TUGAS 2

ANALISIS DEBIT BANJIR

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TPPIS A

D IV TEKNIK PENGELOLAAN DAN PEMELIHARAAN INFRASTRUKTUR SIPIL

DEPARTEMEN TEKNIK SIPIL- SEKOLAH VOKASI

UNIVERSITAS GADJAH MADA

YOGYAKARTA

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TUGAS 2

Mata Kuliah   : Infrastruktur Keairan

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a	b	c
9	7	9

Curah Hujan berdasarkan data tugas 1 :

Nomor	Tahun	Curah Hujan rata-rata per tahun (mm)	Urutan (Min - Max)
1	2008	103.9476	25.744
2	2009	25.744	27.4738
3	2010	62.9648	28.8062
4	2011	30.7704	30.7704
5	2012	55.1228	45.0712
6	2013	28.8062	55.1228
7	2014	61.0928	61.0928
8	2015	62.445	62.445
9	2016	27.4738	62.9648
10	2017	45.0712	87.3776
11	2018	119.7304	103.9476
12	2019	110.6092	110.6092
13	2020	87.3776	119.7304

INFRASTRUKTUR SUMBER DAYA AIR
ANALISIS DEBIT BANJIR
Dosen **Dr.sc.tech. Adhy Kurniawan**

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ABSTRAK

Kejadian hujan merupakan proses yang berkala dan terus terjadi pada tiap tahun,Sementara curah hujan yaitu jumlah air *yang jatuh di permukaan tanah datar selama periode tertentu yang diukur dengan satuan tinggi (mm). Curah hujan juga bisa diartikan sebagai jumlah air hujan yang terkumpul di tempat datar yang tidak menguap, tidak meresap, dan tidak mengalir setelah hujan turun. sehingga untuk keperluan analisa dan menjelaskan proses stokastik tersebut digunakan teori probabilitas dan analisa frekuensi. Terdapat empat jenis distribusi probabilitas yaitu distribusi normal, log normal, log pearson III dan gumbel.*

Kata kunci : Curah hujan , analisa frekuensi, log pearson III , gumbel

PENDAHULUAN

Banjir atau kekeringan akan mengakibatkan dampak negatif bagi kehidupan. Curah hujan yang sangat tinggi akan mengakibatkan banjir apabila saluran drainase yang ada sudah tida mampu menampung air hujan dan sebaliknya , jika tidak ada hujan akan mengakibatkan kekeringan jika saat hujan tidak dilakukan penyimpanan air hujan . Sehingga untuk keperluan analisa untuk memperikirakan volume debit banjir tersebut digunakan teori probabilitas dan analisa frekuensi serta uji validasi agar dapat yang di pada kalau ulang 2, 10, 15, 25 dan 50 tahun sebagai data dalam pemperkirakan intensitas hujan tiap tahunnya serta perencanaan saluran yang lebih baik dengan diperoleh data ini.

TUJUAN

1. untuk membandingkan hasil analisis perhitungan, dua metode yaitu Gumbell dan Log Pearson III apakah hasil ketiganya memiliki kemiripan
2. Mencari data Intensitas hujan dengan menggunakan metode Mononobe
3. Melalukan analisis debit dengan menggunakan metode Rasional
4. Analisis debit dengan metode Nakayasu

TINJAUAN PUSTAKA

Dalam analisa hidrologi ditekankan mendapatkan debit modulus pembuang yang dihitung berdasarkan besarnya curah hujan. Untuk mendapatkan besaran curah hujan maksimum dilakukan dengan menganalisis curah hujan harian maksimum. Dari besaran curah hujan maksimum kemudian dipilih curah hujan terbesar, yang kemudian dipergunakan sebagai masukan dalam perhitungan curah hujan rancangan.

1. **ANALISIS DEBIT BANJIR**

   (Metode Gumbel dan Log Pearson Type III)

   a. **Uji Frekuensi Metode Gumbel**

Distribusi Gumbel umumnya digunakan untuk analisis data ekstrem, misalnya untuk analisis frekuensi banjir. Persamaan Metode gumbel :

$$X_{TR} = \bar{x} + K. S_x$$

dengan:

X_{TR} = Besarnya curah hujan rencana untuk periode ulang T tahun .

$\bar{x}$ = Nilai rata- rata dari data ($\sum x / n$)

S_x = Simpangan baku

$$= \sqrt{\frac{\sum (Ri - Rr)^2}{n-1}}$$

K = Faktor frekuensi dari periode kala ulang tiap tahunnya

Untuk menghitung factor frekuensi Gumber di dapat dari :

$$Kt = \frac{Yt - Yn}{Sn}$$

dengan:

yt = reduksi sebagai fungsi dari probabilitas (Tabel)

yn dan Sn = Besaran yang merupakan fungsi dari jumlah pengamatan

a. Menghitung nilai presentasi P (%)

$$P1 = \frac{X1 \times 100}{\sum X + 1}$$

$$P1 = \frac{1 \times 100}{13 + 1}$$

$$P1 = 7.142857143 \%$$

b. Menentukan Nilai Hujan Rata-rata

$$R_r = \frac{\sum Ri}{\sum X}$$

$$= \frac{821.1558}{13}$$

$$= 63.16583077$$

c. Menentukan selisih curah hujan maksimum terhadap hujan rata-rata :

$$X1 = (R1 - R_r)^2$$
$$= (25.744 - 63.16583077)^2$$

$$X1 = 1400.39$$

Tabel 1 Selisih Curah Hujan Maksimum

Nomor	Tahun	Curah Hujan Harian max (Ri)	P %	(Ri – R)^2
1	2008	25.7434	7.1429	1400.514
2	2009	27.4754	14.2857	1273.879
3	2010	28.8038	21.4286	1180.818
4	2011	30.7679	28.5714	1049.691
5	2012	45.0736	35.7143	327.365
6	2013	55.122	42.8571	64.719
7	2014	61.0931	50	4.300
8	2015	62.4492	57.1429	0.5150
9	2016	62.9618	64.286	0.0420
10	2017	87.3795	71.4286	586.253
11	2018	103.9516	78.5714	1663.397
12	2019	110.6179	85.7143	2251.603
13	2020	119.7297	92.8571	3199.357

∑	13 tahun	821.1689		13002.4546
∑Rr		63.1668		

Menentukan Kala Ulang 2, 5, 10, 25 tahun

Suatu data hujan (x) akan mencapai suatu harga tertentu/disamai (x') atau kurang dari (x') atau lebih/melampaui dari (x') dan diperkirakan terjadi sekali dalam kurun waktu T tahun. Maka T tahun ini dianggap sebagai periode ulang dari (x').

a. Menentukan nilai Standart Deviasi

$$Sx = \sqrt{\frac{\sum (Ri - Rr)^2}{n-1}}$$

$$Sx = \sqrt{\frac{\sum (13.002,4546)^2}{13-1}}$$

$$Sx = 32.91$$

b. Menentukan data variasi fungsi kala ulang Yt

Tabel 2 . Nilai Yt , Yn dan untuk Sn Distribusi Gumbel Variasi Yt

Periode Ulang (Tahun)	Variasi yang berkurang
2	0.3665
5	1.4999
10	2.2502
25	3.1985
50	3.9019

c. Menentukan nilai Yn dan Sn

n = 13
Yn = 0.5070
Sn = 0,9971

d. Menentukan Hujan Rencana Untuk Kala 2 Tahunann

$$Kt = \frac{Yt - Yn}{Sn}$$

$$= \frac{0,3665 - 0,5070}{0.9971}$$

$$Kt = -0,14090$$

$$Rt = R_r + (Kt * Sx)$$

$$= 63.16583077 + (-0,14090 \times 32.915)$$

$$Rt = 58.5285$$

Tabel 3 Hujan Rencana kala Ulang 2;5;10;25 dan 25 tahun

KALA ULANG (TAHUN)	Yt	Kt	Rt (mm)
2	0.3665	-0.140908635	58.52782305
5	1.4999	0.995787785	95.9421857
10	2.2502	1.748269983	120.7101373
25	3.1985	2.699328051	152.0142136
50	4.6001	4.105004513	198.2820543

b. Metode Log Pearson Type III

Distribusi *Log-Pearson Type III* banyak digunakan dalam analisis hidrologi, terutama dalam analisis data maksimum (banjir) dan minimum (debit minimum) dengan nilai ekstrem.

Persamaan Metode Log Pearson Type III :

$$\text{Log } X_{Tr} = \overline{Log\ X} + K \cdot (S_{\text{Log x}})$$

dengan :

Log X_{Tr} = Besarnya curah hujan rencana
untuk periode ulang T tahun

$\overline{Log\ X}$ = Harga Rata- rata dari data

$\overline{S\ Log\ X}$ = Simpangan baku

$$= \sqrt{\frac{\sum\left(Log\ Ri - \overline{Log\ R}\ \right)^2}{n-1}}$$

K = Koefisien frekuens , di dapat berdasarkan hubungan nilai Cs dengan periode ulang T

$$Cs = \frac{n \times \sum\left(Log\ Ri - \overline{Log\ R}\ \right)^3}{(n-1)(n-2)*Sx^3}$$

a. Menghitung Logaritma Curah Hujan Maksimum (Log Ri)
Log(R1) = Log (25.744)

$$= 1.411$$

b. Menghitung Harga Tengahnya
$$\overline{Log\ R} = \frac{\sum Log\ Ri}{n}$$

$$= \frac{22.65324005}{13}$$

$$= 1.743$$

Tabel. 4 Curah Hujan Maksimum (Ri) Log Pearson III

Nomor	CHH Max			
Xi	**Ri**	Log Ri	(Log Ri - $\overline{Log\ R}$)²	(Log Ri - $\overline{Log\ R}$)³
1	25.744	1.411	0.11014	-0.03655
2	27.4738	1.439	0.09220	-0.02799
3	28.8062	1.459	0.08013	-0.02268
4	30.7704	1.488	0.06473	-0.01647
5	45.0712	1.654	0.00786	-0.00070
6	55.1228	1.741	0.0000015	-0.00000000184
7	61.0928	1.786	0.00189	0.00008193
8	62.445	1.7955	0.00280	0.000148
9	62.9648	1.799	0.00320	0.00018
10	87.3776	1.941	0.03954	0.00786
11	103.9476	2.017	0.07522	0.02063
12	110.6092	2.044	0.09074	0.02733
13	119.7304	2.078	0.11266	0.03781
	821.1558	22.653	0.68111	-0.01035

- Analisis Hujan Rencana Kala Ulang Metode Log Pearson Tipe III

a. Menghitung Standart Deviasi

$$\overline{S\ Log\ X} = \sqrt{\frac{\sum\left(Log\ Ri - \overline{Log\ R}\ \right)^2}{n-1}}$$

$$= \sqrt{\frac{0,68111}{12}}$$

$$= 0.238$$

b. Menghitung Koefisien Asimetris (Cs)

$$Cs = \frac{n \times \sum\left(Log\ Ri - \overline{Log\ R}\ \right)^3}{(n-1)(n-2)*Sx^3}$$

$$Cs = \frac{13 \times (-0.01035)}{(13-1)(13-2)*(0.238)^3}$$

$$= -0.07559$$

Nilai -0.07559 terdapat di dalam rangen 0.000 – (- 0.100) untuk mencari nilai Kf

Tabel. 5 Faktor Frekuensi K untuk Distribusi Log Pearson Type III

Lampiran 2. Lanjutan. Faktor Frekuensi K Untuk Distribusi Log Pearson Tipe III
dengan Koefisien Skewness (Cs) Negatif

Koefisien Cs	Waktu balik dalam tahun (Periode Ulang)							
	2	5	10	25	50	100	200	1000
	Peluang (%)							
	50	20	10	4	2	1	0,5	0,1
0	0	0,842	1,282	1,751	2,054	2,326	2,576	3,090
-0,1	0,017	0,836	1,270	1,716	2,000	2,252	2,482	2,950
-0,2	0,033	0,850	1,258	1,680	1,945	2,178	2,388	2,810
-0,3	0,050	0,853	1,245	1,643	1,89	2,104	2,294	2,675
-0,4	0,066	0,855	1,231	1,606	1,834	2,029	2,201	2,540
-0,5	0,083	0,856	1,216	1,567	1,777	1,955	2,108	2,400
-0,6	0,099	0,857	1,200	1,528	1,72	1,880	2,016	2,275
-0,7	0,116	0,857	1,183	1,488	1,663	1,806	1,926	2,150
-0,8	0,132	0,856	1,166	1,448	1,606	1,733	1,837	2,035
-0,9	0,148	0,854	1,147	1,407	1,549	1,660	1,749	1,910
-1,0	0,164	0,852	1,128	1,366	1,492	1,588	1,664	1,800
-1,2	0,195	0,844	1,086	1,282	1,379	1,449	1,501	1,625
-1,4	0,225	0,832	1,041	1,198	1,270	1,318	1,351	1,465
-1,6	0,254	0,817	0,994	1,116	1,166	1,197	1,261	1,280
-1,8	0,282	0,799	0,945	1,035	1,069	1,087	1,097	1,130
-2,0	0,307	0,777	0,895	0,959	0,980	0,990	0,995	1,000
-2,2	0,330	0,752	0,844	0,888	0,900	0,905	0,907	0,910
-2,5	0,360	0,711	0,771	0,793	0,798	0,799	0,800	0,802
-3,0	0,396	0,636	0,660	0,666	0,666	0,667	0,667	0,668

c. Menentukan Faktor Kekerapatan Kf

Tabel 6 . Menentukan Faktor Kekerapan (Kf)

