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ANALYSIS AND DESIGN OF DRAINAGE SYSTEM PLANNING STUDY (CASE STUDY GRAHA WISATA SIDOARJO RESIDENTIAL)

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ABSTRACT

Graha Wisata Sidoarjo Housing has a land area of 470,000 m2 located in Lebo Village, Sidoarjo District, Sidoarjo Regency. The housing is passed by the Anak Afvoer Sidokare channel. With the change in land function, it is necessary to analyze the capacity of the Anak Afvoer Sidokare watershed. The rainfall data used is the annual maximum rainfall from the rain station Durungbedug, Ketintang, Sidoarjo, Sumput .. The method of rainfall analysis uses the Log Pearson type III method. Planned flood discharge in the Anak Afvoer Sidokare watershed at 25 years using the Nakayasu method is 450.55 m3 / sec while the existing Afvoer capacity with dimensions of 10 m x 4.172 m is 537.39 m3 / sec, the cross section of the Son Afvoer Sidokare channel is not overflow.

Keywords: flood, drainage system, capacity**.**

INTRODUCTION

Graha Wisata Sidoarjo Housing is a housing that is above the rice fields and passed by the Anak Afvoer Sidokare channel. With the transition of land functions into settlements. or changes in land use, it is necessary to analyze the Anak Afvoer Sidokare watershed. In determining the planned flood discharge there are two things that need to be considered, namely overflow or no overflow.

Floods

Flooding is an indication of an imbalance in the environmental system in the process of flowing water and is influenced by the amount of water flowing that exceeds the drainage capacity (Suripin, 2004).

To get the flood design there are two approaches, namely the hydrograph method and the non-hydrograph hifrograph method producing the magnitude of the flood each peak hour. An example of the method used is Nakayasu synthetic unit hydrograph.

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Location of the study

The research location used for the study was the Anak Afvoer Sidokare river, Sidoarjo district, Sidoarjo regency

Figure 1. Condition of the Afvoer Sidokare River

Data requirements include rainfall data for 10 years from 2006 - 2016 at the rain station Durungbedug, Ketintang, Sidoarjo, Sumput.

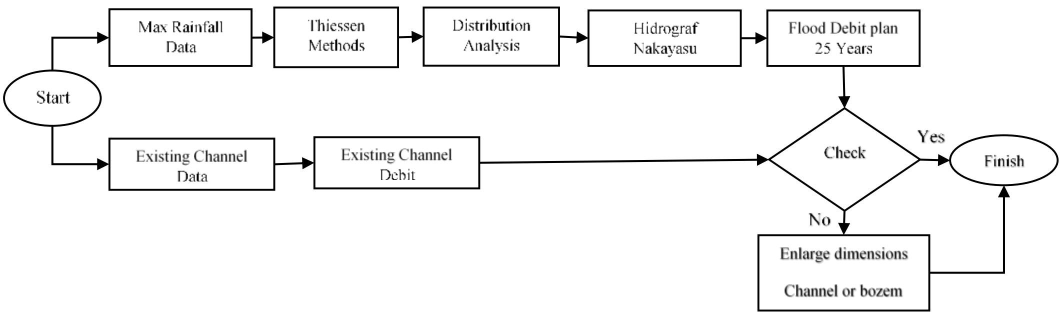

Figure 2. Data requirements include rainfall data for 10 years from 2006- 2016

METHODOLOGY

Rain Intensity

Rain that occurs in each area must be different from the period of time, namely annual rainfall, monthly rainfall and daily rainfall. The results obtained are used to determine future prospects.

To calculate the intensity of the rain, the mononobe formula is used:

$$I = \frac{R24}{24}\left(\frac{24}{t}\right)^{\frac{2}{3}}$$

With
I = Rain Intensity (mm / hour)
t = The duration of rain (hours)
R24 = Daily maximum rainfall in 24 hours (mm)

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Table 1. Distribution of rain every hour

