

FLOOD ASSESSMENT STUDY IN THE CITY OF TANGERANG, WEST JAVA

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ABSTRACT

Tangerang city is a region which has a relatively flat and inclined contour-shaped basin so that in some areas when the rains come will experience flooding. The cause of the flooding is necessary to identify the field. From the results obtained that the identification of flood discharge for the region amounted to 29.91 m³ / s with 1.65 km². Dari watershed area of this discharge can only be accommodated by the existing drainage network is only 5 m³ / sec so that the excess is what makes this region flood. For excess of 24.91 m³ / s is done by creating a polder or ponds so that these advantages can be accommodated. Polder or ponds that can accommodate this excess area of 6.3 hectares with a depth of 4 meters. In addition to planning embung / Polder required also increase drainage infrastructure sehingga can flow smoothly.

Keywords: Flood discharge, Embung / Polder.

I. INTRODUCTION

Flooding is a popular word among Tangerang City Government, particularly in the rainy season. Flooding in the city of Tangerang influenced by several things, including natural factors such as the characteristics of a river with a small river channel capacity, the rising tide of sea water that block the flow of rivers, as well as topography is relatively flat so that about 40% of the area of Tangerang City is a flood plain

As a result of runoff increases. Land use change from the open area into the area awake also increase erosion. Erosion material carried along into the water channel, time, and resulted in the silting of reservoirs and constriction. Based on the above, it would require a treatment program (control) by planning the manufacture of reservoir. The planning of the expected flow of rain water can be optimally accommodated in the reservoir which is in accordance with its capacity.

METHODOLOGY.

Average rainfall can be calculated by the approximate formula:

Where:

H_i = rain at each station i (1,2, ..., N in the area under review).

N = number of stations,

RH = average rain

Note that to calculate the rain region by adopting an average of algebra, rainfall data were reviewed and taken into account is the rainfall data inside the basin (catchment area) in this case H_1, H_2, \dots, H_n . Which are outside the area of the flow is not calculated.

Analysis of Maximum Daily Rainfall and Flooding Debit

Determination of maximum precipitation with a specific return period can be calculated using frequency analysis methods. Several well-known methods such as Method Log-Pearson Type III, Haspers, and Gumbel. The method used will be determined by looking at the characteristics of the local area rainfall distribution. Return period will be calculated for each method is repeated for a period of 2, 5, 10, 25, 50, and 100 years. As the examples below are presented the calculation method based on Gumbel.

Frequency distribution Gumbel.

Gumbel distribution method is widely used in the analysis of the frequency of rain that has formula

$$R_t = R + K \cdot S_x$$

$$K = (y_t - y_n) / S_n$$

$$y_t = - (0.834 + 2.303 \log T / T - 1)$$

Where:

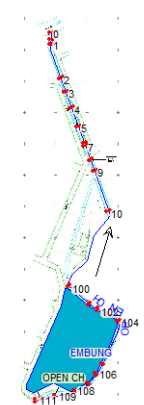
R_t = Rainfall for year return period T (mm).

R = maximum rainfall average.

S_x = standard deviation.

Debit calculation Flood

In planning the maximum discharge in a channel which involves hydrological therein, often encountered estimate the flood peak is calculated by a simple and practical method, in which the calculation technique by inserting a factor of rainfall, physical state and nature of the hydraulics flow area. Determination of flood discharge plan, made in accordance with the Procedures for Flood Discharge Calculation Plan, SNI. Determination of flood discharge can be done in two (2) ways, namely Rational Method or Method Unit hydrograph (Synthetic hydrograph).



the steady flow analysis. Here layout plan.

Gambar VI.1 Layout Polder

Metode Rasional

Procedures rational use of the formula method. Rational use of the formula method procedure is given in the figure below. The following points should be noted:

There are four components of this formula which must be obtained magnitude.

- Look for a unit intensity of the rain, when the intensity in liters / detik.ha, and streams in the area ha, it will obtain the discharge in liters / sec.
- If the intensity in mm / h, then it should be first converted into units of liters / detik.ha (multiply by 2.78).

Debit Perum Pondok Arum will be added to the watershed discharge Cimone. The amount of discharge is added to the primary drainage channel adapted to the capacity of the channel so that the excess will be accommodated by the reservoir. On this model, the channel capacity is still able to accommodate the additional discharge Cimone watershed of 5 m³ / s, so that the excess flow of 24.91 m³ / s will be accommodated by the reservoir (Q₂₅ DAS Cimone = 29.91 m³ / s).