Koefisien	Interval Ulang, Tahun						
	2	5	10	25	50	100	200
	Persen Peluang Terlampaui						
Asimetris C	50	20	10	4	2	1	0.5
0.000	0.000	0.842	1.282	1.751	2.054	2.326	2.576
-0.100	0.017	0.36	1.27	1.716	2	2.252	2.482
Maka dilakukan Interpolasi Nilai K							
Cs	= -0.075	$1.27 + \dfrac{(-0.075 - (-0.100))}{(0.000 - (-0.100))} \times (1.282 - 1.270)$					
K 2 tahun	1.273						
K 5 Tahun	1.7248	$1.716 + \dfrac{(-0.075 - (-0.100))}{(0.000 - (-0.100))} \times (1.751 - 1.716)$					
K 10 Tahun	2.0135	$2 + \dfrac{(-0.075 - (-0.100))}{(0.000 - (-0.100))} \times (2.054 - 2)$					
K 25 Tahun	2.2705	$2.252 + \dfrac{(-0.075 - (-0.100))}{(0.000 - (-0.100))} \times (2.326 - 2,252)$					
K 50 Tahun	2.5055	$2.482 + \dfrac{(-0.075 - (-0.100))}{(0.000 - (-0.100))} \times (2.576 - 2.482)$					

d. Menentukan Hujan rencana untuk Kala ulang

$$\text{Log R2} = \overline{Log\ R} + (k*Sx)$$
$$= 1.743 + (1.273 * 0.238)$$
$$= 2,046$$
$$R = 10^{\log Rt}$$
$$= 10^{2.046}$$
$$R10 = 111.166 \text{ mm}$$

Tabel. 7 Uji Log Pearson III

Kala Ulang	$\sum$Log R	K	Sx	Log Rt	10^LogRt
2 tahunan	1.743	0.013	0.2383	1.746	55.6688
5 tahunan	1.743	0.479	0.2383	1.857	71.8812
10 tahunan	1.743	1.273	0.2383	2.046	111.1329
25 tahunan	1.743	1.725	0.2383	2.153	142.3812
50 tahunan	1.743	2.013	0.2383	2.222	166.8134

Tabel. 8 Nilai Rekapitulasi Metode Gumber dan Log Pearson Type III

REKAPITULASI						
no.	Metode Perhitungan	Curah Hujan Harian Maksimum (mm)				
		PUH	PUH	PUH	PUH	PUH
		2 Tahun	5 Tahun	10 Tahun	25 Tahun	50 Tahun
1	Gumbel	58.53	95.85	120.71	152.02	175.24
2	Log Pearson	55.67	71.88	111.13	142.38	166.81

➢ **Metode Validasi Chi-Squared dengan Metode Gumbel**

a. Jumlah Data   = 13
b. Jumlah kelas interval dengan rumus Sturges(b)
   G = 1 + 33log n   = 4,676 = 5
c. Interval Peluang   = 1/b   = 0.200
d. Nilai Hujan rata-rata (Rr)   = 63.167 mm
e. Standart Deviasi (Sx)   =32.917
f. Uji Chi-Squared Teoritis (Dari Tabel Chi-Squared)
   • Jumlah sebaran kelas dimana R = 2
   • Derajat kebebasan (Dk) = G - (R+1)
                = 5-3   = 2

- Dengan tingkat kepercayaan 95% = 0.95
- tingkat signifikansi(5%)= 0.05
- Berdasarkan nilai dk dan tingkat signifikan didapatkan nilai Chi-   Kuadrat dari tabel = 5.591

Tabel. 9 Nilai Krtitis untuk distribusi Chi- Squared

Tabel. 10 Uji Chi – Squared Metode Gumbel

No	Pr	K	X	Batas Kelas			Oi	Ei	(Oi-Ei)^2/Ei
1	80	-0.9857	30.7190		x<=	30.7190	3	2.6	0.06154
2	60	-0.4208	49.3153	30.7190	<x<=	49.315	2	2.6	0.1385
3	40	0.1652	68.6049	49.315	<x<=	68.605	4	2.6	0.7538
4	20	0.9958	95.9466	68.605	<x<=	95.947	1	2.6	0.9846
5	0	0	0.0000		x>=	95.947	3	2.6	0.0615
∑							13	13	2

Dimana :

Pr = adalah nilai interval yang diberikan untuk mengetahui nilai dari batas kelas

K   = Nilai ((Yt-Yn)/Sn)

X   = ((Rata-rata hujan) + (Sx × K))

Oi = Jumlah frekuensi yang terjadi

Ei = Nilai frekuensi yang diharapkan

g. Analisa Kecocokan

Nilai Chi-Kuadrat matematis   = 2

Nilai Chi- Kuadart Teoritis   = 5.991

Sehingga dapat disimpulkan dengan tingkat kepercayaan 95% dan kesalahan 5% distribusi normal **dapat DITERIMA** karena nilai chi-kuadran matematis lebih kecil dari chi-kuadran Teoritis (2 < 5.991)

➢ **Uji Validasi Chi-Square Metode Log Pearson Type III**

a. Jumlah Data   = 13
b. Jumlah kelas interval dengan rumus Sturges (b)
     G = 1 + 33log n   = 4,7094 = 5
c. Interval Peluang   = 1/b = 0.200
d. Koefisien Asimetris   = -0.075
e. $\overline{Log\ R}$ = 1.743
f. $\overline{S\ Log\ X}$ = 0.238

Tabel . 11 Uji Chi – Squared Metode Log Pearson Type III

No	Pr	K	Log X	X	Batas Kelas			Oi	Ei	(Oi-Ei)^2/Ei
1	80	0.013	1.746	55.6688		x ≤	55.66	6	2.6	4.446
2	60	0.479	1.857	71.8812	55.668	< x ≤	71.881	3	2.6	0.062
3	40	1.273	2.046	111.1329	71.881	< x ≤	111.133	3	2.6	0.0615
4	20	1.725	2.153	142.3812	111.133	< x ≤	142.381	1	2.6	0.985
5	0	2.013	2.222	166.8134		x >	142.381	0	2.6	2.600
∑								13	13	8.153

g. Uji Chi-Squared Teoritis (Dari Tabel Chi-Squared)
- Jumlah sebaran kelas dimana R = 2
- Derajat kebebasan (Dk) = G - (R+1)
                    = 5-3 = 2
- Dengan tingkat kepercayaan 95% = 0.95
- tingkat signifikansi(5%)= 0.05
- Berdasarkan nilai dk dan tingkat signifikan didapatkan nilai Chi-Kuadrat dari tabel = 5.591
   Nilai Chi Kuadran Matematis = 8.153
   Nilai Chi-Kuadaras Teoritis = 5.5991
   Nilai Ch- Kuadran Matematis > Nilai Chi Kuadran Teoritis
   Sehingga hipotesis menggunakan distribusi Gumbel ***TIDAK DITERIMA***

RESUME ANALISISN DEBIT BANJIR

Tabel. 12 Resume Analisis Debit Banjir

METODE	Hasil Uji Chi-Kuadarat	R2	R5	R10	R25	R50
GUMBEL	DITERIMA	58.5285	95.8503	120.7149	152.0210	175.2422
LOG PEARSON III	DITOLAK	55.6688	71.8812	111.1329	142.3812	166.8134

Karena Metode Log Pearson Type III tidak memuhi syarat Nilai Chi-Kuadran matematis dan teoritis yang disebabskan bebrapa alas an curah hujan yang berubah secara drastits, perbedaan kondisi geografis , ataupun keakuratan dari data yang di dapatkan . Oleh sebab itu data Rt yang digunakan sebagai data perhitungan selanjutnya menggunakan Data dari Metode Gumbel .

Tabel. 13 Rancangan Hujan Harian maksimum adalah	
KALA ULANG (TAHUN)	Rt (mm)
2	58.5285
5	95.8503
10	120.7149
25	152.0210
50	175.2422

2. INTENSITAS HUJAN DENGAN METODE MONONOBE

Dengan melihat perbandingan Curah hujan antara metode gumbel dan metode log pearson type III , maka diperoleh nilai curah hujan (Xtr) yang tertinggi yaitu pada metode gumbel . Sehingga hasil yang di capai pada metode gumbel dapata digunakan untuk menentukan curah hujan harian dengan metode mononobe .

Persamaan Metode mononobe :

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

Dimana :

I   = Intensitas Curah Hujan (mm/jam)

R24 = Curah Hujan Maksimum harian (selama 24 jam) (mm)

t   = Lamanya hujan (jam)

Tabel.14 Hujan Rencana Untuk Kala Ulang Metode gumbele

Kala Ulang (Tahun)	Yt	Kt	Rt (mm)
2	0.3665	-0.1405	58.5285
5	1.4999	0.9929	95.8503
10	2.2502	1.7483	120.7149
25	3.1985	2.6993	152.0210
50	3.9019	3.4048	175.2422

Tabel. 15 Curah hujan Metode Mononobe

Data Curah Hujan Metode
Mononobe

periode ulang	5	10	20	40	60	80	120	240	300	360
	Menit	Menit	Menit	Menit	Menit	Menit	Menit	Menit	Menit	Menit
	0.083333333	0.16666667	0.33333	0.6667	1	1.33333	2	4	5	6
	Jam	Jam	Jam	Jam	Jam	Jam	Jam	Jam	Jam	Jam
2	106.3533426	66.9984075	42.2063	26.588	20.2906	16.74960	12.782	8.0523	6.9393	6.14510
5	174.171554	109.721203	69.1200	43.5422	33.2294	27.43030	20.933	13.187	11.364	10.0636
10	219.3535307	138.18406	87.0505	54.838	41.8495	34.54601633	26.363	16.607	14.312	12.67427
25	276.2404896	174.02060	109.626	69.0601224	52.7027	43.50515	33.20064	20.9151	18.024	15.9612

| 50 | 318.436210
4 | 200.60224
22 | 126.37
1 | 79.60 | 60.753
0 | 50.15056 | 38.27
2 | 24.10
9 | 20.77
7 | 18.399
2 |

Grafik . 1 Intensitas Durasi Metode Mononobe
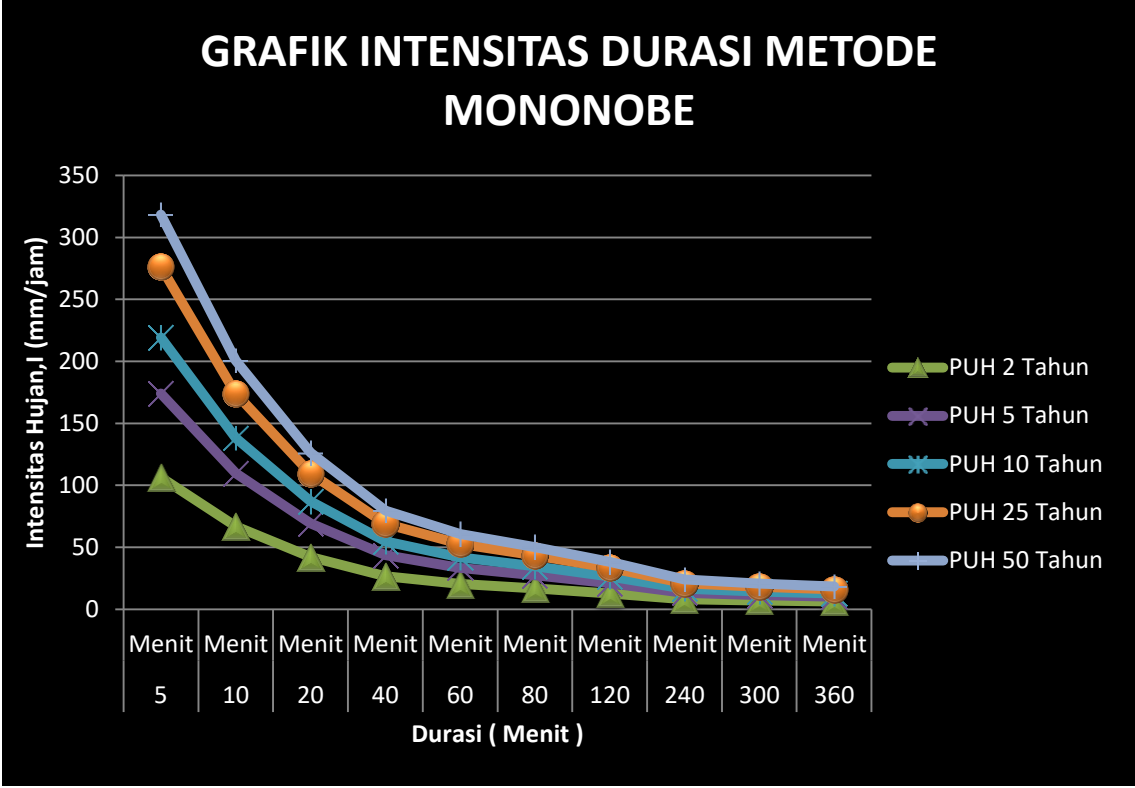
3. ANALISIS DEBIT DENGAN METODE RASIONAL

metode Rasional dikembangkan berdasarkan asumsi bahwa curah hujan yang terjadi mempunyai intensitas seragam dan merata di seluruh daerah pengaliran selama paling sedikit sama dengan waktu konsentrasi (t_c). Merupakan rumus empirik sederhana yang masih banyak digunakan saat ini untuk menghitung debit puncak banjir (Qp). Persamaan matematik Metode Rasional adalah sebagai berikut :

$$Q=0{,}278.C.I.A$$

dimana :

Q	:	Debit (m^3/detik)
0,278	:	Konstanta, digunakan jika satuan luas daerah menggunakan km^2
C	:	Koefisien aliran
I	:	Intensitas curah hujan selama waktu konsentrasi (mm/jam)
A	:	Luas daerah aliran (km^2)

$$t_c = 0.0195\ L^{0.77} S^{-0.385}$$

Keterangan:

t_c : waktu konsentrasi (menit)

L : panjang lereng (m)

S : kemiringan lereng (m/m)

Diketahui :