Waktu	Periode Ulang					
	2	5	10	25	50	100
	94.6452	121.228	142.038	172.223	197.623	225.684
1	32.8117	42.0273	49.2418	59.7063	68.5122	78.2402
2	20.67	26.4755	31.0204	37.6126	43.16	49.2882
3	15.7742	20.2046	23.673	28.7038	32.9372	37.614
4	13.0213	16.6785	19.5416	23.6944	27.1891	31.0496
5	11.2214	14.3731	16.8405	20.4193	23.4308	26.7578
6	9.93712	12.7281	14.9131	18.0822	20.7492	23.6953
7	8.96663	11.485	13.4566	16.3163	18.7227	21.3812
8	8.20291	10.5068	12.3105	14.9266	17.1281	19.56
9	7.58344	9.71337	11.3808	13.7993	15.8346	18.0829
10	7.06906	9.05451	10.6088	12.8633	14.7605	16.8563
11	6.63386	8.49708	9.95571	12.0714	13.8518	15.8186
12	6.25999	8.01821	9.39464	11.3911	13.0711	14.9271
13	5.93471	7.60156	8.90646	10.7992	12.3919	14.1515
14	5.64862	7.23513	8.47713	10.2786	11.7946	13.4693
15	5.3947	6.90988	8.09605	9.81655	11.2644	12.8638
16	5.16751	6.61889	7.7551	9.40315	10.79	12.3221
17	4.96282	6.35671	7.44792	9.03068	10.3626	11.834
18	4.77727	6.11904	7.16945	8.69304	9.97515	11.3915
19	4.60814	5.90241	6.91563	8.38528	9.622	10.9882
20	4.45323	5.70398	6.68314	8.10339	9.29854	10.6188
21	4.31071	5.52144	6.46926	7.84405	9.00095	10.279
22	4.17907	5.35283	6.27171	7.60451	8.72609	9.9651
23	4.05704	5.19652	6.08857	7.38246	8.47129	9.67412
24	3.94355	5.05116	5.91825	7.17594	8.23431	9.40349

Nakayasu Method

Watershed data parameters

Large = 16,8 km^2
River large = 20 km
Average Slope = 0,0002
Coefisien = 2

Paraneter Tg

Tg = 0,4 + (0,058 . L)
Tg = 1,56 hours

Parameter Tr

Tr = 0,75 Tg
Tr = 1,17 hours

Parameter Tp

Tp = Tg +0,8 Tr
Tp = 2,496 hours

Parameter T0,3

T0,3 = α . Tg
T0,3 = 2 . 1,56 = 3.12 hours
Tp +T 0,3 = 2,496 +3,12 = 5,616 hours
Tp + T0,3 +1,5 . T0,3 = 5,615 +1,5 . 3,12 = 10,296 hours

Parameter Qp

$$= \frac{A.Ro}{3{,}6(0{,}3\ tp + T0{,}3)}$$

$$= \frac{16{,}8\ .\ 1}{3{,}6(0{,}3\ .\ 2{,}496 + 10{,}296)} = 1{,}206\ m^3/sec$$

Ordynat hydrograf

1. 0 < t < Tp => 0 < t < 2,496

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Qt = Q max (t/Tp)2,4
2. Tp < t < (Tp + T0,3) => 2,496 < t < 5,616
Qt = Q max (0,3)(t-Tp/T0,3)
3. (Tp + T0,3) < t < Tp +T0,3+1,5 . T0,3 => 5,616 < t < 10,296
Qt = Q max (0,3)((t-Tp)+0.5 T0,3)/1,5 T0,3)
4. t > (Tp + T0,3 + 1,5 . T0,3) => t > 10,296
Qt = Q max (0,3)((t-Tp)+1,5 T0,3)/2 T0,3)

Table 2. Ordynat Hydrograf

t	Q	ket
0	0	
0.7	0.057053042	
1	0.134289949	
1.2	0.208007262	
1.5	0.355355081	
1.6	0.414888566	
1.8	0.5504242	
2	0.708786598	
2.2	0.890959456	
2.4	1.097868912	qa
2.5	1.204370597	
2.8	1.072712502	
3	0.993037099	
3.3	0.884481332	
3.6	0.787792549	
3.9	0.701673486	
4.2	0.624968695	
4.5	0.556649036	
4.7	0.515304094	
5	0.458972633	Qd2
5.2	0.424882577	
5.8	0.347692779	
6	0.332912699	
7	0.267919186	
8	0.215614154	
9	0.173520471	
10	0.139644608	
10.2	0.133708452	q3
10.3	0.130864103	
10.5	0.126669353	
11	0.116761347	
11.5	0.10762834	
12	0.099209711	
12.5	0.091449583	
13	0.084296448	
13.5	0.077702827	
14	0.071624955	
14.5	0.066022491	
15	0.060858249	
16	0.05171	
17	0.043936922	
20	0.026952242	
24	0.014048024	q4

