1. Introduction
Changes in the development of land use often cause new problems, one of which is the functioning of existing drainage channels. Changes in land use will affect the magnitude of runoff coefficient (C), the runoff coefficient influences the amount of discharge (Q), water level (H), and dimensions of the drainage channel. One of them is in the Samarinda Seberang area, which is an urban area that is actively developing. Given the limited budget owned by the regional government, it is necessary to handle floods by planning a drainage channel according to the priority scale that meets technical standards, effectively and efficiently.

From the description above, the existing problems can be identified, namely, big is the design flood discharge for the return period 2, 5, 10 and 25 years, and how many dimensions of the cross-section of the drainage channel in Samarinda Seberang area which covers Jalan Bung Tomo, Cipto Mangunkusumo, Pattimura, Hasanudin and Mangkupalas and determining handling priority scale.

2. Research Methods
In this study, the Rational Modification Method was used as a Hydrological Analysis and Manning Method as a Hydraulics Analysis, based on previous studies and Journals/Proceedings on the
Effectiveness of Polder Doors as Flood Control Alternatives in the Sempaja Watershed of Samarinda City, East Kalimantan by SSN. Banjarsanti, 2015, which was published in the Proceedings of PIT HATHI / XXXII / 2015.

The analysis carried out includes:

a. Analysis of rainfall design with Gumbel Method and Person Type III Log
b. Analysis of the frequency of rainfall data
c. Test the frequency analysis of Smirnov-Kolmogorov and Chi-Square
d. Analysis of the design flood discharge with the Rational Modification Method

The truth of the conclusions made from the analysis of hydrological data is actually not absolutely correct, because the conclusion of the hydrological analysis is generally made based on sample data from the population. Therefore the application of opportunity theory is very much needed in the hydrological analysis. One of them is the Pearson Type III Log Distribution Application, with the Skill Coefficient Value

\[ CS = \frac{n \cdot \sum \left( \log X - \bar{\log} X \right)}{(n-1) \cdot (n-2) \cdot \left( S \cdot \log X \right)} \]

By:
\[ Y : \text{average value of } Y \]
\[ \bar{Y}: \text{average value of } Y \]
\[ S: \text{standard deviation from } Y \]
\[ k: \text{characteristics of the Pearson type III log distribution} \]

Source: (Asdak, Chay. 2010 [1]; Soemarto, CD, 1986 [2]; Soewarno, 1991 [3])

2.1. Debit Flood Plan (Q plan)

Flood discharge plan (Q plan) is the volume of water flowing through a cross-section of a channel. The most commonly used method in calculating the planned discharge due to rainwater is the Rational Modification Method, \( Q = 0.278 \cdot Cs \cdot C \cdot I \cdot A \)

By:
\[ Q = \text{maximum flood discharge (m}^3/\text{dt)} \]
\[ Cs = \text{Retention coefficient} = \frac{2tc}{(2tc + td)} \]
\[ tc = \text{time of concentration (minutes)} \]
\[ td = \text{channel duration in minutes (minutes)} \]
\[ C = \text{flowing coefficient} \]
\[ I = \text{intensity of average rainfall during arrival time from flood (mm/th)} \]
\[ A = \text{area of drainage area (km2)} \]

Source: (Imam Subarkah. 1980) [4]

2.2 Network Planning

Urban drainage design criteria have specificity because, for urban areas, there are additional design variables such as linkages with land use and city drainage master plans. Hydraulic Analysis as a limitation used in Channel or River Capacity Planning. The channel cross-section is planned to be trapezoidal and calculated based on the following formula [5,6].
Figure 1. Cross-section of Trapezoidal Channel

\[ Q = A V ; A = (b + mh) \text{ h} ; \quad P = b + 2h/\sqrt{m^2 + 1} ; \quad V = \frac{1}{n} R \frac{1}{2} S^2 ; \quad R = \frac{A}{P} \]

By:

- **Q** = Plan debit (m³/sec)
- **A** = Area of wet cross section (m)
- **P** = Wet channel circumference (m)
- **m** = Slope of channel duct
- **R** = Hydraulic finger (m)
- **b** = Basic width Channel (m)

Table 1. Criteria for Inundation Handling Priority Determination

| Criteria | Handling Priority Determination |
|----------|---------------------------------|
| 1. Inundation parameters | 1. High inundation |
| 2. Area of inundation | 2. Area of inundation |
| 3. Duration of inundation | 3. Duration of inundation |
| 4. Frequency of inundation | 4. Frequency of inundation |
| 5. Economic losses | 5. Economic losses |
| 6. Social disturbances and government facilities | 6. Social disturbances and government facilities |
| 7. Transportation losses and distributions | 7. Transportation losses and distributions |
| 8. Losses in residential areas | 8. Losses in residential areas |
| 9. Loss of personal property rights | 9. Loss of personal property rights |