- C (koefisien Limpasan) = 0.879
- L (panjang Lereng)   = 3279 m
- Kemiringan   = 0.0027
- Luas DAS   = 1,443.91871 km^2

a.) Menentukan Nilai tc

tc = 0.0195 L$^{0.77}$ S$^{-0.385}$

   = $0.0195 \times (3279)^{0.77} (0.0027)^{-0.385}$

   = 97 menit

   = 1.614 jam

b.) Menentukan Intensitas Hujan (I) Tiap kala ulang tahun

$$I\ 2 = \frac{R24}{24} \times (\frac{24}{t})\ ^{2/3}$$

$$= \frac{58.5285}{24} \times (\frac{24}{1.614})\ ^{2/3}$$

$$= 14.7461\ \text{mm/jam}$$

c.) Menentukan Debit Surface Runoff (Q) Tiap kala ulang tahun

Q2 = .C.I.A (0.001) (10000/3600)

   = (0.879) (14.7461) (1,443.91871) (10000/3600)(0.001)

   = 51. 99 m^3/s

Tabel. 16 Debit Surface Runoof metode Rasional

Kala Ulang (Tahun)	Yt	Kt	Rt (mm)	TC	Intensitas hujan,I (mm/jam)	Debit Surface Runoff (m3/s)
2	0.3665	-0.1405	58.5285	1.6141	14.7461	51.99
5	1.4999	0.9929	95.8503	1.6141	24.1492	85.14
10	2.2502	1.7483	120.7149	1.6141	30.4138	107.23
25	3.1985	2.6993	152.0210	1.6141	38.3013	135.03
50	3.9019	3.4048	175.2422	1.6141	44.1518	155.66

d.) Membuat Grafik Debit Maksimal metode Rasional

Tabel. 17 Debit Maksimal Surface Runoof metode Rasional

Kala Ulang (Tahun)	Debit Surface Runoff (m3/s)
2	51.99
5	85.14
10	107.23
25	135.03
50	155.66

Grafik 3   Debit Maksimal Surface Runoof metode Rasional
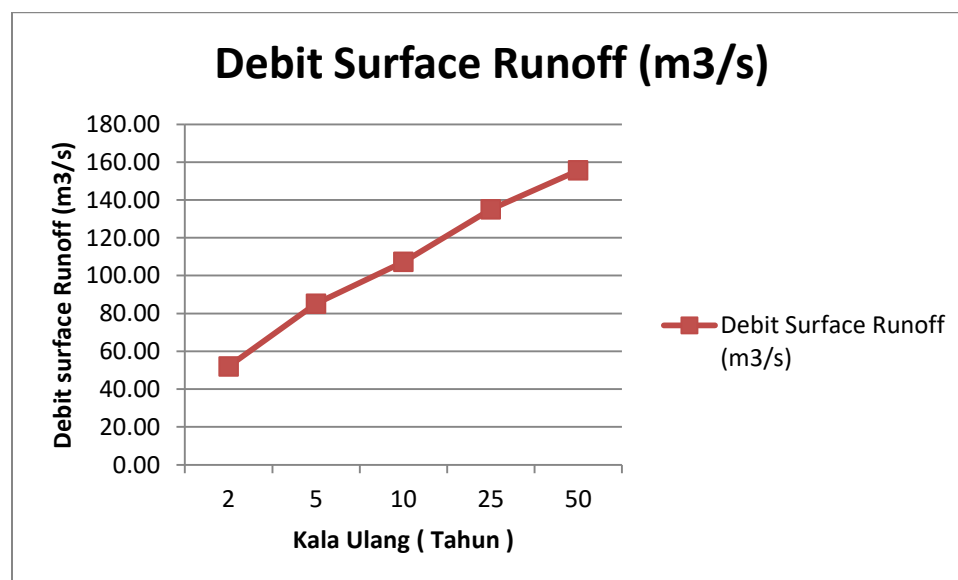
e.) Membuat Grafik Hidrograf Surface Runoff Metode Rasional
Nilai tc untuk tiap tahunnya dikalikan dengan 2 ; 3 dan seterusnya dengan tujuan mendapatakan nilai kurva hidrograf :

Tabel. 18 Nilai waktu konsetrasi (tc) dengan kala ulang tahun

Waktu (jam)	Kala Ulang Tahun				
	2	5	10	25	50
tc					
1.614	0	0	0	0	0
3.228	1	2	3	4	5
4.842	51.99	53.63	51.55	53.59	53.24
6.456	1	2	3	4	5
8.070	0	0	0	0	0
9.685	0	0	0	0	0

Grafik32 Hidrograf Surface Runoff Metode Rasional

	Tc						
10 Tahun		0	3	51.55	3	0	0
25 Tahun		0	4	53.59	4	0	0
5 Tahun		0	2	53.63	2	0	0
2 Tahun		0	1	51.99	1	0	0
50 Tahun		0	5	53.24	5	0	0
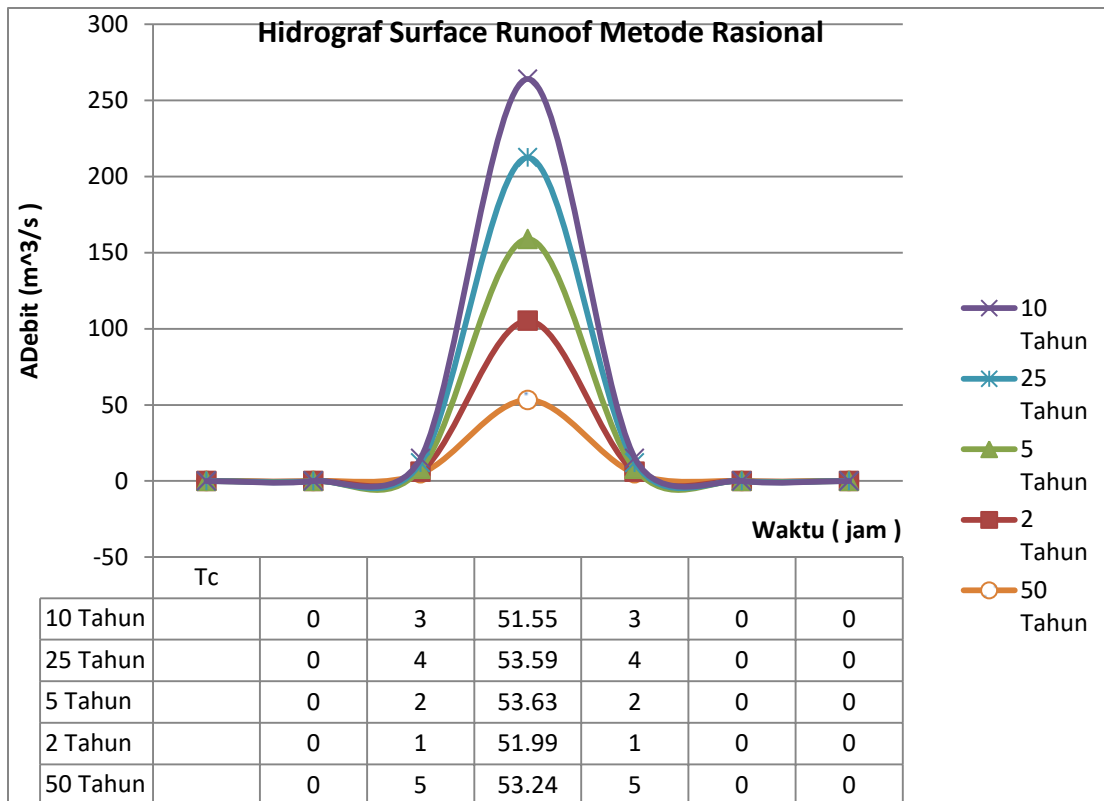
4. ANALISIS DEBIT DENGAN METODE NAKAYASU

Luas DAS diasumsikan menjadi besar, yaitu 12075 km2. Hal ini tidak akan memengaruhi hasil analisis hujan metode Thiessen karena Rata-rata terbobot (weighted average), masing-masing stasiun hujan ditentukan luas daerah pengaruhnya berdasarkan poligon yang dibentuk (menggambarkan garis-garis sumbu pada garis-garis penghubung antara dua stasion hujan yang berdekatan). Cara ini diperoleh dengan membuat poligon yang memotong tegak lurus pada tengah-tengah garis penghubung dua stasiun hujan. Dengan demikian tiap stasiun penakar Rn akan terletak pada suatu poligon tertentu An. Dengan menghitung perbandingan luas untuk setiap stasiun yang besarnya = An/A, dimana A adalah luas daerah penampungan yang dikalikan 100% sehingga nilainya akan tetap sama karena menggunakan data persenan dimana persenan luas dipengaruhi oleh letak stasiun yang sifatnya permanen sehingga berapapun luasan daerah cakupan tidak akan mempengaruhi hasil analisis hujan metode Theiessen.

a. Uji dengan nilai $\alpha = 1.5$

Parameter Das dengan $\alpha = 1.5$

Panjang Sungai Deras Airmata			=	329	km
Luas DAS			=	12075	km2
α			=	1,5	
Ro			=	1	mm
Parameter Tg					
Tg = 0.4 + (0.058*L)			=	19.482	Jam
Parameter Tr					
Tr = 0.75* tg			=	14.6115	Jam
Parameter Tp					

			=	31.1712	
Tp = tg + (0.8*tr)					
Parameter T 0.3					
T0.3 = a* Tg				29.223	Jam
Tp + T_{03}			=	60.3942	Jam
Tp + $T_{0.3}$ + 1.5 $T_{0.3}$ = Tp + 2.5$T_{0.3}$			=	104.2287	Jam
Parameter Qp (Debit Puncak)					
Qp = $\dfrac{A * Ro}{3.6(0.3Tp + T0.3)}$			=	86.953	m^3/dt

- Ordinat Hidrograf dengan α = 1.5

Mencari Ordinat Hidrograf							
1	0 < t < Tp	0	<	t	<	31.1712	
	Qt = Qmax (t/Tp)^2.4						
2	Tp < t < (Tp + T_{03})	31.1712	<	t	<	60.3942	
	Qt = Qmax(0.3)^(t-Tp/($T_{0.3}$))						
3	(Tp + $T_{0.3}$) < t < (Tp + 2.5$T_{0.3}$)	60.3942	<	t	<	104.2287	
	Qt = Qmax(0.3)^((t-Tp)+0.5 T0.3)/1.5 $T_{0.3}$)						
4	t > (Tp + 2.5 T0.3)	t	>	104.2287			
	Qt = Qmax (0.3)^((t-Tp)+1.5 $T_{0.3}$)/(2 $T_{0.3}$)						

b. Uji dengan nilai α = 2

Parameter Das untuk α = 2

Panjang Sungai Deras Airmata			=	329	km
Luas DAS			=	12075	km2
α			=	2	
Ro			=	1	mm
Parameter Tg					
Tg = 0.4 + (0.058*L)			=	19.482	Jam
Parameter Tr					
Tr = 0.75* tg			=	14.6115	Jam
Parameter Tp					
Tp = tg + (0.8*tr)			=	31.1712	
Parameter T 0.3					
T0.3 = a* Tg				38.964	Jam
Tp + T_{03}			=	70.1352	Jam
Tp + $T_{0.3}$ + 1.5 $T_{0.3}$ = Tp + 2.5$T_{0.3}$			=	128.5812	Jam
Parameter Qp (Debit Puncak)					
$Qp = \dfrac{A * Ro}{3.6(0.3Tp + T0.3)}$			=	69.422	m^3/dt

- Ordinat Hidrograf dengan α = 2

Mencari Ordinat Hidrograf						
1	0 < t < Tp	0	<	t	<	31.1712
	Qt = Qmax (t/Tp)^2.4					
2	Tp < t < (Tp + T_{03})	31.1712	<	t	<	70.1352
	Qt = Qmax(0.3)^(t-Tp/($T_{0.3}$))					
3	($Tp + T_{0.3}$) < t < (Tp + 2.5$T_{0.3}$)	70.1352	<	t	<	128.5812
	Qt = Qmax(0.3)^((t-Tp)+0.5 T0.3)/1.5 $T_{0.3}$)					
4	t > (Tp + 2.5 T0.3)	t	>	128.5812		
	Qt = Qmax (0.3)^((t-Tp)+1.5 $T_{0.3}$)/(2 $T_{0.3}$)					

c. Uji dengan nilai α= 3

Parameter Das υντυκ α= 3

Panjang Sungai Deras Airmata			=	329	km
Luas DAS			=	12075	km2
α			=	3	
Ro			=	1	mm
Parameter Tg					
Tg = 0.4 + (0.058*L)			=	19.482	Jam
Parameter Tr					
Tr = 0.75* tg			=	14.6115	Jam
Parameter Tp					
Tp = tg + (0.8*tr)			=	31.1712	
Parameter T 0.3					
T0.3 = a* Tg				58.446	Jam
Tp + T_{03}			=	89.6172	Jam
Tp + $T_{0.3}$ + 1.5 $T_{0.3}$ = Tp + 2.5$T_{0.3}$			=	177.2862	Jam
Parameter Qp (Debit Puncak)					
Qp = $\dfrac{A * Ro}{3.6(0.3Tp + T0.3)}$			=	49.473	m³/dt