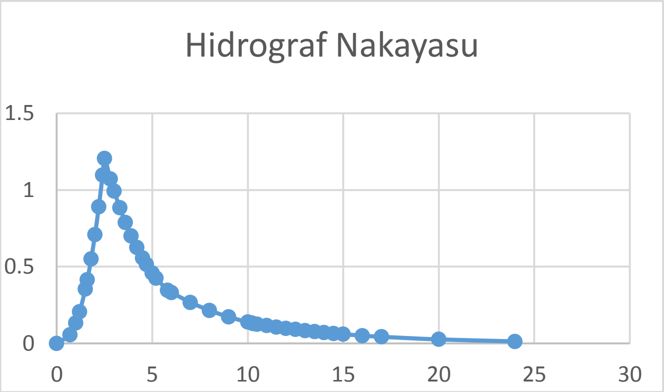

Figure 3. Nakayasu

Calculation of the 25-year return flood rate with the maximum Nakayasu method occurred at 450.56 m3 / sec. For detailed calculations can be seen in table 7

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Table 3. Flood Discharge On 25 Years Return

T Jam	U(T,1)	Q Akibat Hujan Netto																								Q banjir
		59.71	37.61	28.70	23.69	20.42	18.08	16.32	14.93	13.80	12.86	12.07	11.39	10.80	10.28	9.82	9.40	9.03	8.69	8.39	8.10	7.84	7.60	7.38	7.18	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.7	0.06	3.41	2.15	1.64	1.35	1.16	1.03	0.93	0.85	0.79	0.73	0.69	0.65	0.62	0.59	0.56	0.54	0.52	0.50	0.48	0.46	0.45	0.43	0.42	0.41	21.34
1	0.13	8.02	5.05	3.85	3.18	2.74	2.43	2.19	2.00	1.85	1.73	1.62	1.53	1.45	1.38	1.32	1.26	1.21	1.17	1.13	1.09	1.05	1.02	0.99	0.96	50.24
1.2	0.21	12.42	7.82	5.97	4.93	4.25	3.76	3.39	3.10	2.87	2.68	2.51	2.37	2.25	2.14	2.04	1.96	1.88	1.81	1.74	1.69	1.63	1.58	1.54	1.49	77.82
1.5	0.36	21.22	13.37	10.20	8.42	7.26	6.43	5.80	5.30	4.90	4.57	4.29	4.05	3.84	3.65	3.49	3.34	3.21	3.09	2.98	2.88	2.79	2.70	2.62	2.55	132.94
1.6	0.41	24.77	15.61	11.91	9.83	8.47	7.50	6.77	6.19	5.73	5.34	5.01	4.73	4.48	4.26	4.07	3.90	3.75	3.61	3.48	3.36	3.25	3.16	3.06	2.98	155.21
1.8	0.55	32.86	20.70	15.80	13.04	11.24	9.95	8.98	8.22	7.60	7.08	6.64	6.27	5.94	5.66	5.40	5.18	4.97	4.78	4.62	4.46	4.32	4.19	4.06	3.95	205.92
2	0.71	42.32	26.66	20.34	16.79	14.47	12.82	11.56	10.58	9.78	9.12	8.56	8.07	7.65	7.29	6.96	6.66	6.40	6.16	5.94	5.74	5.56	5.39	5.23	5.09	265.16
2.2	0.89	53.20	33.51	25.57	21.11	18.19	16.11	14.54	13.30	12.29	11.46	10.76	10.15	9.62	9.16	8.75	8.38	8.05	7.75	7.47	7.22	6.99	6.78	6.58	6.39	333.31
2.4	1.10	65.55	41.29	31.51	26.01	22.42	19.85	17.91	16.39	15.15	14.12	13.25	12.51	11.86	11.28	10.78	10.32	9.91	9.54	9.21	8.90	8.61	8.35	8.10	7.88	410.72
2.5	**1.20**	**71.91**	**45.30**	**34.57**	**28.54**	**24.59**	**21.78**	**19.65**	**17.98**	**16.62**	**15.49**	**14.54**	**13.72**	**13.01**	**12.38**	**11.82**	**11.32**	**10.88**	**10.47**	**10.10**	**9.76**	**9.45**	**9.16**	**8.89**	**8.64**	**450.56**
2.8	1.07	64.05	40.35	30.79	25.42	21.90	19.40	17.50	16.01	14.80	13.80	12.95	12.22	11.58	11.03	10.53	10.09	9.69	9.33	8.99	8.69	8.41	8.16	7.92	7.70	401.31
