

Analysis of Water Well Quality Drilling Around Waste Disposal Site in Makassar City Indonesia

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Report Generated Date	08 Feb, 2018
Plagiarism Status	100% Unique
Total Words	825
Total Characters	5005
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Water is a major need for life processes on earth. There would be no life if there is no water on this earth. Clean water is highly coveted by human beings both for daily living purposes, for industrial purposes, for urban sanitation, and for agricultural purposes and so on [1]. The need for clean water is arranged in one of the government programs, namely the provision of clean water. The issue of water supply is one of the priorities in improving the health status of the community. Given the existence of water is vital needed by living things. Life on earth can only take place in the presence of water [2]. Many residents are forced to take advantage of water that is not good quality. Of course this will result in less good for public health in the short term, poor quality can lead to Vomiting, Diarrhea, Cholera, Typhoid, or Dysentery. This can occur in an environment of poor sanitation. If ground water and surface water are contaminated by dirt, germs are automatically spread to water sources used for household use. In the long run, less quality water can lead to bone loss, dental corrosion, anemia, and kidney damage. This occurs because of the presence of heavy metal metals that are much toxic (toxic) and deposition in the kidneys. Clean water coverage program in Makassar city In 2004 was 82,55%, while drinking water coverage in 2004 was 80,85% for physical, clean water quality coverage was 87,02% was increase compared to 2003 that was 83,43 % based on Regulation of the Ministry of Health of the Republic of Indonesia [4]. The Garbage Final Disposal Site (TPA) located at RT 04 RW 11 Parang Tambung Village Tamalate Subdistrict, Makassar City, utilizes 900 square meters (m²) of land, and utilization by the community as a garbage dump for 20 years. To be evenly distributed so that it does not accumulate at one point, the local community usually burns the garbage, the people living around the landfill (TPA) of garbage still use dug well water as the source of clean water of the family in daily life (TPA RT 04 RW 11). The existence of dug wells (SGL) around the landfill both from the water quality and construction aspects of dug must meet the health requirements. individual houses for clean water and drinking water with a depth of 7-10 meters from the ground. Dug wells provide water derived from a layer of soil relatively close to the surface of the soil, therefore easily exposed to contamination through seepage. Generally, seepage comes from human waste disposal (latrine/latrine), animal waste, well waste itself, either because of its floors or sewerage that is not water-resistant [25].

2.1. Water Quality

2.1.1. Water Quality Standards. Water Quality is a quality characteristic that is required for the specific utilization of water sources. With the water quality standard, people can measure the quality of the various kinds of water. Each type of water can be measured the concentration of elements contained in the standard of quality, thus can be known quality terms, in other words quality standards can be used as a benchmark. The standard of clean water quality can be defined as the provisions based on Regulation of the Ministry of Health of the Republic of Indonesia (5) which is usually set forth in the form of statement or number indicating the requirements that must be fulfilled so that water does not cause health problems, diseases, technical disturbances, as well as disturbances in aesthetic terms.

This regulation is made with the intention that drinking water that meets health requirements has an important role in the maintenance, protection and heightening of public health. With this regulation has been obtained legal basis and technical foundation in terms of water quality control. Similarly, the water used as daily water needs, the water should be colorless, tasteless, odorless, clear, and has a temperature in accordance with the standards set so as to create a sense of comfort.

2.1.2. Physical requirements. Regulation of the Minister of Health (5) on drinking water quality requirements states that water that is consumed and used in everyday life is water that has good quality as a source of drinking water and raw water (clean water), among others must meet the requirements physically, odorless, tasteless, not cloudy, and colorless. The physical properties of water can be affected by various factors including the following:

a) Temperature

Water temperatures will affect people's acceptance of the water and may also affect chemical reactions in the treatment especially if the temperature is very high. The desired temperature is 20°C-

30°C surrounding air temperature which can provide a sense of freshness, but the local climate or type

of source of water will affect the water temperature. In addition, the temperature of the water directly affects the toxicity of many pollutant chemicals, the growth of microorganisms, and viruses. Temperature or water temperature is measured using a water thermometer.

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Odor and taste

Odor and taste usually occur simultaneously and are usually caused by decaying organic materials, certain types of microscopic organisms, and chemical compounds such as phenol. The ingredients that cause these odors and flavors come from various sources. The intensity of odor and taste can be

increased when there is chlorination. Since the measurement of odor and taste is dependent on individual reactions the reported results are not absolute. For drinking water standards and clean water is expected water does not smell and does not taste.