- Ordinat Hidrograf dengan α= 3

Mencari Ordinat Hidrograf						
1	0 < t < Tp	0	<	t	<	31.1712
	Qt = Qmax (t/Tp)^2.4					
2	Tp < t < (Tp + T_{03})	31.1712	<	t	<	89.6172
	Qt = Qmax(0.3)^(t-Tp/($T_{0.3}$))					
3	(Tp + $T_{0.3}$) < t < (Tp + 2.5$T_{0.3}$)	89.6172	<	t	<	177.2862
	Qt = Qmax(0.3)^((t-Tp)+0.5 T0.3)/1.5 $T_{0.3}$)					
4	t > (Tp + 2.5 T0.3)	t	>	177.2862		
	Qt = Qmax (0.3)^((t-Tp)+1.5 $T_{0.3}$)/(2 $T_{0.3}$)					

d. Pemilihan Koefisien alfa, berdasarkan volume hidrograf satuan

Tabel. 19 Koefisien alfa berdasarkan Volume Hidrograf Satuan

NO	t (jam)			a= 1,5		a= 2		a= 3	
	a= 1,5	a= 2	a=3	Ordinat m3/set	Volume m3	Ordinat m3/set	Volume m3	Ordinat m3/set	Volume m3
1	0.00	0.00	0.00	0	0	0	0	0	0
2	1.00	1.00	1.00	0.022608797	40.6958346	0.018050572	32.4910296	0.012863626	23.1545268
3	2.00	2.00	2.00	0.119329947	255.4897392	0.09527149	203.9797116	0.067894625	145.3648518
4	3.00	3.00	3.00	0.315768256	783.1767654	0.252105301	625.2782238	0.179661249	445.6005732
5	4.00	4.00	4.00	0.629827235	1702.071884	0.502845938	1358.91223	0.358349979	968.4202104
6	5.00	5.00	5.00	1.075983144	3070.458682	0.859051058	2451.414593	0.612197306	1746.985113
7	6.00	6.00	6.00	1.666634848	4936.712386	1.330619758	3941.407469	0.948257758	2808.819115
8	7.00	7.00	7.00	2.412752384	7342.897018	1.926310371	5862.474232	1.372772908	4177.855199
9	8.00	8.00	8.00	3.324248077	10326.60083	2.654036771	8244.624856	1.891382526	5875.479781
10	9.00	9.00	9.00	4.410212136	13922.02838	3.521056464	11115.16782	2.509258629	7921.154079
11	10.00	10.00	10.00	5.67907308	18160.71339	4.534098669	14499.27924	3.231196753	10332.81969
12	11.00	11.00	11.00	7.138712664	23072.01434	5.699456078	18420.39854	4.061681343	13127.18057
13	12.00	12.00	12.00	8.796551465	28683.47543	7.023053186	22900.51668	5.004934454	16319.90843
14	13.00	13.00	13.00	10.6596146	35021.09892	8.510498752	27960.39349	6.064953134	19925.79766
15	14.00	14.00	14.00	12.73458343	42109.55645	10.16712709	33619.72652	7.245538848	23958.88557
16	15.00	15.00	15.00	15.02783711	49972.35697	11.99803124	39897.28499	8.550321117	28432.54794
17	16.00	16.00	16.00	17.54548654	58631.98257	14.00809006	46811.01834	9.982776824	33359.57629
18	17.00	17.00	17.00	20.29340247	68110.00022	16.20199068	54378.14533	11.54624623	38752.2415
19	18.00	18.00	18.00	23.27723921	78427.15502	18.58424743	62615.2286	13.24394645	44622.34682
20	19.00	19.00	19.00	26.50245463	89603.44891	21.15921781	71538.23743	15.07898281	50981.27267
21	20.00	20.00	20.00	29.97432742	101658.2077	23.93111625	81162.60131	17.05435871	57840.01474
22	21.00	21.00	21.00	33.69797197	114610.1389	26.90402601	91503.25607	19.17298405	65209.21697
23	22.00	22.00	22.00	37.67835133	128477.3819	30.08190953	102574.684	21.43768265	73099.20006
24	23.00	23.00	23.00	41.92028859	143277.5519	33.46861751	114390.9487	23.85119868	81519.98639
25	24.00	24.00	24.00	46.42847698	159027.778	37.06789694	126965.726	26.41620242	90481.32198
26	25.00	25.00	25.00	51.20748874	175744.7383	40.88339827	140312.3314	29.13529532	99992.69593
27	26.00	26.00	26.00	56.26178315	193444.6894	44.91868171	154443.744	32.01101455	110063.3578
28	27.00	27.00	27.00	61.59571365	212143.4942	49.177223	169372.6285	35.04583708	120702.3329
29	28.00	28.00	28.00	67.2135343	231856.6463	53.66241852	185111.3547	38.24218331	131918.4367
30	29.00	29.00	29.00	73.11940561	252599.2918	58.37758996	201672.0153	41.60242043	143720.2867
31	30.00	30.00	30.00	79.31739982	274386.2498	63.32598856	219066.4413	45.12886541	156116.3145
32	31.00	31.00	31.00	85.81150573	297232.03	68.51079893	237306.2175	48.82378774	169114.7757
33	32.00	32.00	32.00	84.03426948	305722.3954	67.66706014	245120.1463	48.63591777	175427.4699
34	33.00	33.00	33.00	80.64245049	296418.0959	65.60814731	239895.3734	47.644279	173304.3542
35	34.00	34.00	34.00	77.38753323	284453.9707	63.61188123	232596.0514	46.67285877	169770.848
36	35.00	35.00	35.00	74.26399201	272972.7454	61.67635576	225518.8266	45.72124485	166309.3865
37	36.00	36.00	36.00	71.2665242	261954.9292	59.79972272	218656.9413	44.7890334	162918.5009
38	37.00	37.00	37.00	68.39004117	251381.8177	57.9801902	212003.8433	43.87582884	159596.752
39	38.00	38.00	38.00	65.62965971	241235.4616	56.21602078	205553.1798	42.98124362	156342.7304
40	39.00	39.00	39.00	62.98069367	231498.6361	54.50552994	199298.7913	42.10489812	153155.0551
41	40.00	40.00	40.00	60.43864608	222154.8116	52.84708439	193234.7058	41.24642045	150032.3734
42	41.00	41.00	41.00	57.99920145	213188.1256	51.23910053	187355.1329	40.40544629	146973.3601
43	42.00	42.00	42.00	55.65821849	204583.3559	49.68004297	181654.4583	39.58161878	143976.7171
44	43.00	43.00	43.00	53.41172307	196325.8948	48.16842302	176127.2388	38.7745883	141041.1727
45	44.00	44.00	44.00	51.25590143	188401.7241	46.70279729	170768.1966	37.98401239	138165.4812
46	45.00	45.00	45.00	49.18709378	180797.3914	45.28176631	165572.2145	37.20955554	135348.4223
47	46.00	46.00	46.00	47.20178803	173499.9873	43.90397319	160534.3311	36.45088911	132588.8004
48	47.00	47.00	47.00	45.29661385	166497.1234	42.56810233	155649.7359	35.70769115	129885.4445

49	48.00	48.00	48.00	43.46833693	159776.9114	41.27287815	150913.7649	34.97964627	127237.2074
50	49.00	49.00	49.00	41.71385354	153327.9428	40.0170639	146321.8957	34.26644551	124642.9652
51	50.00	50.00	50.00	40.03018518	147139.2697	38.79946044	141869.7438	33.56778621	122101.6171
52	51.00	51.00	51.00	38.4144736	141200.3858	37.61890513	137553.058	32.8833719	119612.0846
53	52.00	52.00	52.00	36.86397591	135501.2091	36.4742707	133367.7165	32.21291212	117173.3112
54	53.00	53.00	53.00	35.37605992	130032.0645	35.36446419	129309.7228	31.55612236	114784.2621
55	54.00	54.00	54.00	33.94819969	124783.6673	34.28842588	125375.2021	30.91272391	112443.9233
56	55.00	55.00	55.00	32.57797122	119747.1076	33.2451283	121560.3975	30.28244371	110151.3017
57	56.00	56.00	56.00	31.26304837	114913.8353	32.23357524	117861.6664	29.66501432	107905.4245
58	57.00	57.00	57.00	30.00119887	110275.645	31.25280082	114275.4769	29.0601737	105705.3384
59	58.00	58.00	58.00	28.79028056	105824.663	30.30186853	110798.4048	28.4676652	103550.11
60	59.00	59.00	59.00	27.62823773	101553.3329	29.37987035	107427.13	27.88723736	101438.8246
61	60.00	60.00	60.00	26.51309766	97454.4037	28.48592591	104158.4333	27.31864388	99370.58623
62	61.00	61.00	61.00	25.65552427	93903.51947	27.61918161	100989.1935	26.76164346	97344.51721
63	62.00	62.00	62.00	24.96045045	91108.7545	26.77880984	97916.38461	26.21599973	95359.75774
64	63.00	63.00	63.00	24.28420797	88640.38516	25.96400814	94937.07236	25.68148115	93415.46558
65	64.00	64.00	64.00	23.62628662	86238.89026	25.17399851	92048.41197	25.15786088	91510.81565
66	65.00	65.00	65.00	22.98619005	83902.45801	24.40802658	89247.64516	24.64491671	89644.99966
67	66.00	66.00	66.00	22.36343533	81629.32568	23.66536096	86532.09757	24.14243098	87817.22584
68	67.00	67.00	67.00	21.75755263	79417.77833	22.9452925	83899.17623	23.65019043	86026.71854
69	68.00	68.00	68.00	21.16808485	77266.14746	22.24713365	81346.36707	23.16798619	84272.71792
70	69.00	69.00	69.00	20.59458725	75172.80978	21.57021774	78871.2325	22.69561362	82554.47966
71	70.00	70.00	70.00	20.03662717	73136.18596	20.91389844	76471.40912	22.23287227	80871.2746
72	71.00	71.00	71.00	19.49378366	71154.73949	20.45897466	74471.17158	21.77956576	79222.38845
73	72.00	72.00	72.00	18.96564717	69226.97549	20.04183619	72901.45953	21.33550172	77607.12146
74	73.00	73.00	73.00	18.45181925	67351.43956	19.63320276	71415.07011	20.90049172	76024.78819
75	74.00	74.00	74.00	17.95191224	65526.71668	19.23290097	69958.98671	20.47435114	74474.71715
76	75.00	75.00	75.00	17.46554899	63751.43021	18.84076094	68532.59144	20.05689916	72956.25054
77	76.00	76.00	76.00	16.99236257	62024.24081	18.45661626	67135.27896	19.64795861	71468.74399
78	77.00	77.00	77.00	16.53199598	60343.84539	18.08030391	65766.45631	19.24735596	70011.56623
79	78.00	78.00	78.00	16.0841019	58708.97618	17.71166421	64425.54262	18.8549212	68584.09889
80	79.00	79.00	79.00	15.64834241	57118.39976	17.3505407	63111.96884	18.47048781	67185.73622
81	80.00	80.00	80.00	15.22438876	55570.91611	16.99678016	61825.17755	18.09389264	65815.88481
82	81.00	81.00	81.00	14.81192111	54065.35777	16.65023244	60564.62268	17.72497587	64473.96332
83	82.00	82.00	82.00	14.41062826	52600.58887	16.31075049	59329.76927	17.36358096	63159.40229
84	83.00	83.00	83.00	14.02020746	51175.5043	15.97819025	58120.09333	17.00955453	61871.64388
85	84.00	84.00	84.00	13.64036415	49789.0289	15.65241058	56935.08149	16.66274636	60610.1416
86	85.00	85.00	85.00	13.27081178	48440.11667	15.33327325	55774.23089	16.32300926	59374.36012
87	86.00	86.00	86.00	12.91127152	47127.74994	15.02064281	54637.04891	15.99019908	58163.77501
88	87.00	87.00	87.00	12.56147213	45850.93857	14.7143866	53523.05294	15.66417456	56977.87255
89	88.00	88.00	88.00	12.2211497	44608.71929	14.41437466	52431.77027	15.34479737	55816.14947
90	89.00	89.00	89.00	11.89004748	43400.15492	14.12047966	51362.73778	15.03193197	54678.11281
91	90.00	90.00	90.00	11.56791566	42224.33365	13.8325769	50315.50181	14.76420274	53633.04248
92	91.00	91.00	91.00	11.25451122	41080.36838	13.55054419	49289.61796	14.56282943	52788.65791
93	92.00	92.00	92.00	10.94959771	39967.39607	13.27426185	48284.65087	14.3642027	52068.65783
94	93.00	93.00	93.00	10.65294508	38884.57702	13.00361264	47300.17408	14.16828511	51358.47806
95	94.00	94.00	94.00	10.36432953	37831.0943	12.7384817	46335.76981	13.97503969	50657.98464
96	95.00	95.00	95.00	10.08353332	36806.15313	12.47875653	45391.02881	13.78443	49967.04544
97	96.00	96.00	96.00	9.810344595	35808.98025	12.22432689	44465.55016	13.5964201	49285.53018
98	97.00	97.00	97.00	9.544557252	34838.82332	11.97508483	43558.9411	13.41097451	48613.3103
99	98.00	98.00	98.00	9.285970768	33894.95044	11.73092457	42670.81692	13.22805828	47950.25902
100	99.00	99.00	99.00	9.034390054	32976.64948	11.49174249	41800.80071	13.04763689	47296.25131
101	100.00	100.00	100.00	8.789625305	32083.22765	11.25743711	40948.52328	12.86967632	46651.16378
102	101.00	101.00	101.00	8.55149186	31214.0109	11.02790898	40113.62296	12.69414301	46014.87479
103	102.00	102.00	102.00	8.319810059	30368.34345	10.80306071	39295.74544	12.52100385	45387.26435