3. Results and Discussion

Location of inundation/flooding that occurred in Samarinda Seberang area, covering Jalan Bung Tomo, Cipto Mangunkusumo, Pattimura, Hasanudin, and Mangkupalaas, as shown in the following figure 2. The processing of the data is as follows:

Figure 2. Location map

Source: Measurement Results (Survey)
3.1. Processing of Rainfall Data Into Rain Intensity

Hydrological analysis is needed to calculate the amount of design discharge that will be used in calculating drainage channel capacity. In this plan, rainfall data from the Temindung Airport Rainfall Recording Station, which are located 2 km from the study location, recorded (31 years) are presented in the following table:

| No. | Maximum daily rainfall number (mm) |
|-----|-----------------------------------|
| 1   | 115.80                            |
| 2   | 105.60                            |
| 3   | 85.70                             |
| 4   | 80.50                             |
| 5   | 108.90                            |
| 6   | 97.30                             |
| 7   | 89.40                             |
| 8   | 105.30                            |
| 9   | 94.30                             |
| 10  | 90.00                             |
| 11  | 141.80                            |
| 12  | 82.00                             |
| 13  | 79.10                             |
| 14  | 94.60                             |
| 15  | 85.00                             |
| 16  | 117.10                            |
| 17  | 83.80                             |
| 18  | 101.60                            |
| 19  | 66.30                             |
| 20  | 39.00                             |
| 21  | 118.20                            |
| 22  | 108.00                            |
| 23  | 132.10                            |
| 24  | 94.40                             |
| 25  | 73.00                             |
| 26  | 60.20                             |
| 27  | 86.50                             |
| 28  | 105.50                            |
| 29  | 98.90                             |
| 30  | 96.00                             |
| 31  | 102.50                            |

*Source: Temindung Airport Samarinda Rainfall Record Station*

Rainfall calculation results are designed by the Person Type III Log Method

| Return Periode (Year) | Probability (%) | Log X (mm) | X (mm)     |
|-----------------------|-----------------|------------|------------|
| 2                     | 50              | 1.987      | 78.885     |
| 5                     | 20              | 2.050      | 101.175    |
| 10                    | 10              | 2.073      | 118.430    |
| 25                    | 4               | 2.090      | 128.948    |

*Source: Calculation results*
3.2. Frequency Conformity Test

Smirnov Test - Kolmogorov, this test is carried out to test the deviation in the horizontal direction, in order to determine the largest horizontal deviation of the theoretical distribution and empirical distribution (the difference or Δ). The testing stages are as follows:

- Number of data (n) = 31; Significant level α = 5%
- With n = 31 and α = 5%, then from the table, the relationship between n and α can find the critical price (Δcr) for the Smirnov Kolmogorov Test, which is (Δcr) = 0.29

\[ \Delta cr = \left(\frac{31 - 31}{31 - 31}\right) \approx (0.29 - 0.29) + 0.29 = 0 + 0.29 = 0.29 \]

The meaning of α = 5% (significance level of 5% means): approximately five out of 100 conclusions that will reject the hypothesis y that should be accepted or about 95% believe that we have made a correct conclusion.

\[ P = \frac{10 \cdot m}{n + 1} \text{ (%) } = \frac{100 \cdot 1}{31 + 1} = 3.125\% \]

Seen from the graph the relationship between percent chance of sceuronce (pr) or opportunity with XT so that the theoretical Dist. P, obtained al, for example, PT = 4.60

Kolom (7)'Δ= |Po - PT|(%) = |4.76 - 4.60| = 0.16

Conclusion:
ΔP max = 13.71% = 0.1371 ≈ 0.14%; Significant degree (α) = 5%
Trust = 95%; Number of data (n) = 31; Δcritical = 0.29%; Because the value of maks P max <Δcr; Namely: 0.14 <0.29 - hypothesis accepted.

The conclusion is the hypothesis that the Type III Log Person Method is acceptable and meets the requirements.

Calculation of City Drainage Channels with Rational Modification Method

In the planning of the drainage channel, here is used the Rational Modification Method. The main drainage channel of the settlement is planned with T = 10 years, including:

1. Jl. Bung Tomo (Reel Road, Jl. Solid Karya, Jl. H. Jahrah)
2. Jl. Cipto Mangunkusumo
Jl. Sultan Hasanuddin

4. (Partly Jl. MAS Penghulu, Jl. Mangkupalas), partially Jl. Ampera.