The color in the water is divided into two, apparent colors are the colors caused by the turbidity particles (soil, sand, etc.), fine particles of iron, manganese, microorganism particles, industrial colors,

etc. The second is true color is a color derived from the decomposition of natural organic substances, namely humus, lignin, tannins and other organic acid.

Technical color removal can be done in various ways. Among them: coagulation, flocculation, sedimentation, filtration, oxidation, reduction, bioremoval, applied electro, etc. The degree of water dye can be known through laboratory examination by photometric method. For the color of clean water standard is 25 TCU and maximum standard for drinking water is 15 TCU.

c) Turbidity

Water is said to be turbid when the water contains so many suspended material particles that it gives a muddy and dirty color. The materials that cause this turbidity include clay, mud, organic

materials dispersed from small particles that are suspended. Turbidity in water is one thing that should be considered in the provision of water to the public, given that the turbidity will diminish the

aesthetic aspect, make it difficult in screening efforts, and will reduce the effectiveness of the disinfection effort.

The level of turbidity of water can be known through laboratory examination with Turbidimeter

method. For a maximum permissible water turbidity standard of 25 NTU and 5 NTU for drinking water standards.

2.1.3. Chemical Requirements. Good clean water is water that is not contaminated with excessive chemical substances that are harmful to health such as iron (Fe), degree of

acidity (pH), chloride and other chemicals. The content of chemicals in clean water used daily should not exceed the maximum levels allowed for drinking water quality standards and clean water.

a) Iron (Fe)

Iron is one of the more important elements in surface water and groundwater. Iron-containing waters are highly undesirable for domestic use, as they may cause rust marks on clothing, porcelain and other tools and cause unpleasant taste in drinking water at concentrations above about 0.31 mg / l. The aquatic chemical properties of iron are redox properties, complex formation, metabolism by microorganisms, and exchange of iron between phases and solid phases containing iron carbonate, hydroxide and sulfide.

b) Degree of acidity (pH)

The degree of acidity (pH) is a term used to express the intensity of the acid or base state of a solution. It is also a way of expressing the concentration of H⁺ ions. In water supply, pH is a factor

affecting the processing activity to be performed [6].

As a measure of the acidity and alkalinity nature of water is expressed by pH value, which is defined as the logarithm of the return of hydrogen ion concentration in moles per liter. The pure water at 24 is weighed with respect to the OH ions - each having a content of 10⁻⁷ moles per liter. Thus the pH of pure water is 7 [7].

c) Chloride (Cl)

Chloride levels generally increase with increasing cadminerality. High chloride levels, followed by high levels of calcium and magnesium, can improve the corrosivity of water. This resulted in the occurrence of metal appliances. Chloride levels > 250 mg / l can give a salty taste in water because the value is a chloride limit for water supply, which is 250 mg / l.

Biological Requirements

In bacteriological parameters used indicator bacteria or sanitary indicator pollution indicators. Bacterial indicator sanitation is a bacteria that can be used as an indication of fecal pollution from

humans and from animals, because the organism is an organism contained in the gastrointestinal tract

of humans and animals. Water contaminated by human feces cannot be used for drinking, washing food or cooking because it is considered to contain pathogenic microorganisms that are harmful to

health, especially pathogen-causing gastrointestinal infections.

3. Method and Data

Sample in this research is a part of all digging wells which have distance less than 50 meter from garbage dump RT 04 RW 11 Parang Tambung village Tamalate Subdistrict, Makassar city, that is as much 4 dug wells. The sampling method is done by purposive sampling with the following criteria: a)

The owner of the dug well that still uses the well water as the clean water daily (bathing and washing),

b) the location of the well from other pollutant sources, and c) The well owner is willing to have the well to be sampled.

Water samples are taken on dug wells that have been determined location or place. The water sample will then be under a laboratory to test the physics, chemical and biological parameters. Parameters analyzed in the laboratory are color, turbidity, pH, iron, chloride and total coliform.

For temperature parameters, taste and odor are directly determined at each location of the dug well water sampling.

3.1. Physical Parameters

- Temperature (temperature) is measured in the field using a water thermometer.
- Flavors and odors are determined directly in the field using taste and olfactory senses.
- Color is measured in laboratory by using test method / technique SNI 06-6989.24-2005 [21]
- Turbidity is measured in collaboration by using SNI 06-6989.25-2005 test method

3.2. Chemical Parameters

- pH was measured in laboratory using test method/technique SNI 06-6989.11-2004 [22]
- Iron (Fe) is measured in laboratory using test method/technique SNI 6989.4-2009 [23]
- Chloride (Cl) was measured in laboratory using test method/technique SNI 06-6989.19-2004 [24]

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Biological Parameters

• Total coliform was measured in laboratory using standard total coliform fermentation technique.