3	0.99	59.29	37.35	28.50	23.53	20.28	17.96	16.20	14.82	13.70	12.77	11.99	11.31	10.72	10.21	9.75	9.34	8.97	8.63	8.33	8.05	7.79	7.55	7.33	7.13	371.50
3.3	0.88	52.81	33.27	25.39	20.96	18.06	15.99	14.43	13.20	12.21	11.38	10.68	10.08	9.55	9.09	8.68	8.32	7.99	7.69	7.42	7.17	6.94	6.73	6.53	6.35	330.89
3.6	0.79	47.04	29.63	22.61	18.67	16.09	14.25	12.85	11.76	10.87	10.13	9.51	8.97	8.51	8.10	7.73	7.41	7.11	6.85	6.61	6.38	6.18	5.99	5.82	5.65	294.72
3.9	0.70	41.89	26.39	20.14	16.63	14.33	12.69	11.45	10.47	9.68	9.03	8.47	7.99	7.58	7.21	6.89	6.60	6.34	6.10	5.88	5.69	5.50	5.34	5.18	5.04	262.50
4.2	0.62	37.31	23.51	17.94	14.81	12.76	11.30	10.20	9.33	8.62	8.04	7.54	7.12	6.75	6.42	6.14	5.88	5.64	5.43	5.24	5.06	4.90	4.75	4.61	4.48	233.80
4.5	0.56	33.24	20.94	15.98	13.19	11.37	10.07	9.08	8.31	7.68	7.16	6.72	6.34	6.01	5.72	5.46	5.23	5.03	4.84	4.67	4.51	4.37	4.23	4.11	3.99	208.24
4.7	0.52	30.77	19.38	14.79	12.21	10.52	9.32	8.41	7.69	7.11	6.63	6.22	5.87	5.56	5.30	5.06	4.85	4.65	4.48	4.32	4.18	4.04	3.92	3.80	3.70	192.78
5	0.46	27.40	17.26	13.17	10.88	9.37	8.30	7.49	6.85	6.33	5.90	5.54	5.23	4.96	4.72	4.51	4.32	4.14	3.99	3.85	3.72	3.60	3.49	3.39	3.29	171.70
5.2	0.42	25.37	15.98	12.20	10.07	8.68	7.68	6.93	6.34	5.86	5.47	5.13	4.84	4.59	4.37	4.17	4.00	3.84	3.69	3.56	3.44	3.33	3.23	3.14	3.05	158.95
5.8	0.35	20.76	13.08	9.98	8.24	7.10	6.29	5.67	5.19	4.80	4.47	4.20	3.96	3.75	3.57	3.41	3.27	3.14	3.02	2.92	2.82	2.73	2.64	2.57	2.50	130.07
6	0.33	19.88	12.52	9.56	7.89	6.80	6.02	5.43	4.97	4.59	4.28	4.02	3.79	3.60	3.42	3.27	3.13	3.01	2.89	2.79	2.70	2.61	2.53	2.46	2.39	124.54
7	0.27	16.00	10.08	7.69	6.35	5.47	4.84	4.37	4.00	3.70	3.45	3.23	3.05	2.89	2.75	2.63	2.52	2.42	2.33	2.25	2.17	2.10	2.04	1.98	1.92	100.23
8	0.22	12.87	8.11	6.19	5.11	4.40	3.90	3.52	3.22	2.98	2.77	2.60	2.46	2.33	2.22	2.12	2.03	1.95	1.87	1.81	1.75	1.69	1.64	1.59	1.55	80.66
9	0.17	10.36	6.53	4.98	4.11	3.54	3.14	2.83	2.59	2.39	2.23	2.09	1.98	1.87	1.78	1.70	1.63	1.57	1.51	1.46	1.41	1.36	1.32	1.28	1.25	64.91
10	0.14	8.34	5.25	4.01	3.31	2.85	2.53	2.28	2.08	1.93	1.80	1.69	1.59	1.51	1.44	1.37	1.31	1.26	1.21	1.17	1.13	1.10	1.06	1.03	1.00	52.24