Example Calculation of drainage channel discharge plan Jl. Bung Tomo, and the results of the debit calculation and the results of the subsequent channel dimensions are reflected in the table below.

The calculation example is given to one of the Jalan Bung Tomo segments as follows:

1. Jl. Bung Tomo (Runoff Coefficient Value (C))

| Segment  | 1/3.6 | Cs  | C (mm/hour) | A (km²) | Q (m³/sec) | Qtotal (m³/sec) |
|----------|-------|-----|-------------|---------|------------|----------------|
| Bung Tomo 2 | 0.278 | 0.669 | 0.83 | 9.986 | 0.10 | 0.154 | 1.2 |
| Bung Tomo 1 | 0.278 | 0.672 | 0.83 | 9.833 | 0.38 | 0.579 |
| Bung Tomo 3 | 0.278 | 0.670 | 0.83 | 9.872 | 0.28 | 0.154 |
| Bung Tomo 4 | 0.278 | 0.672 | 0.81 | 11.562 | 0.07 | 0.118 |

Table 5. Recapitulation of Channel Dimension Calculation Results in Samarinda Seberang Area

| Segment                      | T (m) | b (m) | H (m) | m | Material            |
|------------------------------|-------|-------|-------|---|---------------------|
| Jl. Bung Tomo                | 1.70  | 0.50  | 1.40  | 1 : 1 | Beton               |
| Jl. Sultan Hasanudin         | 1.30  | 0.50  | 0.70  | 1 : 1 | Pasangan Batu      |
| Jl. Pattimura                | 1.70  | 0.50  | 1.40  | 1 : 1 | Pasangan Batu      |
| Jl. Cipto Mangunkusumo       | 3.30  | 0.80  | 2.52  | 1 : 1 | Pasangan Batu      |
Table 6. Criteria for Determining Priority Handling Scale in Samarinda Seberang

| Priority of Inundation Handling in Samarinda Seberang Subdistrict | Determining |
|---------------------------------------------------------------|-------------|
|                                                               | Cipto M  | Pattimura | Bung Tomo | Hasanuddin |
| 1. Inundation parameters                                      | 100      | 100       | 30        | 25         |
| a. Inundation height                                          |          |           |           |            |
| b. Area of inundation                                         | 0        | 25        | 0         | 25         |
| c. Duration of inundation                                     | 50       | 50        | 25        | 25         |
| d. Inundation frequency                                       | 100      | 100       | 100       | 25         |
| 2. Economic losses                                            | 65       | 30        | 30        | 30         |
| 3. Social disturbances and government facilities              | 65       | 30        | 65        | 30         |
| 4. Transportation losses and disruptions                      | 100      | 30        | 65        | 30         |
| 5. Losses in residential areas                                | 65       | 100       | 65        | 30         |
| 6. Loss of personal property rights                           | 65       | 65        | 0         | 0          |
| Total                                                         | 610      | 530       | 400       | 220        |

Source: Calculation Results

Based on the assessment of the determinants of the priority scale of inundation handling with assessment analysis, the higher the value of the priority criteria for inundation handling, the regions will be prioritized to be dealt with based on inundation parameters, economic studies, social disturbances, transportation losses and disruptions, and losses in the regions housing and property rights, with the results of the priority areas for inundation and flooding in Samarinda Seberang District are Jalan Cipto Mangunkusumo with values (610), Pattimura with grades (530), Bung Tomo (400), and Hasanuddin (220).

4. Conclusions

Based on the analysis of priority areas for inundation and flooding, the highest to lowest priority scale values were obtained in Samarinda Seberang Subdistrict, namely the highest value of Jalan Cipto Mangunkusumo, namely (610), Pattimura with grades (530), Bung Tomo (400), and Hasanuddin (220). The results of the calculation of drainage channel planning that got the first priority scale, namely Jalan Cipto Mangunkusumo the priority scale value is 610, with the result of the largest design flood (Q) with a 10 year return period of 7.79 m$^3$/dt, with the results of the drainage channel planning dimension channel base width (b) 0.77 m ~ 0.80 m, channel peak width (T) 3.30 m, channel depth (h) 1.925 m, watch height (f) 0.6 m, total depth of channel (H) 2, 52 m, with the slope of the channel wall (m) 1:1.

Recommendation

Given the budget constraints of the regional government, where flood control in the area must still meet technical standards, be effective and efficient, it should be done by determining the priority scale of handling inundation or flood areas so that the location of the area that has a higher inundation or flood influence is determined to become a top priority for immediate technical handling.
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