Further data is analyzed in the laboratory to determine the nature of physics, chemistry, and biology. Furthermore, in comparison with the standards of water quality criteria in accordance with Regulation of The Minister of Health of the Republic of Indonesia [5] for water quality parameters. And for the construction of dug wells compared to the requirements of wells in general according to Suripin [7].

4. Result

4.1. Construction of Dug well

Field observation results can be explained about the construction of dug wells around the landfill of RT 04 RW 11 Parang Tambung Village Tamalate Sub District, Makassar City as follows. The drawing construction of wells dug around waste disposal site can be seen in Based on Table 1. it is known that all dug wells have a waterproof wall 3 meters down, and one digging well does not have well lips and two wells spaced from pollution less than 11 meters. Based on the observation of dug wells examined, overall after the analysis of the allocation of two wells that do not meet the health requirements that have been set the wells at the location of points II and III because it has no well lips and well distances from pollution sources less than 11 meters. Physical parameters in this study are odor, taste, temperature, color and turbidity. The results of the analysis can be seen in the Table 2. Based on Table 2 it is known that from the four wells taken by water samples, there are two wells whose water quality physically does not meet the water quality requirements as determined by Minister of Health of the Republic of Indonesia [5].

4.2.1. Temperature

Based on the measurements at the four sample sites, the sample well water temperature ranges from 29

°C - 31 °C. The results of the analysis can be seen Based on Figure 3 above shows that the highest turbidity value is located at location I that is 6.14

NTU, but it does not pass the water quality feasibility standard. While the lowest turbidity value is at location II that is 0.04 NTU.

4.3. Chemical Parameters

Chemical parameters here are pH, iron (Fe), chloride (Cl), where if one of these variables is not eligible, it can be said that the water does not meet the water quality requirements determined in

accordance with Regulation of the Minister of Health of the Republic of Indonesia [5]. The analysis of sample can be seen in the

When viewed from the iron content of the highest value that is at the location II is 0.1340 mg / L while the lowest iron content value is the third location of 0.0838 mg / L. According to Cole, in [9], iron is only found in waters that are in anaerobic condition (anoxic). Iron compounds are generally soluble and quite abundant in the soil. Groundwater typically has a relatively large amount of carbon dioxide, presumably with low dissolved oxygen or even anaerobic atmosphere. From the results of the research, it is known that dug wells are located around the garbage dump RT 04 RW 11 Parang Tambung Village, Tamalate Subdistrict, Makassar City, from four dug wells that have been checked the water quality physically there are two digging wells that the physical quality of the water does not meet the standard of clean water quality criteria in accordance with the decision of Regulation of the Minister of Health of the Republic of Indonesia [5], the location of Point II and location of Point III, where the physical condition of the well water at the Point II location, the taste in the well water feels slightly brackish and the temperature water exceeds the water quality standards set. While at the location of Point III the physical state of the well water smells the soil.

The odor of dug well water at the location of Point III, which smells of soil, may be caused by water derived from various sources such as waste material or caused by the process of organic

compounds by bacteria and carcasses of animals suspended in well water so that water wells at the location of Point III smelled of soil.

According to Edfendi [9], water is good and safe for consumption is water that has characteristic odorless when kissed from far or near. Groundwater is caused by water derived from various sources such as waste material or caused by the process of organic compounds by bacteria and animal carcasses.

The flavor of the well water in point II, which is slightly brackish, whereas at the location of Point I, III, and IV the taste of the water is not felt or in accordance with the water quality requirements in general. According to Hadipurwo and Danayanto [10], groundwater flavor is determined by the presence of salt or substances contained in the water, either suspended or dissolved. The slightly brackish water flavor at the site of Point II, the possibility of any salt or substances contained in the water, either suspended or dissolved.

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Based on the temperature measurements of the four sampling sites, one well (Location of Point II) whose water temperature exceeds the threshold with the water temperature of 31 ° C. While the desired temperature in clean water is 20 ° C - 30 ° C. The high temperature is due to the local climate and the type of water source that will affect the temperature [7]. The state of well water temperature depends on the local climate including the temperature and rainfall conditions [11][12]. This is not much different from the results of the study by Maru, et. al. the average daytime temperature in Makassar is 31.29 ° C [13],[15]. Even some other big cities have experienced similar things, as the study in Jakarta by Maru and Ahmad, that the average temperature during the day is 33.32 ° C [15]. Among the causes of rising air temperatures are reduced forest areas or green open spaces [16], and increasing anthropogenic activity [17].

