Housing Drainage Network Evaluation in Education Teacher Road Merauke

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Abstract. Increasing population, residential and land development of the narrow lead to flooding or waterlogging during the rainy season. Based on the author's observation that this occurs as a result of population growth and settlement. Areas that were once as a rain water reservoir and the water reservoir tidal inland transformed into residential areas and development centers of economic activity, and social services. The residential area of Merauke teacher education road is low-lying areas and densely populated, thus increasing the flow of water entering the waste stream. Based on the calculation of discharge, obtained Qk = 79,586,978.48 m³/sec. The magnitude of the flood Qfb = 24,488,511.58 m³/sec obtained high discharge may cause flooding in the residential area of teacher education path Merauke. So it is necessary to increase the dimensions of the existing channels in order to cope with flooding during the rainy season.

1. Introduction

The growth rate of the population in a short period of time that will have an impact on city planning, as well as the availability of facilities and infrastructure[1], Some of the facilities and infrastructures supporting the city include roads, drainage, bridges, government buildings, hospitals, ports, and airports. One of the city drainage infrastructures[2].

Increasing population, residential and land development of the narrow lead to flooding or waterlogging during the rainy season. Areas that were once as a rain water reservoir and the water reservoir tidal inland transformed into residential areas and development centers of economic activity, and social services. In other words, the area that was once a water catchment area turned into a surge / flood puddles.[3]

The residential area of Merauke teacher education road is low-lying areas and densely populated, thus increasing the flow of water entering the waste stream. The use of water in a high volume and is not offset by a waste water disposal system that is less balanced can lead to flooding, especially when the water flow is abundant. In addition the surface of the previous runoff as infiltration areas (water shed) of rain water into the soil, as well as drainage systems which have been inadequate. The flow of water during the rainy season resulting in water overflowing from the channel and meets the road surface so that it becomes one of the problems faced by the regions which suffered flood prone. One is in a residential area teachers, Merauke.
2. Methods

2.1. Method of collecting data.

Literature method, a method where in obtaining the data by collecting, identifying, processing the data written by the method of the work done. Method of observation, namely by direct observation to the site to know the actual conditions in the field.

2.2. Analysis and Data Processing

1. Analysis of rainfall data

Analysis of rainfall data is used to determine rainfall plan that will be used as the basis for determining and analyzing the flood discharge that occurs.

2. Analysis discharge

Flood discharge in the drainage channel by counting the flood discharges associated pendimension effective channel width, depth and design effective flow patterns that will occur[4], Flood discharge is also needed to know the ability of channel dimensions in addressing peluapan water due to heavy rains[5].

3. Result and discussion

3.1. Analysis of rainfall data

Below is a table of rainfall data analysis (method of Gumbel) for 10 years (2006-2015). According to sources in the office Meteorology and Geophysics Agency (BMKG) Merauke district. Where Xi = highest rainfall and ΣXi = the highest amount of rainfall.

| No. | Year | Xi  | (Xi - X) | (Xi - X)^2 |
|-----|------|-----|----------|------------|
| 1   | 2006 | 662.7 | 136.01  | 18498.7    |
| 2   | 2007 | 416.4 | -110.29 | 12163.9    |
| 3   | 2008 | 403.8 | -122.89 | 15.102     |
| 4   | 2009 | 631.5 | 104.81  | 10985.1    |
| 5   | 2010 | 610  | 83.31   | 6940.56    |
| 6   | 2011 | 530.3 | 3.61    | 13.0381    |
| 7   | 2012 | 525.9 | .79     | .6241      |
| 8   | 2013 | 575.5 | 48.91   | 2392.19    |
| 9   | 2014 | 482.7 | -43.99  | 1935.12    |
| 10  | 2015 | 327  | -199.69 | 39876.1    |
| Σ   |      | 5165.9|         | 107 907    |
Table 2. Analysis of rainfall forecast.

| T return period (years) | X  | Yn | Sn  | sd  | Yt  | K     | RT   |
|-------------------------|----|----|-----|-----|-----|-------|------|
| 2                       | 516.59 | 0.5035 | 0.9833 | 109.497 | 0.36651 | 0.1378 | 531.678 |
| 5                       | 516.59 | 0.5128 | 1.0206 | 109.497 | 1.5004 | 0.9677 | 622.550 |
| 10                      | 516.59 | 0.5236 | 1.0628 | 109.497 | 2.2510 | 1.6253 | 694.555 |

3.2. Rainfall intensity

Calculation of rainfall intensity using Mononobe method with the following formula:

\[
I = \frac{E}{24} \left( \frac{24^{2/3}}{756.856} \right) = 983.706 \text{ mm/hour}
\]

Table 4.3 Calculation of Intensity of rainfall

| It mm/hour | Rt mm/24 hours | 5 | 10 | 15 | 20 | 30 | 60 | 120 |
|------------|---------------|---|----|----|----|----|----|-----|
| I2         | 531.678       | 984.533 | 618.786 | 471.584 | 388.911 | 296.911 | 186.285 | 117.394 |
| I5         | 622.550       | 1152.81 | 724.546 | 552.185 | 455.382 | 347.052 | 218.125 | 137.093 |
| I10        | 694.555       | 1286.14 | 808.348 | 616.052 | 508.052 | 387.193 | 234.353 | 152.949 |

The following graph shows the results of the calculation of rainfall intensity within a period of 10 years.

**Figure 4.1** Graph of rainfall intensity

Based on the calculation of discharge, obtained Qk = 79,586,978.48 m3/sec. The magnitude of the flood Qb = 24,488,511.58 m3/sec obtained high discharge may cause flooding in the residential area of teacher education path Merauke. So it is necessary to increase the dimensions of the existing channels in order to cope with flooding during the rainy season. Based on the control Qk > Qb it can be said safely because of the results of the calculation Qk > Qb (79,586,978.48 m3/s > 24,488,511.58 m3/sec).
4. Conclusions

Appropriate evaluation conducted on the network of drainage residential area of teacher education road floods during the rainy season was obtained Q of drainage capacity of 79,586,978.48 m³/sec, while Q flood of 24,488,511.58 m³/sec.

References
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