.01	mg/L		Graphite Furnance - AAS	Permenkes No. 32 tahun 2017
2	B	W2020-1720-20429	BOD	2.30	mg/L		Spectrophotometer	
			COD	4.40	mg/L		BOD5 With Titrimetry	
			Kekeruhan	8.43	NTU		Spectrophotometer	Permenkes No. 32 tahun 2017
			Al	0.12	mg/L		Graphite Furnance – AAS	
			Fe	0.17	mg/L		Graphite Furnance – AAS	
			Mn	<0.01	mg/L		Graphite Furnance – AAS	Permenkes No. 32 tahun 2017
			PB	<0.01	mg/L		Graphite Furnance - AAS	Permenkes No. 32 tahun 2017
3	C	W2020-1720-20430	BOD	2.40	mg/L		Spectrophotometer	
			COD	5.30	mg/L		BOD5 With Titrimetry	
			Kekeruhan	9.14	NTU		Spectrophotometer	Permenkes No. 32 tahun 2017
			Al	0.12	mg/L		Graphite Furnance – AAS	
			Fe	0.19	mg/L		Graphite Furnance – AAS	
			Mn	<0.01	mg/L		Graphite Furnance – AAS	Permenkes No. 32 tahun 2017
			PB	<0.01	mg/L		Graphite Furnance - AAS	Permenkes No. 32 tahun 2017

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