104	103.00	103.00	103.00	8.094405111	29545.58731	10.58279687	38494.54364	12.35022619	44768.21407
105	104.00	104.00	104.00	7.87510696	28745.12173	10.367024	37709.67757	12.18177781	44157.6072
106	105.00	105.00	105.00	7.702435924	28039.57719	10.15565052	36940.81414	12.01562695	43555.32857
107	106.00	106.00	106.00	7.545390792	27446.08809	9.948586745	36187.62708	11.85174227	42961.2646
108	107.00	107.00	107.00	7.391547657	26886.48921	9.745744796	35449.79677	11.69009287	42375.30325
109	108.00	108.00	108.00	7.240841233	26338.3	9.547038596	34727.01011	11.53064824	41797.334
110	109.00	109.00	109.00	7.093207565	25801.28784	9.352383821	34018.96035	11.37337833	41227.24783
111	110.00	110.00	110.00	6.948584004	25275.22482	9.161697866	33325.34704	11.21825347	40664.93724
112	111.00	111.00	111.00	6.806909175	24759.88772	8.974899811	32645.87582	11.0652444	40110.29617
113	112.00	112.00	112.00	6.668122958	24255.05784	8.791910386	31980.25835	10.91432227	39563.22001
114	113.00	113.00	113.00	6.532166455	23760.52094	8.612651936	31328.21218	10.76545861	39023.60558
115	114.00	114.00	114.00	6.398981973	23276.06717	8.43704839	30689.46059	10.61862535	38491.35113
116	115.00	115.00	115.00	6.268512992	22801.49094	8.265025229	30063.73251	10.47379479	37966.35625
117	116.00	116.00	116.00	6.140704146	22336.59085	8.096509452	29450.76243	10.33093961	37448.52192
118	117.00	117.00	117.00	6.015501197	21881.16962	7.931429547	28850.2902	10.19003288	36937.75048
119	118.00	118.00	118.00	5.892851013	21435.03398	7.769715459	28262.06101	10.05104802	36433.94562
120	119.00	119.00	119.00	5.772701547	20997.99461	7.611298563	27685.82524	9.913958809	35937.01229
121	120.00	120.00	120.00	5.655001811	20569.86604	7.456111633	27121.33835	9.778739402	35446.85678
122	121.00	121.00	121.00	5.539701858	20150.4666	7.304088813	26568.3608	9.645364292	34963.38665
123	122.00	122.00	122.00	5.426752757	19739.61831	7.155165589	26026.65792	9.513808324	34486.51071
124	123.00	123.00	123.00	5.316106579	19337.1468	7.009278764	25495.99984	9.384046687	34016.13902
125	124.00	124.00	124.00	5.207716367	18942.8813	6.866366428	24976.16135	9.256054907	33552.18287
126	125.00	125.00	125.00	5.101536126	18556.65449	6.726367936	24466.92186	9.129808845	33094.55475
127	126.00	126.00	126.00	4.997520797	18178.30246	6.589223875	23968.06526	9.00528469	32643.16836
128	127.00	127.00	127.00	4.895626238	17807.66466	6.454876048	23479.37986	8.882458957	32197.93856
129	128.00	128.00	128.00	4.795809209	17444.5838	6.323267441	23000.65828	8.76130848	31758.78139
130	129.00	129.00	129.00	4.698027352	17088.90581	6.20771654	22555.77117	8.641810411	31325.614
131	130.00	130.00	130.00	4.602239171	16740.47974	6.112545578	22176.47181	8.52394221	30898.35472
132	131.00	131.00	131.00	4.508404018	16399.15774	6.018833689	21836.48268	8.407681649	30476.92295
133	132.00	132.00	132.00	4.416482071	16064.79496	5.926558503	21501.70595	8.2930068	30061.23921
134	133.00	133.00	133.00	4.326434323	15737.24951	5.835697996	21172.0617	8.179896035	29651.2251
135	134.00	134.00	134.00	4.238222561	15416.38239	5.746230478	20847.47125	8.068328021	29246.8033
136	135.00	135.00	135.00	4.15180935	15102.05744	5.658134592	20527.85713	7.958281716	28847.89753
137	136.00	136.00	136.00	4.06715802	14794.14127	5.571389312	20213.14303	7.849736365	28454.43255
138	137.00	137.00	137.00	3.984232647	14492.5032	5.485973929	19903.25383	7.742671496	28066.33415
139	138.00	138.00	138.00	3.902998042	14197.01524	5.401868057	19598.11557	7.637066917	27683.52914
140	139.00	139.00	139.00	3.823419731	13907.55199	5.319051617	19297.65541	7.532902709	27305.94533
141	140.00	140.00	140.00	3.745463944	13623.99062	5.237504843	19001.80163	7.430159228	26933.51149
142	141.00	141.00	141.00	3.669097599	13346.21078	5.157208268	18710.4836	7.328817095	26566.15738
143	142.00	142.00	142.00	3.594288289	13074.0946	5.078142726	18423.63179	7.228857198	26203.81373
144	143.00	143.00	143.00	3.521004268	12807.5266	5.000289344	18141.17773	7.130260683	25846.41219
145	144.00	144.00	144.00	3.449214436	12546.39367	4.923629537	17863.05399	7.033008955	25493.88535
146	145.00	145.00	145.00	3.378888329	12290.58498	4.848145008	17589.19418	6.937083672	25146.16673
147	146.00	146.00	146.00	3.309996102	12039.99198	4.773817738	17319.53294	6.842466743	24803.19075
148	147.00	147.00	147.00	3.24250852	11794.50832	4.700629984	17054.0059	6.749140321	24464.89272
149	148.00	148.00	148.00	3.176396945	11554.02984	4.628564278	16792.54967	6.657086806	24131.20883
150	149.00	149.00	149.00	3.111633319	11318.45448	4.557603416	16535.10185	6.566288836	23802.07616
151	150.00	150.00	150.00	3.04819016	11087.68226	4.48773046	16281.60098	6.476729287	23477.43262
152	151.00	151.00	151.00	2.986040546	10861.61527	4.418928732	16031.98655	6.388391266	23157.217
153	152.00	152.00	152.00	2.925158101	10640.15756	4.351181808	15786.19897	6.301258114	22841.36888
154	153.00	153.00	153.00	2.865516989	10423.21516	4.284473518	15544.17959	6.215313397	22529.82872
155	154.00	154.00	154.00	2.807091902	10210.696	4.218787937	15305.87062	6.130540905	22222.53774
156	155.00	155.00	155.00	2.749858045	10002.5099	4.154109386	15071.21518	6.04692465	21919.438
157	156.00	156.00	156.00	2.69379113	9798.568515	4.090422427	14840.15726	5.964448861	21620.47232
158	157.00	157.00	157.00	2.638867364	9598.785289	4.027711858	14612.64171	5.883097985	21325.58432

159	158.00	158.00	158.00	2.585063441	9403.075449	3.965962709	14388.61422	5.802856676	21034.71839
160	159.00	159.00	159.00	2.532356527	9211.355942	3.905160241	14168.02131	5.723709803	20747.81966
161	160.00	160.00	160.00	2.480724255	9023.545408	3.84528994	13950.81033	5.645642437	20464.83403
162	161.00	161.00	161.00	2.430144715	8839.564146	3.786337515	13736.92942	5.568639856	20185.70813
163	162.00	162.00	162.00	2.380596442	8659.334083	3.728288894	13526.32754	5.492687535	19910.3893
164	163.00	163.00	163.00	2.33205841	8482.778734	3.671130221	13318.95441	5.41777115	19638.82563
165	164.00	164.00	164.00	2.284510021	8309.823176	3.614847851	13114.76053	5.343876572	19370.9659
166	165.00	165.00	165.00	2.237931097	8140.394012	3.559428351	12913.69716	5.270989863	19106.75958
167	166.00	166.00	166.00	2.192301872	7974.419344	3.504858491	12715.71632	5.199097278	18846.15685
168	167.00	167.00	167.00	2.147602982	7811.828737	3.451125246	12520.77073	5.128185258	18589.10856
169	168.00	168.00	168.00	2.103815458	7652.553192	3.398215789	12328.81386	5.058240427	18335.56623
170	169.00	169.00	169.00	2.06092072	7496.52512	3.346117491	12139.7999	4.989249594	18085.48204
171	170.00	170.00	170.00	2.018900563	7343.678309	3.294817916	11953.68373	4.921199748	17838.80882
172	171.00	171.00	171.00	1.977737156	7193.947894	3.244304819	11770.42092	4.854078053	17595.50004
173	172.00	172.00	172.00	1.93741303	7047.270335	3.194566141	11589.96773	4.787871851	17355.50983
174	173.00	173.00	173.00	1.897911075	6903.583389	3.145590011	11412.28107	4.722568655	17118.79291
175	174.00	174.00	174.00	1.859214525	6762.82608	3.097364737	11237.31855	4.658156149	16885.30465
176	175.00	175.00	175.00	1.82130696	6624.938673	3.049878809	11065.03838	4.594622184	16655.001
177	176.00	176.00	176.00	1.784172293	6489.862655	3.003120891	10895.39946	4.531954777	16427.83853
178	177.00	177.00	177.00	1.747794766	6357.540706	2.957079822	10728.36128	4.47014211	16203.7744
179	178.00	178.00	178.00	1.712158941	6227.916673	2.911744612	10563.88398	4.41999126	16002.24007
180	179.00	179.00	179.00	1.677249695	6100.935545	2.86710444	10401.92829	4.374699559	15830.44347
181	180.00	180.00	180.00	1.643052215	5976.543438	2.823148649	10242.45556	4.329871963	15668.22874
182	181.00	181.00	181.00	1.609551988	5854.687565	2.779866748	10085.42771	4.285503715	15507.67622
183	182.00	182.00	182.00	1.576734798	5735.316215	2.737248405	9930.807275	4.24159011	15348.76889
184	183.00	183.00	183.00	1.544586718	5618.378729	2.695283447	9778.557334	4.198126488	15191.48988
185	184.00	184.00	184.00	1.513094107	5503.825485	2.653961857	9628.641547	4.155108238	15035.82251
186	185.00	185.00	185.00	1.482243598	5391.607869	2.613273771	9481.02413	4.112530797	14881.75026
Total Volume (m³)				11690884.02		11347978.14		10527569.98	
Luas Das (m²)				12075000000		12075000000		12075000000	
Hujan Satuan (mm)				0.968189153		0.93979115		0.871848445	
Hujan Satuan Ideal (mm)				1.00		1.00		1.00	
Selisih (%)				3.1811		6.021		12.815	

Hujan satuan ideal = 1 mm (ketetapan)
Kesimpulan :

$$\alpha \quad \text{yang dipakai} \quad = 1.5$$

Karena volume hujan satuan mendekati 1 mm dengan selisih volume hujan 3,1811 %

> Menghitung Nisbah Metode Nakayasu :
> Diketahui :

- HSS Nakayasu Distribusi 6 jam
  HSS Nakayasu merupakan suatu cara untuk mendapatkan hidrograf banjir rencana dalam suatu DAS dengan mempertimbangkan karakteristik atau parameter daerah aliran sungai tersebut .

  $$Rt = \frac{R24}{6} \times \left(\frac{6}{t} \right)^{\frac{2}{3}}$$

- Curah Hujan Jam ke T

  $$Rt = t * Rt - (t-0.5)* R(-1)$$

Tabel. 20 Nilai waktu konsetrasi (tc) dengan kala ulang tahun

Jam ke- (t)	Distribusi Hujan (Rt)		Curah Hujan	Rasio	Kumulaatif
	0.5 jam-an		jam ke-	(%)	(%)
0.5	0.87358	R_{24}	0.4368	43.67902	43.679
1	0.55032	R_{24}	0.1100	11.35	55.030
1.5	0.41997	R_{24}	0.0800	7.96	63.000
2	0.34668	R_{24}	0.0600	6.34	69.340
2.5	0.29876	R_{24}	0.0500	5.35	74.690
3	0.26457	R_{24}	0.0500	4.68	79.370
3.5	0.23873	R_{24}	0.0400	4.18	83.550
4	0.21840	R_{24}	0.0400	3.8	87.360
4.5	0.20190	R_{24}	0.03	3.5	90.86
5	0.18821	R_{24}	0.03	3.25	94.1
5.5	0.17662	R_{24}	0.03	3.04	97.14
6	0.16667	R_{24}	0.03	2.86	100
			0.987	99.98902	
	Jumlah		1.000	100	

- Menentukan Nilai Koefisian Pengaliran (C)

   Analisis debit banjir dengan menggunakan metode Nakayasu dengan jenis das yang digunakan adalah berpermukaan beton *(concreate)* Sehingga sesuai dengan table "Return Period (years) nilai C yang digunakan :

Tabel. 21 Nilai waktu konsetrasi (tc) dengan kala ulang tahun

Kala Ulang (Tr)	(tahun)	2	5	10	25	50
Koef. Pengaliran (C)		0.75	0.8	0.83	0.88	0.92

Tabel. 22 Nilai waktu konsetrasi (tc) dengan kala ulang tahun

Kala Ulang (Tr)	(tahun)	2	5	10	25	50
R rancangan	(mm)	58.5285	95.8503	120.7149	152.0210	175.2422
Koef. Pengaliran (C)		0.75	0.8	0.83	0.88	0.92
Rn		43.896	76.680	100.193	133.778	161.223
Jam ke		Nisbah (%)				
1	0.550	24.157	42.199	55.139	73.621	88.724
2	0.347	15.218	26.584	34.735	46.378	55.893
3	0.265	11.614	20.287	26.508	35.393	42.654
4	0.218	9.587	16.747	21.882	29.217	35.210
5	0.188	8.262	14.432	18.857	25.178	30.343
6	0.167	7.316	12.780	16.699	22.296	26.870