10.2	0.13	7.98	5.03	3.84	3.17	2.73	2.42	2.18	2.00	1.85	1.72	1.61	1.52	1.44	1.37	1.31	1.26	1.21	1.16	1.12	1.08	1.05	1.02	0.99	0.96	50.02
10.3	0.13	7.81	4.92	3.76	3.10	2.67	2.37	2.14	1.95	1.81	1.68	1.58	1.49	1.41	1.35	1.28	1.23	1.18	1.14	1.10	1.06	1.03	1.00	0.97	0.94	48.96
10.5	0.13	7.56	4.76	3.64	3.00	2.59	2.29	2.07	1.89	1.75	1.63	1.53	1.44	1.37	1.30	1.24	1.19	1.14	1.10	1.06	1.03	0.99	0.96	0.94	0.91	47.39
11	0.12	6.97	4.39	3.35	2.77	2.38	2.11	1.91	1.74	1.61	1.50	1.41	1.33	1.26	1.20	1.15	1.10	1.05	1.02	0.98	0.95	0.92	0.89	0.86	0.84	43.68
11.5	0.11	6.43	4.05	3.09	2.55	2.20	1.95	1.76	1.61	1.49	1.38	1.30	1.23	1.16	1.11	1.06	1.01	0.97	0.94	0.90	0.87	0.84	0.82	0.79	0.77	40.26
12	0.10	5.92	3.73	2.85	2.35	2.03	1.79	1.62	1.48	1.37	1.28	1.20	1.13	1.07	1.02	0.97	0.93	0.90	0.86	0.83	0.80	0.78	0.75	0.73	0.71	37.11
12.5	0.09	5.46	3.44	2.62	2.17	1.87	1.65	1.49	1.37	1.26	1.18	1.10	1.04	0.99	0.94	0.90	0.86	0.83	0.79	0.77	0.74	0.72	0.70	0.68	0.66	34.21
13	0.08	5.03	3.17	2.42	2.00	1.72	1.52	1.38	1.26	1.16	1.08	1.02	0.96	0.91	0.87	0.83	0.79	0.76	0.73	0.71	0.68	0.66	0.64	0.62	0.60	31.54
13.5	0.08	4.64	2.92	2.23	1.84	1.59	1.41	1.27	1.16	1.07	1.00	0.94	0.89	0.84	0.80	0.76	0.73	0.70	0.68	0.65	0.63	0.61	0.59	0.57	0.56	29.07
14	0.07	4.28	2.69	2.06	1.70	1.46	1.30	1.17	1.07	0.99	0.92	0.86	0.82	0.77	0.74	0.70	0.67	0.65	0.62	0.60	0.58	0.56	0.54	0.53	0.51	26.80
14.5	0.07	3.94	2.48	1.90	1.56	1.35	1.19	1.08	0.99	0.91	0.85	0.80	0.75	0.71	0.68	0.65	0.62	0.60	0.57	0.55	0.54	0.52	0.50	0.49	0.47	24.70
15	0.06	3.63	2.29	1.75	1.44	1.24	1.10	0.99	0.91	0.84	0.78	0.73	0.69	0.66	0.63	0.60	0.57	0.55	0.53	0.51	0.49	0.48	0.46	0.45	0.44	22.77
16	0.05	3.09	1.94	1.48	1.23	1.06	0.94	0.84	0.77	0.71	0.67	0.62	0.59	0.56	0.53	0.51	0.49	0.47	0.45	0.43	0.42	0.41	0.39	0.38	0.37	19.34
17	0.04	2.62	1.65	1.26	1.04	0.90	0.79	0.72	0.66	0.61	0.57	0.53	0.50	0.47	0.45	0.43	0.41	0.40	0.38	0.37	0.36	0.34	0.33	0.32	0.32	16.44
20	0.03	1.61	1.01	0.77	0.64	0.55	0.49	0.44	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.26	0.25	0.24	0.23	0.23	0.22	0.21	0.20	0.20	0.19	10.08
24	0.01	0.84	0.53	0.40	0.33	0.29	0.25	0.23	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.14	0.13	0.13	0.12	0.12	0.11	0.11	0.11	0.10	0.10	5.26