From the water test of the four digging wells as clean water that has been done by the Center of

Production of Makassar Plantation Industry is 2.5 TCU (Eligible) in accordance with the decision of

Minister of Health of the Republic of Indonesia [5] is 50 TCU.

The color of the water is due to the presence of natural tannins and humic acid. This substance when exposed to chlorine can form toxic chloroform compounds [18].

From the fourth well water turbidity test, the turbidity level ranged from 0.04 - 6.14 NTU. The

standard of turbidity parameter based on the Regulation of the Minister of Health of the Republic of Indonesia [5] is maximum 25 NTU, so it can be concluded that all four wells taken by water samples are all eligible according to Regulation of the Minister of Health of the Republic of Indonesia [5].

According to Hadipurwo [10], turbidity of water caused by the presence of not soluble substances contained. An example is the presence of clay particles, silt, as well as organic substances or microorganisms.

From the result of the research, it is known that the dug wells around the landfill of RT 04 RW 11

Parang Tambung Village Tamalate Subdistrict of Makassar City, from the four digging wells that have been checked the water quality chemically include pH, Iron (Fe), and Chloride (Cl), the four wells all

meet the water quality criteria criteria in accordance with the Regulation of the Minister of Health of the Republic of Indonesia [5].

From pH test on dug well water as clean water which has been done by Indonesian Center

For

Plantation Product of Makassar City is 6,690 - 6,757 (Normal) and feasible according to standard quality value from Decree of Minister of Health of the Republic of Indonesia [5] is 6,5 - 9,0. The pH content in water does not exceed the maximum quality standard.

Water should be neutral, not acidic or alkaline, to prevent the occurrence of heavy metal dissolution and corrosion of water distribution networks. Water is a very good solvent, so it is helped by a non-neutral pH to dissolve the various chemical elements it passes through [17].

From Iron (Fe) test on well water dug as clean water that has been done by Center of Production

Industry of Makassar City is 0,0838 mg / L - 0,1340 mg / L (Eligible) as per standard value of Regulation of the Minister of Health of the Republic of Indonesia [5] is 1.0 mg / L. Iron is soluble at low pH and can cause yellowish water, cause stains on clothing and breeding place of creonothrix bacteria, therefore iron content should not exceed 1.0 mg / L, because it can accelerate the growth of bacteria and can cause taste and smell [18].

From Chloride (Cl) test on well water as clean water that has been done by Center of Production

Industry of Makassar City is 27,2256 mg / L - 45,0924 mg / L (Eligible) according to standard quality value of Minister of Health of the Republic of Indonesia [5] is 600 mg / L. What if the content of chloride (Cl) in well water exceeds the quality standard in large amounts of chloride will cause saltiness, corrosion in the water supply system pipeline [17].

From the examination of Total Coliform in digging well water as clean water which has been done by Central of Makassar Plantation Product Industry is <1,8 - 48 per 100 ml of sample and (Eligible)

according to value of clean water quality standard from Regulation of the Minister of Health of the Republic of Indonesia [5] is 50 Mg / L. According to Fardiaz [20], the high amount of Coliform Total can occur due to the high contamination of pathogenic bacteria from human or animal digestive tract and other pathogenic agents Based on the research objectives and discussion, it can be concluded and suggestions as follows:

Physical quality of well water around the landfill of RT 04 RW 11 Parang Tambung Village, Tamalate Sub-District, Makassar City, at location I and IV meet the criteria of clean water quality in accordance with Regulation of the Minister of Health of the Republic of Indonesia [5], based on the construction of dug wells meet the requirements. While on location II and III the physical quality of the water does not meet the criteria of clean water quality in accordance with Minister of Health of the Republic of Indonesia [5] based on the construction of dug wells do not meet the requirements. Description of the chemical quality of well water dug around the landfill of RT 04 RW 11 Parang Tambung Village, Tamalate Subdistrict, Makassar City, from 4 wells taken by water samples all meet the criteria of clean water quality in accordance with Regulation of the Minister of Health of the Republic of Indonesia [5], based on the construction of the dug wells at sites II and III although not eligible but the water quality does not exceed the threshold for the chemical quality of the water.