1. Debit maksimum Rancangan DAS Sungai Deras AirMata Metode Nakayasu Kala Ulang 2 Tahun

Tabel. 23 Debit rancangan kala ulang 2 tahun metode nakayasu

t	U (t,1)	Q akibat hujan netto (m³/dt)						Baseflow	Q banjir
		24.157	15.218	11.614	9.587	8.262	7.316		
(jam)	(m³/det/mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m³/det)	(m³/det)
0	0	0.00						10	10.00
1	0.022608797	0.55	0.00					10	10.55
2	0.119329947	2.88	0.34	0.00				10	13.23
3	0.315768256	7.63	1.82	0.26	0.00			10	19.71
4	0.629827235	15.21	4.81	1.39	0.22	0.00		10	31.62
5	1.075983144	25.99	9.58	3.67	1.14	0.19	0.00	10	50.58
6	1.666634848	40.26	16.37	7.31	3.03	0.99	0.17	10	78.13
7	2.412752384	58.28	25.36	12.50	6.04	2.61	0.87	10	115.66
8	3.324248077	80.30	36.72	19.36	10.32	5.20	2.31	10	164.21
9	4.410212136	106.54	50.59	28.02	15.98	8.89	4.61	10	224.62
10	5.67907308	137.19	67.11	38.61	23.13	13.77	7.87	10	297.68
11	7.138712664	172.45	86.42	51.22	31.87	19.93	12.19	10	384.09
12	8.796551465	212.50	108.64	65.96	42.28	27.46	17.65	10	484.49
13	10.6596146	257.50	133.87	82.91	54.45	36.44	24.32	10	599.48
14	12.73458343	307.63	162.22	102.16	68.44	46.92	32.27	10	729.63
15	15.02783711	363.03	193.79	123.80	84.33	58.98	41.55	10	875.48
16	17.54548654	423.85	228.69	147.90	102.19	72.68	52.23	10	1037.54
17	20.29340247	490.23	267.01	174.53	122.09	88.07	64.36	10	1216.28
18	23.27723921	562.31	308.82	203.77	144.07	105.21	77.99	10	1412.18
19	26.50245463	640.22	354.23	235.69	168.21	124.16	93.17	10	1625.68
20	29.97432742	724.09	403.31	270.34	194.55	144.96	109.94	10	1857.20
21	33.69797197	814.04	456.15	307.80	223.16	167.66	128.36	10	2107.18
22	37.67835133	910.20	512.82	348.12	254.08	192.32	148.47	10	2376.00
23	41.92028859	1012.67	573.39	391.37	287.36	218.96	170.30	10	2664.05
24	46.42847698	1121.57	637.94	437.60	323.06	247.65	193.89	10	2971.71

25	51.20748874	1237.02	706.55	486.86	361.22	278.41	219.29	10	3299.36
26	56.26178315	1359.12	779.28	539.22	401.89	311.30	246.53	10	3647.33
27	61.59571365	1487.97	856.19	594.72	445.11	346.35	275.65	10	4015.99
28	67.2135343	1623.68	937.36	653.42	490.93	383.59	306.69	10	4405.67
29	73.11940561	1766.35	1022.86	715.37	539.38	423.08	339.67	10	4816.70
30	79.31739982	1916.07	1112.73	780.62	590.52	464.83	374.63	10	5249.41
31	85.81150573	2072.95	1207.05	849.21	644.38	508.90	411.61	10	5704.10
32	84.03426948	2030.02	1305.88	921.19	701.00	555.32	450.63	10	5974.04
33	80.64245049	1948.08	1278.83	996.61	760.42	604.11	491.73	10	6089.79
34	77.38753323	1869.45	1227.22	975.97	822.67	655.32	534.94	10	6095.58
35	74.26399201	1794.00	1177.68	936.58	805.64	708.97	580.29	10	6013.16
36	71.2665242	1721.59	1130.15	898.78	773.12	694.29	627.80	10	5855.72
37	68.39004117	1652.10	1084.53	862.50	741.91	666.27	614.79	10	5632.11
38	65.62965971	1585.42	1040.76	827.69	711.97	639.38	589.98	10	5405.19
39	62.98069367	1521.42	998.75	794.28	683.23	613.57	566.17	10	5187.43
40	60.43864608	1460.02	958.44	762.22	655.66	588.80	543.32	10	4978.45
41	57.99920145	1401.09	919.76	731.46	629.19	565.04	521.39	10	4777.92
42	55.65821849	1344.54	882.63	701.93	603.80	542.23	500.34	10	4585.47
43	53.41172307	1290.27	847.01	673.60	579.43	520.35	480.15	10	4400.79
44	51.25590143	1238.19	812.82	646.41	556.04	499.34	460.77	10	4223.57
45	49.18709378	1188.21	780.01	620.32	533.60	479.19	442.17	10	4053.50
46	47.20178803	1140.25	748.53	595.29	512.06	459.85	424.32	10	3890.30
47	45.29661385	1094.23	718.32	571.26	491.39	441.29	407.20	10	3733.68
48	43.46833693	1050.06	689.32	548.20	471.56	423.48	390.76	10	3583.38
49	41.71385354	1007.68	661.50	526.07	452.52	406.38	374.99	10	3439.15
50	40.03018518	967.01	634.80	504.84	434.26	389.98	359.85	10	3300.74
51	38.4144736	927.98	609.18	484.46	416.73	374.24	345.33	10	3167.92
52	36.86397591	890.52	584.59	464.91	399.91	359.14	331.39	10	3040.46
53	35.37605992	854.58	561.00	446.15	383.77	344.64	318.01	10	2918.14
54	33.94819969	820.09	538.35	428.14	368.28	330.73	305.18	10	2800.77
55	32.57797122	786.99	516.62	410.86	353.41	317.38	292.86	10	2688.12
56	31.26304837	755.22	495.77	394.27	339.15	304.57	281.04	10	2580.03
57	30.00119887	724.74	475.76	378.36	325.46	292.28	269.70	10	2476.30
58	28.79028056	695.49	456.56	363.09	312.33	280.48	258.81	10	2376.75
59	27.62823773	667.42	438.13	348.43	299.72	269.16	248.37	10	2281.22
60	26.51309766	640.48	420.45	334.37	287.62	258.30	238.34	10	2189.55
61	25.65552427	619.76	403.48	320.87	276.01	247.87	228.72	10	2106.71
62	24.96045045	602.97	390.43	307.92	264.87	237.87	219.49	10	2033.54
63	24.28420797	586.63	379.85	297.96	254.18	228.26	210.63	10	1967.52
64	23.62628662	570.74	369.56	289.89	245.96	219.05	202.13	10	1907.33
65	22.98619005	555.28	359.54	282.04	239.30	211.97	193.97	10	1852.09
66	22.36343533	540.23	349.80	274.40	232.81	206.22	187.70	10	1801.16
67	21.75755263	525.60	340.33	266.96	226.51	200.64	182.61	10	1752.64
68	21.16808485	511.36	331.11	259.73	220.37	195.20	177.66	10	1705.43
69	20.59458725	497.50	322.14	252.69	214.40	189.91	172.85	10	1659.49
70	20.03662717	484.02	313.41	245.85	208.59	184.77	168.17	10	1614.80
71	19.49378366	470.91	304.92	239.19	202.94	179.76	163.61	10	1571.32
72	18.96564717	458.15	296.66	232.71	197.44	174.89	159.18	10	1529.02
73	18.45181925	445.74	288.62	226.40	192.09	170.15	154.87	10	1487.87
74	17.95191224	433.66	280.80	220.27	186.89	165.54	150.67	10	1447.83
75	17.46554899	421.92	273.19	214.30	181.82	161.06	146.59	10	1408.88
76	16.99236257	410.48	265.79	208.49	176.90	156.69	142.62	10	1370.98
77	16.53199598	399.36	258.59	202.84	172.10	152.45	138.75	10	1334.10
78	16.0841019	388.54	251.58	197.35	167.44	148.32	134.99	10	1298.23
79	15.64834241	378.02	244.77	192.00	162.91	144.30	131.34	10	1263.33

80	15.22438876	367.78	238.14	186.80	158.49	140.39	127.78	10	1229.37
81	14.81192111	357.81	231.68	181.74	154.20	136.59	124.32	10	1196.34
82	14.41062826	348.12	225.41	176.82	150.02	132.89	120.95	10	1164.20
83	14.02020746	338.69	219.30	172.03	145.96	129.29	117.67	10	1132.93
84	13.64036415	329.51	213.36	167.37	142.00	125.78	114.48	10	1102.50
85	13.27081178	320.58	207.58	162.83	138.15	122.38	111.38	10	1072.91
86	12.91127152	311.90	201.96	158.42	134.41	119.06	108.36	10	1044.11
87	12.56147213	303.45	196.48	154.13	130.77	115.83	105.43	10	1016.09
88	12.2211497	295.23	191.16	149.95	127.23	112.70	102.57	10	988.83
89	11.89004748	287.23	185.98	145.89	123.78	109.64	99.79	10	962.31
90	11.56791566	279.45	180.94	141.94	120.43	106.67	97.09	10	936.51
91	11.25451122	271.88	176.04	138.09	117.16	103.78	94.46	10	911.41
92	10.94959771	264.51	171.27	134.35	113.99	100.97	91.90	10	886.99
93	10.65294508	257.34	166.63	130.71	110.90	98.24	89.41	10	863.23
94	10.36432953	250.37	162.12	127.17	107.90	95.57	86.99	10	840.11
95	10.08353332	243.59	157.72	123.72	104.97	92.98	84.63	10	817.63
96	9.810344595	236.99	153.45	120.37	102.13	90.47	82.34	10	795.74
97	9.544557252	230.57	149.29	117.11	99.36	88.01	80.11	10	774.46
98	9.285970768	224.32	145.25	113.94	96.67	85.63	77.94	10	753.75
99	9.034390054	218.24	141.31	110.85	94.05	83.31	75.83	10	733.60
100	8.789625305	212.33	137.49	107.85	91.50	81.05	73.77	10	713.99
101	8.55149186	206.58	133.76	104.93	89.02	78.86	71.77	10	694.92
102	8.319810059	200.98	130.14	102.08	86.61	76.72	69.83	10	676.36
103	8.094405111	195.54	126.61	99.32	84.27	74.64	67.94	10	658.31
104	7.87510696	190.24	123.18	96.63	81.98	72.62	66.10	10	640.74
105	7.702435924	186.07	119.84	94.01	79.76	70.65	64.30	10	624.64
106	7.545390792	182.27	117.22	91.46	77.60	68.74	62.56	10	609.85
107	7.391547657	178.56	114.83	89.46	75.50	66.88	60.87	10	596.08
108	7.240841233	174.92	112.48	87.63	73.84	65.06	59.22	10	583.16
109	7.093207565	171.35	110.19	85.85	72.34	63.64	57.61	10	570.98
110	6.948584004	167.86	107.94	84.10	70.86	62.34	56.35	10	559.45
111	6.806909175	164.43	105.74	82.38	69.42	61.07	55.20	10	548.25
112	6.668122958	161.08	103.59	80.70	68.00	59.82	54.08	10	537.27
113	6.532166455	157.80	101.48	79.06	66.62	58.60	52.97	10	526.52
114	6.398981973	154.58	99.41	77.44	65.26	57.41	51.89	10	515.99
115	6.268512992	151.43	97.38	75.86	63.93	56.24	50.84	10	505.67
116	6.140704146	148.34	95.39	74.32	62.62	55.09	49.80	10	495.57
117	6.015501197	145.32	93.45	72.80	61.35	53.97	48.78	10	485.67
118	5.892851013	142.35	91.54	71.32	60.10	52.87	47.79	10	475.97
119	5.772701547	139.45	89.68	69.86	58.87	51.79	46.81	10	466.47
120	5.655001811	136.61	87.85	68.44	57.67	50.73	45.86	10	457.16
121	5.539701858	133.82	86.06	67.04	56.49	49.70	44.93	10	448.04
122	5.426752757	131.09	84.30	65.68	55.34	48.69	44.01	10	439.11
123	5.316106579	128.42	82.58	64.34	54.21	47.69	43.11	10	430.36
124	5.207716367	125.80	80.90	63.03	53.11	46.72	42.23	10	421.79
125	5.101536126	123.24	79.25	61.74	52.03	45.77	41.37	10	413.40
126	4.997520797	120.73	77.64	60.48	50.97	44.84	40.53	10	405.17
127	4.895626238	118.26	76.05	59.25	49.93	43.92	39.70	10	397.12
128	4.795809209	115.85	74.50	58.04	48.91	43.03	38.89	10	389.22
129	4.698027352	113.49	72.98	56.86	47.91	42.15	38.10	10	381.49
130	4.602239171	111.18	71.49	55.70	46.93	41.29	37.32	10	373.92
131	4.508404018	108.91	70.04	54.56	45.98	40.45	36.56	10	366.50
132	4.416482071	106.69	68.61	53.45	45.04	39.62	35.82	10	359.23
133	4.326434323	104.51	67.21	52.36	44.12	38.82	35.09	10	352.11
134	4.238222561	102.38	65.84	51.29	43.22	38.02	34.37	10	345.13