Afvoer cross section calculation

Channel Name : Afvoer Sidokare
Length : 20 km
Wide (b) : 10 m
High (h) : 4,172 m
Slope of the wall (m) : 4,66 m
Elevated headwaters : 12 m
Elevated downstream : -11 m
Slope Of Channel(s) : 0,0011
K : 70
M : 5
Sectional of area : (B+mh)h = (10+4.66 x 4.172) . 4.172 = 122,90 m2
Wet circumference (P) : B +2h $(m^2+1)0.5$ = 10+2 . 4,172 . ((4,662)+1)0,5 = 49,80 M
Hydraulic finger (R) : A/P = 2,50 M
Flow Speed : K×R^(2/3)×S^(1/2)= 4,37261 m/sec

Channel Discharge : V.A =4,37 . 122.9=537,393m3/sec

RESULTS AND DISCUSSION

Hydrological Analysis

Hydrological analysis was carried out to determine the rainfall intensity of the data used in the form of rainfall data for the last 10 years from 2006 to 2016. From the data then determine the analysis of frequency distribution and design flood discharge.

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Maximum rainfall analysis

Through data from the Sidoarjo Regency Water Service in the Anak Afvoer Sidokare Watershed, there are 4 rain gauge stations, namely Durungbedug Station (4.20 km2), Ketintang Station (4.05 km2) Sidoarjo Station (2.35 km2) and Sumput Station (3.55 km2)

Table 4. Maximum rainfall data

TAHUN	TANGGAL	STASIUN PENAKAR HUJAN				TOTAL
		DURUNGBEDUG	KETINTANG	SIDOARJO	SUMPUT	
		0.297	0.286	0.166	0.251	
2006	26 Peb	115	25	80	104	80.668
2007	8-Mar	86	75	78	76	79.014
2008	31-Jan	105	115	110	95	106.184
2009	6-Mar	170	90	71	13	91.272
2010	15-Oct	143	125	168	160	146.265
2011	26-Dec	141	75	0	141	98.693
2012	15-Jan	68	85	53	115	82.166
2013	2-Jan	122	81	96	135	109.208
2014	13-Mar	113	129	18	74	92.018
2015	19-Mar	100	80	0	77	71.898
2016	10-Oct	176	176	170	167	172.746

Frequency Analysis

The selection of the appropriate type of rainfall distribution is based on the values of asymmetric coefficients (Cs), coefficient of variation (Cv) and coefficient of kurtosis (Ck). The coefficient is obtained by determining the value of statistical parameters from rainfall data

Table 5. Frequency Analysis

No	Tahun	Tanggal	Xi	Xi - Xr	Xi - Xr 2	Xi - Xr 3	Xi - Xr 4
1	2015	19-Mar	71.898	-30.842	951.2063	-29337	904793.3418
2	2007	8-Mar	79.014	-23.725	562.8768	-13354	316830.2562
3	2006	26 Peb	80.668	-22.071	487.1429	-10752	237308.2
4	2012	15-Jan	82.166	-20.573	423.2516	-8707.6	179141.9563
5	2009	6-Mar	91.272	-11.467	131.4938	-1507.8	17290.61315
6	2014	13-Mar	92.018	-10.721	114.9504	-1232.4	13213.58505
7	2011	26-Dec	98.693	-4.047	16.3748	-66.262	268.1340912
8	2008	31-Jan	106.184	3.445	11.8652	40.8707	140.7825221
9	2013	2-Jan	109.208	6.469	41.8521	270.755	1751.60076
10	2010	15-Oct	146.265	43.526	1894.5004	82459.8	3589131.871
11	2016	10-Oct	172.746	70.006	4900.8995	343094	24018815.86
Xr			102.739	0.000	9536.4137	360909	29278686.2

Sx $= \sqrt{\frac{9536{,}4137}{10}} = 30{,}881$

Cs $= \frac{11\ .360909}{(10)(9)30{,}881^3} = 1{,}498$

Ck $= \frac{11^2 .\ 29278686{,}2}{10\ .\ 9\ .\ 8\ .\ 30{,}881^4} = 5{,}411$

Because Cs ≠ 0, what is used is Log Pearson Type III

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Planned Rainfall Analysis based on Log Pearson Type III