Analysis Calculation

Resume Calculation Frequency Distribution Analysis

Periode Ulang	Metode			
	Normal	Log Normal	Log Person Type III	Gumbel
2	130.513	129.916	127.272	129.238
5	140.629	140.414	139.005	144.831
10	145.927	146.262	147.547	155.153
25	151.081	151.283	158.952	168.200
50	155.200	157.163	167.825	177.877
100	158.572	161.208	176.969	187.482

Periode Ulang (tahun)	Hujan Rencana R ₂₄ (mm)	Debit Banjir Rencana (m ³ /dt)	
		Metode Rasional	Metode Haspers
2	127.272	23.952	25.162
5	139.005	26.160	27.481
10	147.547	27.767	29.170
25	158.952	29.914	31.425
50	167.825	31.584	33.179
100	176.969	33.304	34.986

C alculacion of flood discharge plan Rational Method

Periode T (tahun)	A (km ²)	R ₂₄ (mm)	L (km)	H (km)	C	w (km/jam)	t (jam)	I (mm/jam)	Qt (m ³ /dt)
2	3.790	127.272	3.430	0.010	0.70	2.168	1.582	32.502	23.952
5	3.790	139.005	3.430	0.010	0.70	2.168	1.582	35.498	26.160
10	3.790	147.547	3.430	0.010	0.70	2.168	1.582	37.679	27.767
25	3.790	158.952	3.430	0.010	0.70	2.168	1.582	40.592	29.914
50	3.790	167.825	3.430	0.010	0.70	2.168	1.582	42.858	31.584
100	3.790	176.969	3.430	0.010	0.70	2.168	1.582	45.193	33.304

Method of calculation of flood discharge plan Haspers

Periode Ulang (tahun)	Hujan Rencana R ₂₄ (mm)	Luas DAS A (km ²)	Durasi hujan t (jam)	Distribusi hujan Rn (mm)	Debit tiap Km q (m ³ /km /dt)	α	β	Qt (m ³ /dt)
2	127.272	3.790	0.897	60.172	18.639	0.866	0.412	25.162
5	139.005	3.79	0.897	65.719	20.357	0.866	0.412	27.481
10	147.547	3.79	0.897	69.757	21.608	0.866	0.412	29.170
25	158.952	3.79	0.897	75.150	23.279	0.866	0.412	31.425
50	167.825	3.79	0.897	79.345	24.578	0.866	0.412	33.179
100	176.969	3.79	0.897	83.667	25.917	0.866	0.412	34.986

This scenario will be performed on the stages of the design as follows:

- a) hydrograph discharge into the reservoir together with scenario 3 amounted to 24.91 m³ / s.
- b) Inlet reservoir is next to the spillway and outlet B = 10m water reservoir door dimensions are 0.5x0.5m (BxH) and 4 units of the pump.
- c) The depth of the reservoir is 4 m, with consideration of the level of security for areas outside the reservoir is a settlement.

RESULTS AND DISCUSSION

From the results of modeling of flood water surface profile, it can be concluded:

- 1. The cause of flooding in Perum Pondok Arum, including:
 - a. Culverts are not able to accommodate the discharge of a cottage complex Arum and Cimone.
 - b. Wet cross-sectional area small bridge into a bottle neck stream, causing backwater.

Solution Perum Pondok flooding in Arum:

c. Culverts will not be used again, because the sewer lines will be created ponds.

d. Primary drainage channel which will pass through the back of the Posyandu. New paths of STA 101 - STA 8 with the type of open channel dimensions 3x2.5m (BxH), the channel length of 150 m, and the channel bottom slope 0:23%.

e. Widening the wet cross-sectional area of the bridge, by reducing the thick bridge deck. Wet cross-section of the existing bridge 3x0.7m (BxH), bridge design 3x2m (BxH).

f. By implementing the solution of flooding on points a - c, complex drainage channel capacity cottage Arum only can stream discharge from watersheds and watershed Cimone cottage Arum for 5 m³ / s. So there are excess flow 24.9 m³ / s that can not be drained by drainage channels.

g. To accommodate the excess discharge of 24.9 m³ / s, it will be planned two scenarios, ie with and without the pump flood pump flood.

h. If using reservoir outlet orifice door dimensions 1x1m (BxH). So that the required storage capacity is 178.100m³ with spacious pool 6.3Ha and reservoir depth of 4 m. Because the reservoir is 0.3Ha land availability, so the shortage of land for dam location is 6HA.

i. If using reservoir outlet orifice door dimensions 0.5x0.5m (BxH), 2 units per pump station with a capacity of 2 m³ / s, and 2 units per pump station with a capacity of 1 m³ / s. So that the required storage capacity is 116.000m³ with spacious pool 4.1Ha and reservoir depth of 4 m. Because the reservoir is 0.3Ha land availability, so the shortage of land for dam location is 3.8Ha.

2. In this work, time Sabi not go into design planning restrictions so it is not done modeling of flood water surface profile in Kali Sabi. So the flood water level in Kali Sabi (downstream drainage channels) are assumed to be able to accommodate the discharge of a cottage complex Cimone if Arum and watershed planning Sabi normalization has been carried out. Due to the normalization Sabi planning would have take into account the DAS cottage Arum and Cimone.

Referensi

1. Arifjaya, N.M. 2002. Hutan dan Pencegahan Banjir. Makalah Seminar Disampaikan dalam Diskusi Panel Upaya
2. Penanggulangan Banjir di Jabotabek pada Tanggal 7 Maret 2002 di IPB Bogor. Asdak, C. 1995.
3. Hidrologi dan Pengelolaan Daerah Aliran Sungai. Gadjah Mada University Press. Yogyakarta.
4. Balai Rehabilitasi Lahan dan Konservasi Tanah (BRLKT) Citarum-Ciliwung. 2002.
5. Identifikasi Banjir dan Genangan di Wilayah Jabotabek. Bogor.