135	4.15180935	100.30	64.50	50.25	42.34	37.25	33.67	10	338.30
136	4.06715802	98.25	63.18	49.22	41.48	36.49	32.98	10	331.61
137	3.984232647	96.25	61.89	48.22	40.63	35.75	32.31	10	325.05
138	3.902998042	94.28	60.63	47.24	39.80	35.02	31.65	10	318.62
139	3.823419731	92.36	59.40	46.27	38.99	34.30	31.01	10	312.33
140	3.745463944	90.48	58.18	45.33	38.20	33.60	30.37	10	306.17
141	3.669097599	88.63	57.00	44.41	37.42	32.92	29.76	10	300.13
142	3.594288289	86.83	55.84	43.50	36.66	32.25	29.15	10	294.21
143	3.521004268	85.06	54.70	42.61	35.91	31.59	28.55	10	288.42
144	3.449214436	83.32	53.58	41.74	35.18	30.95	27.97	10	282.74
145	3.378888329	81.62	52.49	40.89	34.46	30.31	27.40	10	277.18
146	3.309996102	79.96	51.42	40.06	33.76	29.70	26.84	10	271.73
147	3.24250852	78.33	50.37	39.24	33.07	29.09	26.30	10	266.40
148	3.176396945	76.73	49.34	38.44	32.39	28.50	25.76	10	261.17
149	3.111633319	75.17	48.34	37.66	31.73	27.92	25.23	10	256.05
150	3.04819016	73.64	47.35	36.89	31.09	27.35	24.72	10	251.03
151	2.986040546	72.13	46.39	36.14	30.45	26.79	24.22	10	246.12
152	2.925158101	70.66	45.44	35.40	29.83	26.24	23.72	10	241.30
153	2.865516989	69.22	44.52	34.68	29.22	25.71	23.24	10	236.59
154	2.807091902	67.81	43.61	33.97	28.63	25.18	22.76	10	231.97
155	2.749858045	66.43	42.72	33.28	28.04	24.67	22.30	10	227.44
156	2.69379113	65.07	41.85	32.60	27.47	24.17	21.85	10	223.01
157	2.638867364	63.75	40.99	31.94	26.91	23.67	21.40	10	218.67
158	2.585063441	62.45	40.16	31.29	26.36	23.19	20.96	10	214.41
159	2.532356527	61.17	39.34	30.65	25.83	22.72	20.54	10	210.24
160	2.480724255	59.93	38.54	30.02	25.30	22.26	20.12	10	206.16
161	2.430144715	58.71	37.75	29.41	24.78	21.80	19.71	10	202.16
162	2.380596442	57.51	36.98	28.81	24.28	21.36	19.31	10	198.24
163	2.33205841	56.34	36.23	28.22	23.78	20.92	18.91	10	194.40
164	2.284510021	55.19	35.49	27.65	23.30	20.50	18.53	10	190.64
165	2.237931097	54.06	34.77	27.08	22.82	20.08	18.15	10	186.96
166	2.192301872	52.96	34.06	26.53	22.36	19.67	17.78	10	183.35
167	2.147602982	51.88	33.36	25.99	21.90	19.27	17.42	10	179.82
168	2.103815458	50.82	32.68	25.46	21.46	18.87	17.06	10	176.36
169	2.06092072	49.79	32.02	24.94	21.02	18.49	16.71	10	172.96
170	2.018900563	48.77	31.36	24.43	20.59	18.11	16.37	10	169.64
171	1.977737156	47.78	30.72	23.94	20.17	17.74	16.04	10	166.39
172	1.93741303	46.80	30.10	23.45	19.76	17.38	15.71	10	163.20
173	1.897911075	45.85	29.48	22.97	19.36	17.03	15.39	10	160.07
174	1.859214525	44.91	28.88	22.50	18.96	16.68	15.08	10	157.01
175	1.82130696	44.00	28.29	22.04	18.57	16.34	14.77	10	154.02
176	1.784172293	43.10	27.72	21.59	18.20	16.01	14.47	10	151.08
177	1.747794766	42.22	27.15	21.15	17.82	15.68	14.17	10	148.20
178	1.712158941	41.36	26.60	20.72	17.46	15.36	13.89	10	145.39
179	1.677249695	40.52	26.06	20.30	17.10	15.05	13.60	10	142.63
180	1.643052215	39.69	25.52	19.89	16.76	14.74	13.32	10	139.92
181	1.609551988	38.88	25.00	19.48	16.41	14.44	13.05	10	137.27
182	1.576734798	38.09	24.49	19.08	16.08	14.15	12.79	10	134.68
183	1.544586718	37.31	23.99	18.69	15.75	13.86	12.53	10	132.14
184	1.513094107	36.55	23.51	18.31	15.43	13.57	12.27	10	129.65
185	1.482243598	35.81	23.03	17.94	15.12	13.30	12.02	10	127.21

2. Debit Maksimum Rancangan DAS Sungai Deras AirMata Metode Nakayasu Kala Ulang 5Tahun

Tabel. 24 Debit rancangan kala ulang 5 tahun metode nakayasu

t	U (t,1)	Q akibat hujan netto (m³/dt)						Baseflow	Q banjir
		42.199	26.584	20.287	16.747	14.432	12.78		
(jam)	(m³/det/mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m³/det)	(m³/det)
0	0	0.00						10	10.00
1	0.022608797	0.95	0.00					10	10.95
2	0.119329947	5.04	0.60	0.00				10	15.64
3	0.315768256	13.33	3.17	0.46	0.00			10	26.96
4	0.629827235	26.58	8.39	2.42	0.38	0.00		10	47.77
5	1.075983144	45.41	16.74	6.41	2.00	0.33	0.00	10	80.88
6	1.666634848	70.33	28.60	12.78	5.29	1.72	0.29	10	129.01
7	2.412752384	101.82	44.31	21.83	10.55	4.56	1.53	10	194.58
8	3.324248077	140.28	64.14	33.81	18.02	9.09	4.04	10	279.38
9	4.410212136	186.11	88.37	48.95	27.91	15.53	8.05	10	384.91
10	5.67907308	239.65	117.24	67.44	40.41	24.05	13.75	10	512.54
11	7.138712664	301.25	150.97	89.47	55.67	34.82	21.30	10	663.48
12	8.796551465	371.21	189.78	115.21	73.86	47.98	30.83	10	838.86
13	10.6596146	449.83	233.85	144.82	95.11	63.65	42.48	10	1039.74
14	12.73458343	537.39	283.38	178.46	119.55	81.96	56.36	10	1267.09
15	15.02783711	634.16	338.54	216.25	147.32	103.03	72.58	10	1521.87
16	17.54548654	740.40	399.50	258.35	178.52	126.95	91.23	10	1804.95
17	20.29340247	856.36	466.43	304.87	213.27	153.84	112.42	10	2117.19
18	23.27723921	982.28	539.48	355.95	251.67	183.79	136.23	10	2459.39
19	26.50245463	1118.38	618.80	411.69	293.83	216.88	162.75	10	2832.34
20	29.97432742	1264.89	704.54	472.23	339.85	253.22	192.06	10	3236.78
21	33.69797197	1422.02	796.84	537.66	389.82	292.87	224.23	10	3673.44
22	37.67835133	1589.99	895.83	608.09	443.84	335.94	259.35	10	4143.03
23	41.92028859	1768.99	1001.64	683.63	501.98	382.48	297.48	10	4646.21
24	46.42847698	1959.24	1114.41	764.38	564.34	432.59	338.70	10	5183.66
25	51.20748874	2160.90	1234.25	850.44	631.00	486.33	383.07	10	5756.00
26	56.26178315	2374.19	1361.30	941.89	702.04	543.77	430.66	10	6363.86
27	61.59571365	2599.28	1495.66	1038.85	777.54	604.99	481.53	10	7007.85
28	67.2135343	2836.34	1637.46	1141.38	857.57	670.06	535.74	10	7688.56
29	73.11940561	3085.57	1786.80	1249.59	942.22	739.03	593.36	10	8406.56
30	79.31739982	3347.11	1943.81	1363.56	1031.54	811.97	654.43	10	9162.43
31	85.81150573	3621.16	2108.57	1483.37	1125.63	888.95	719.03	10	9956.71
32	84.03426948	3546.16	2281.21	1609.11	1224.53	970.03	787.19	10	10428.24
33	80.64245049	3403.03	2233.97	1740.86	1328.33	1055.26	858.99	10	10630.43
34	77.38753323	3265.68	2143.80	1704.80	1437.09	1144.71	934.47	10	10640.54
35	74.26399201	3133.87	2057.27	1635.99	1407.32	1238.43	1013.68	10	10496.56
36	71.2665242	3007.38	1974.23	1569.96	1350.52	1212.78	1096.67	10	10221.54
37	68.39004117	2885.99	1894.55	1506.59	1296.01	1163.83	1073.96	10	9830.93
38	65.62965971	2769.51	1818.08	1445.78	1243.70	1116.86	1030.61	10	9434.54
39	62.98069367	2657.72	1744.70	1387.43	1193.50	1071.78	989.01	10	9054.14
40	60.43864608	2550.45	1674.28	1331.43	1145.33	1028.52	949.09	10	8689.10
41	57.99920145	2447.51	1606.70	1277.69	1099.10	987.01	910.79	10	8338.79

42	55.65821849	2348.72	1541.85	1226.12	1054.74	947.17	874.02	10	8002.62
43	53.41172307	2253.92	1479.62	1176.63	1012.17	908.94	838.75	10	7680.02
44	51.25590143	2162.95	1419.90	1129.14	971.31	872.25	804.89	10	7370.44
45	49.18709378	2075.65	1362.59	1083.56	932.11	837.04	772.41	10	7073.36
46	47.20178803	1991.87	1307.59	1039.83	894.49	803.26	741.23	10	6788.26
47	45.29661385	1911.47	1254.81	997.86	858.38	770.84	711.31	10	6514.68
48	43.46833693	1834.32	1204.17	957.58	823.74	739.73	682.60	10	6252.13
49	41.71385354	1760.28	1155.56	918.93	790.49	709.87	655.05	10	6000.18
50	40.03018518	1689.23	1108.92	881.84	758.58	681.22	628.61	10	5758.41
51	38.4144736	1621.05	1064.16	846.25	727.96	653.72	603.24	10	5526.39
52	36.86397591	1555.62	1021.21	812.09	698.58	627.34	578.89	10	5303.73
53	35.37605992	1492.83	979.99	779.31	670.39	602.01	555.53	10	5090.07
54	33.94819969	1432.58	940.44	747.86	643.33	577.72	533.10	10	4885.02
55	32.57797122	1374.76	902.48	717.67	617.36	554.40	511.59	10	4688.26
56	31.26304837	1319.27	866.05	688.71	592.44	532.02	490.94	10	4499.43
57	30.00119887	1266.02	831.10	660.91	568.53	510.55	471.12	10	4318.23
58	28.79028056	1214.92	797.55	634.23	545.58	489.94	452.11	10	4144.34
59	27.62823773	1165.88	765.36	608.63	523.56	470.17	433.86	10	3977.46
60	26.51309766	1118.83	734.47	584.07	502.43	451.19	416.35	10	3817.33
61	25.65552427	1082.64	704.82	560.49	482.15	432.98	399.54	10	3672.63
62	24.96045045	1053.31	682.03	537.87	462.69	415.50	383.42	10	3544.81
63	24.28420797	1024.77	663.55	520.47	444.01	398.73	367.94	10	3429.48
64	23.62628662	997.01	645.57	506.37	429.65	382.64	353.09	10	3324.33
65	22.98619005	969.99	628.08	492.65	418.01	370.26	338.84	10	3227.84
66	22.36343533	943.71	611.06	479.31	406.69	360.23	327.88	10	3138.88
67	21.75755263	918.15	594.51	466.32	395.67	350.47	318.99	10	3054.11
68	21.16808485	893.27	578.40	453.69	384.95	340.97	310.35	10	2971.64
69	20.59458725	869.07	562.73	441.40	374.52	331.74	301.94	10	2891.40
70	20.03662717	845.53	547.49	429.44	364.37	322.75	293.76	10	2813.34
71	19.49378366	822.62	532.65	417.80	354.50	314.00	285.80	10	2737.39
72	18.96564717	800.33	518.22	406.48	344.90	305.50	278.06	10	2663.49
73	18.45181925	778.65	504.18	395.47	335.55	297.22	270.53	10	2591.60
74	17.95191224	757.55	490.52	384.76	326.46	289.17	263.20	10	2521.66
75	17.46554899	737.03	477.23	374.33	317.62	281.33	256.07	10	2453.61
76	16.99236257	717.06	464.30	364.19	309.01	273.71	249.13	10	2387.41
77	16.53199598	697.63	451.72	354.32	300.64	266.30	242.38	10	2323.00
78	16.0841019	678.73	439.49	344.72	292.50	259.08	235.81	10	2260.34
79	15.64834241	660.34	427.58	335.38	284.57	252.06	229.43	10	2199.37
80	15.22438876	642.45	416.00	326.30	276.86	245.23	223.21	10	2140.05
81	14.81192111	625.05	404.73	317.46	269.36	238.59	217.16	10	2082.34
82	14.41062826	608.11	393.76	308.86	262.06	232.13	211.28	10	2026.20
83	14.02020746	591.64	383.09	300.49	254.96	225.84	205.55	10	1971.57
84	13.64036415	575.61	372.71	292.35	248.06	219.72	199.99	10	1918.43
85	13.27081178	560.01	362.62	284.43	241.33	213.77	194.57	10	1866.73
86	12.91127152	544.84	352.79	276.72	234.80	207.97	189.30	10	1816.42
87	12.56147213	530.08	343.23	269.22	228.44	202.34	184.17	10	1767.48
88	12.2211497	515.72	333.93	261.93	222.25	196.86	179.18	10	1719.87
89	11.89004748	501.75	324.89	254.83	216.23	191.52	174.32	10	1673.54
90	11.56791566	488.15	316.09	247.93	210.37	186.34	169.60	10	1628.47
91	11.25451122	474.93	307.52	241.21	204.67	181.29	165.01	10	1584.62
92	10.94959771	462.06	299.19	234.68	199.12	176.38	160.54	10	1541.96
93	10.65294508	449.54	291.08	228.32	193.73	171.60	156.19	10	1500.46
94	10.36432953	437.36	283.20	222.13	188.48	166.95	151.95	10	1460.08
95	10.08353332	425.52	275.53	216.12	183.37	162.43	147.84	10	1420.79
96	9.810344595	413.99	268.06	210.26	178.40	158.02	143.83	10	1382.57