Table 6. Log Pearson Type III Methods

No	Tahun	Tanggal	Xi	Log Xi	log x - log xi	(log x - log xi)2	(log x - log xi)3
1	2015	19-Mar	71.89753	1.856714	-0.139755802	0.019531684	-0.002729666
2	2007	8-Mar	79.01413	1.897705	-0.098764965	0.009754518	-0.000963405
3	2006	26 Peb	80.66784	1.9067	-0.089769299	0.008058527	-0.000723408
4	2012	15-Jan	82.16608	1.914693	-0.081777195	0.00668751	-0.000546886
5	2009	6-Mar	91.27208	1.960338	-0.03613178	0.001305506	-4.71702E-05
6	2014	13-Mar	92.01767	1.963871	-0.032598529	0.001062664	-3.46413E-05
7	2011	26-Dec	98.69258	1.994285	-0.002185251	4.77532E-06	-1.04353E-08
8	2008	31-Jan	106.1837	2.026058	0.02958829	0.000875467	2.59036E-05
9	2013	2-Jan	109.2085	2.038256	0.041786614	0.001746121	7.29645E-05
10	2010	15-Oct	146.265	2.16514	0.168670717	0.028449811	0.00479865
11	2016	10-Oct	172.7456	2.237407	0.240937201	0.058050735	0.013986581
Total			1130.131	21.96117	0.000000000	0.135527317	0.013838913

$$\text{Log Xi} = \frac{21{,}96117}{11} = 1{,}99647$$

$$\text{S Log X} = \sqrt{\frac{0{,}135527317}{11-1}} = 0{,}11641$$

$$\text{Cs} = \frac{11\ .\ 0{,}013838}{(11-1)(11-2)(0.11641)^3}\ 1{,}072042$$

Table 7. Re-period of the Log Pearson Type III method

periode ulang	KT	RT
2	-0.17499	94.64518
5	0.748454	121.2277
10	1.33946	142.038
25	2.058309	172.2226
50	2.571537	197.6234
100	3.066846	225.6838

CONCLUSSION

Flood discharge at the 25-year return period that occurred in Avfoer Sidokare's children was 450.56 m3 / sec, while the Afvoer capacity of Sidokare's children at residential locations with dimensions of 10 x 4.172 was 537,393 m3 / sec. Then the cross section of the Afvoer Sidokare Son does not experience overflow.

REFERENCES

Soemarto,CD. (1987_. Hidrologi Teknik. Surabaya. Usaha Nasional
Soewarno. (1995). Hidrologi aplikasi metode statistic untuk analisa data. Bandung. Nova
Suripin. (2004). Sistem Drainase Perkotaan yang Berkelanjutan. ANDI Offset Yogyakarta.
Evi Nurlely (2014). Perencanaan Pengendalian Banjir Kali Krukut Jakarta (skripsi). Universitas Pendidikan Indonesia
Agantriely. N. T. 2013. Perancangan Ulang Dimensi Saluran Drainase Di Perumahan Jihad Indah Persada 2 Kecamatan Koto Tangah Padang.
Aldridge T.L. Tobing. Tinjauan Rencana Drainase di Perumahan Kota Baru Medan Hills dlam Upaya Mewujudkan Kawasan Perumahan yang Bebas Banjir
Andri Setiawan. S. 2016. Evaluasi Sistem Drainase Di Kelurahan Paminggir Garut. 14.(1)
Andy. 2009. Perencanaan Sistem Drainase Perumahan Josroyo Permai RW 11 Kecamatan Jaten Kabupaten Karanganyar [skripsi]. Surakarta (ID): Universitas Sebelas Maret.
Arifal Hidayat. 2013. Perencanaan Saluran Drainase (Studi Kasus Desa Rambah) Universitas Pasir Pengaraian

ISSN : 2615-2096 (ONLINE)
ISSN : 2615-2088(PRINTED)

Bambang Triadmodjo. 2008. Hidrologi Terapan. Yogya. Beta Offset

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Fuad. 2014.Pengaruh hubungan Tata Guna Lahan Dengan Debit Banjir Pada Daerah Aliran Sungai Malalayang.4(1):45-54.