97	9.544557252	402.77	260.80	204.56	173.57	153.74	139.94	10	1345.38
98	9.285970768	391.86	253.73	199.02	168.87	149.58	136.14	10	1309.21
99	9.034390054	381.24	246.86	193.63	164.29	145.53	132.46	10	1274.01
100	8.789625305	370.91	240.17	188.38	159.84	141.58	128.87	10	1239.76
101	8.55149186	360.86	233.66	183.28	155.51	137.75	125.38	10	1206.44
102	8.319810059	351.09	227.33	178.32	151.30	134.02	121.98	10	1174.03
103	8.094405111	341.58	221.17	173.48	147.20	130.38	118.67	10	1142.49
104	7.87510696	332.32	215.18	168.78	143.21	126.85	115.46	10	1111.81
105	7.702435924	325.04	209.35	164.21	139.33	123.42	112.33	10	1083.68
106	7.545390792	318.41	204.76	159.76	135.56	120.07	109.29	10	1057.85
107	7.391547657	311.92	200.59	156.26	131.88	116.82	106.33	10	1033.79
108	7.240841233	305.56	196.50	153.07	128.99	113.65	103.45	10	1011.22
109	7.093207565	299.33	192.49	149.95	126.36	111.16	100.64	10	989.94
110	6.948584004	293.22	188.57	146.89	123.79	108.90	98.44	10	969.80
111	6.806909175	287.24	184.72	143.90	121.26	106.67	96.43	10	950.23
112	6.668122958	281.39	180.95	140.97	118.79	104.50	94.46	10	931.06
113	6.532166455	275.65	177.27	138.09	116.37	102.37	92.54	10	912.28
114	6.398981973	270.03	173.65	135.28	114.00	100.28	90.65	10	893.89
115	6.268512992	264.52	170.11	132.52	111.67	98.24	88.80	10	875.86
116	6.140704146	259.13	166.64	129.82	109.39	96.23	86.99	10	858.21
117	6.015501197	253.85	163.24	127.17	107.16	94.27	85.22	10	840.92
118	5.892851013	248.67	159.92	124.58	104.98	92.35	83.48	10	823.97
119	5.772701547	243.60	156.66	122.04	102.84	90.47	81.78	10	807.38
120	5.655001811	238.64	153.46	119.55	100.74	88.62	80.11	10	791.12
121	5.539701858	233.77	150.33	117.11	98.69	86.82	78.48	10	775.19
122	5.426752757	229.00	147.27	114.72	96.68	85.05	76.88	10	759.59
123	5.316106579	224.33	144.26	112.38	94.70	83.31	75.31	10	744.31
124	5.207716367	219.76	141.32	110.09	92.77	81.61	73.78	10	729.34
125	5.101536126	215.28	138.44	107.85	90.88	79.95	72.27	10	714.67
126	4.997520797	210.89	135.62	105.65	89.03	78.32	70.80	10	700.30
127	4.895626238	206.59	132.85	103.49	87.21	76.72	69.35	10	686.23
128	4.795809209	202.38	130.15	101.38	85.44	75.16	67.94	10	672.44
129	4.698027352	198.25	127.49	99.32	83.69	73.63	66.55	10	658.93
130	4.602239171	194.21	124.89	97.29	81.99	72.12	65.20	10	645.70
131	4.508404018	190.25	122.35	95.31	80.32	70.65	63.87	10	632.74
132	4.416482071	186.37	119.85	93.37	78.68	69.21	62.57	10	620.05
133	4.326434323	182.57	117.41	91.46	77.07	67.80	61.29	10	607.61
134	4.238222561	178.85	115.01	89.60	75.50	66.42	60.04	10	595.42
135	4.15180935	175.20	112.67	87.77	73.96	65.07	58.82	10	583.49
136	4.06715802	171.63	110.37	85.98	72.45	63.74	57.62	10	571.79
137	3.984232647	168.13	108.12	84.23	70.98	62.44	56.44	10	560.34
138	3.902998042	164.70	105.92	82.51	69.53	61.17	55.29	10	549.12
139	3.823419731	161.34	103.76	80.83	68.11	59.92	54.16	10	538.13
140	3.745463944	158.05	101.64	79.18	66.72	58.70	53.06	10	527.36
141	3.669097599	154.83	99.57	77.57	65.36	57.50	51.98	10	516.81
142	3.594288289	151.68	97.54	75.98	64.03	56.33	50.92	10	506.48
143	3.521004268	148.58	95.55	74.43	62.73	55.18	49.88	10	496.35
144	3.449214436	145.55	93.60	72.92	61.45	54.05	48.86	10	486.44
145	3.378888329	142.59	91.69	71.43	60.19	52.95	47.87	10	476.72
146	3.309996102	139.68	89.82	69.97	58.97	51.87	46.89	10	467.21
147	3.24250852	136.83	87.99	68.55	57.76	50.82	45.94	10	457.89
148	3.176396945	134.04	86.20	67.15	56.59	49.78	45.00	10	448.75
149	3.111633319	131.31	84.44	65.78	55.43	48.76	44.08	10	439.81
150	3.04819016	128.63	82.72	64.44	54.30	47.77	43.18	10	431.04
151	2.986040546	126.01	81.03	63.13	53.20	46.80	42.30	10	422.46

152	2.925158101	123.44	79.38	61.84	52.11	45.84	41.44	10	414.05
153	2.865516989	120.92	77.76	60.58	51.05	44.91	40.59	10	405.81
154	2.807091902	118.46	76.18	59.34	50.01	43.99	39.77	10	397.74
155	2.749858045	116.04	74.62	58.13	48.99	43.09	38.96	10	389.84
156	2.69379113	113.68	73.10	56.95	47.99	42.22	38.16	10	382.09
157	2.638867364	111.36	71.61	55.79	47.01	41.36	37.38	10	374.50
158	2.585063441	109.09	70.15	54.65	46.05	40.51	36.62	10	367.07
159	2.532356527	106.86	68.72	53.53	45.11	39.69	35.87	10	359.79
160	2.480724255	104.68	67.32	52.44	44.19	38.88	35.14	10	352.66
161	2.430144715	102.55	65.95	51.37	43.29	38.08	34.43	10	345.67
162	2.380596442	100.46	64.60	50.33	42.41	37.31	33.72	10	338.83
163	2.33205841	98.41	63.29	49.30	41.54	36.55	33.04	10	332.13
164	2.284510021	96.40	62.00	48.30	40.70	35.80	32.36	10	325.56
165	2.237931097	94.44	60.73	47.31	39.87	35.07	31.70	10	319.12
166	2.192301872	92.51	59.49	46.35	39.05	34.36	31.06	10	312.82
167	2.147602982	90.63	58.28	45.40	38.26	33.66	30.42	10	306.65
168	2.103815458	88.78	57.09	44.48	37.48	32.97	29.80	10	300.60
169	2.06092072	86.97	55.93	43.57	36.71	32.30	29.20	10	294.67
170	2.018900563	85.20	54.79	42.68	35.97	31.64	28.60	10	288.87
171	1.977737156	83.46	53.67	41.81	35.23	30.99	28.02	10	283.18
172	1.93741303	81.76	52.58	40.96	34.51	30.36	27.45	10	277.61
173	1.897911075	80.09	51.50	40.12	33.81	29.74	26.89	10	272.16
174	1.859214525	78.46	50.45	39.30	33.12	29.14	26.34	10	266.81
175	1.82130696	76.86	49.43	38.50	32.45	28.54	25.80	10	261.58
176	1.784172293	75.29	48.42	37.72	31.78	27.96	25.28	10	256.45
177	1.747794766	73.76	47.43	36.95	31.14	27.39	24.76	10	251.42
178	1.712158941	72.25	46.46	36.20	30.50	26.83	24.26	10	246.50
179	1.677249695	70.78	45.52	35.46	29.88	26.29	23.76	10	241.68
180	1.643052215	69.34	44.59	34.73	29.27	25.75	23.28	10	236.95
181	1.609551988	67.92	43.68	34.03	28.67	25.22	22.80	10	232.33
182	1.576734798	66.54	42.79	33.33	28.09	24.71	22.34	10	227.79
183	1.544586718	65.18	41.92	32.65	27.52	24.21	21.88	10	223.35
184	1.513094107	63.85	41.06	31.99	26.96	23.71	21.44	10	219.00
185	1.482243598	62.55	40.22	31.34	26.41	23.23	21.00	10	214.74

3. Debit Maksimum Rancangan DAS Sungai Deras AirMata Metode Nakayasu Kala Ulang 10 Tahun

Tabel. 25 Debit rancangan kala ulang 10 tahun metode nakayasu

| t | U (t,1) | Q akibat hujan netto (m³/dt) | | | | | | Baseflow | Q banjir |
| | | 55.139 | 34.735 | 26.508 | 21.882 | 18.857 | 16.699 | | |
(jam)	(m³/det/mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m³/det)	(m³/det)
0	0	0.00						10	10.00
1	0.022608797	1.25	0.00					10	11.25
2	0.119329947	6.58	0.79	0.00				10	17.37
3	0.315768256	17.41	4.14	0.60	0.00			10	32.16
4	0.629827235	34.73	10.97	3.16	0.49	0.00		10	59.35
5	1.075983144	59.33	21.88	8.37	2.61	0.43	0.00	10	102.61
6	1.666634848	91.90	37.37	16.70	6.91	2.25	0.38	10	165.50
7	2.412752384	133.04	57.89	28.52	13.78	5.95	1.99	10	251.18
8	3.324248077	183.30	83.81	44.18	23.54	11.88	5.27	10	361.98
9	4.410212136	243.17	115.47	63.96	36.47	20.29	10.52	10	499.88
10	5.67907308	313.14	153.19	88.12	52.80	31.43	17.97	10	666.64
11	7.138712664	393.62	197.26	116.91	72.74	45.50	27.83	10	863.86
12	8.796551465	485.03	247.96	150.54	96.50	62.69	40.29	10	1093.02
13	10.6596146	587.76	305.55	189.23	124.27	83.16	55.51	10	1355.49
14	12.73458343	702.17	370.26	233.18	156.21	107.09	73.65	10	1652.56
15	15.02783711	828.62	442.34	282.57	192.49	134.61	94.83	10	1985.46
16	17.54548654	967.44	521.99	337.57	233.25	165.88	119.21	10	2355.34
17	20.29340247	1118.96	609.44	398.36	278.66	201.01	146.89	10	2763.32
18	23.27723921	1283.48	704.89	465.10	328.84	240.14	178.00	10	3210.45
19	26.50245463	1461.32	808.53	537.94	383.93	283.38	212.65	10	3697.76
20	29.97432742	1652.75	920.56	617.03	444.06	330.86	250.95	10	4226.22
21	33.69797197	1858.07	1041.16	702.53	509.35	382.67	292.99	10	4796.78
22	37.67835133	2077.55	1170.50	794.56	579.93	438.94	338.88	10	5410.35
23	41.92028859	2311.44	1308.76	893.27	655.90	499.76	388.71	10	6067.83
24	46.42847698	2560.02	1456.10	998.78	737.38	565.23	442.56	10	6770.07
25	51.20748874	2823.53	1612.69	1111.22	824.48	635.44	500.54	10	7517.91
26	56.26178315	3102.22	1778.69	1230.73	917.30	710.50	562.72	10	8312.16
27	61.59571365	3396.33	1954.25	1357.41	1015.95	790.49	629.19	10	9153.62
28	67.2135343	3706.09	2139.53	1491.39	1120.52	875.50	700.03	10	10043.05
29	73.11940561	4031.73	2334.66	1632.78	1231.12	965.62	775.31	10	10981.22
30	79.31739982	4373.48	2539.80	1781.70	1347.84	1060.93	855.11	10	11968.86
31	85.81150573	4731.56	2755.09	1938.25	1470.77	1161.51	939.52	10	13006.69
32	84.03426948	4633.57	2980.66	2102.55	1600.00	1267.45	1028.59	10	13622.81
33	80.64245049	4446.54	2918.93	2274.69	1735.62	1378.81	1122.40	10	13887.00
34	77.38753323	4267.07	2801.12	2227.58	1877.73	1495.69	1221.02	10	13900.20
35	74.26399201	4094.84	2688.06	2137.67	1838.84	1618.15	1324.52	10	13712.08
36	71.2665242	3929.56	2579.56	2051.39	1764.62	1584.63	1432.97	10	13352.73
37	68.39004117	3770.96	2475.44	1968.59	1693.39	1520.67	1403.29	10	12842.35
38	65.62965971	3618.75	2375.53	1889.13	1625.04	1459.30	1346.65	10	12324.40
39	62.98069367	3472.69	2279.65	1812.88	1559.45	1400.40	1292.29	10	11827.37
40	60.43864608	3332.53	2187.63	1739.71	1496.51	1343.87	1240.13	10	11350.39
41	57.99920145	3198.02	2099.34	1669.49	1436.11	1289.63	1190.08	10	10892.67

42	55.65821849	3068.94	2014.60	1602.11	1378.14	1237.58	1142.05	10	10453.42
43	53.41172307	2945.07	1933.29	1537.44	1322.52	1187.63	1095.95	10	10031.90
44	51.25590143	2826.20	1855.26	1475.39	1269.14	1139.69	1051.71	10	9627.39
45	49.18709378	2712.13	1780.37	1415.84	1217.91	1093.69	1009.26	10	9239.21
46	47.20178803	2602.66	1708.51	1358.69	1168.76	1049.55	968.53	10	8866.70
47	45.29661385	2497.61	1639.55	1303.85	1121.58	1007.18	929.44	10	8509.22
48	43.46833693	2396.80	1573.38	1251.22	1076.31	966.53	891.92	10	8166.17
49	41.71385354	2300.06	1509.87	1200.72	1032.87	927.52	855.92	10	7836.97
50	40.03018518	2207.22	1448.93	1152.26	991.18	890.08	821.38	10	7521.05
51	38.4144736	2118.14	1390.45	1105.75	951.17	854.16	788.22	10	7217.89
52	36.86397591	2032.64	1334.33	1061.12	912.78	819.68	756.41	10	6926.96
53	35.37605992	1950.60	1280.47	1018.29	875.94	786.60	725.88	10	6647.78
54	33.94819969	1871.87	1228.79	977.19	840.59	754.85	696.58	10	6379.86
55	32.57797122	1796.32	1179.19	937.75	806.66	724.38	668.46	10	6122.76
56	31.26304837	1723.81	1131.60	899.90	774.10	695.14	641.48	10	5876.03
57	30.00119887	1654.24	1085.92	863.58	742.85	667.09	615.59	10	5639.27
58	28.79028056	1587.47	1042.09	828.72	712.87	640.16	590.74	10	5412.06
59	27.62823773	1523.39	1000.03	795.27	684.10	614.32	566.90	10	5194.02
60	26.51309766	1461.91	959.67	763.17	656.49	589.53	544.02	10	4984.78
61	25.65552427	1414.62	920.93	732.37	629.99	565.73	522.06	10	4795.70
62	24.96045045	1376.29	891.14	702.81	604.56	542.90	500.99	10	4628.70
63	24.28420797	1339.01	867.00	680.08	580.16	520.99	480.77	10	4478.00
64	23.62628662	1302.73	843.51	661.65	561.39	499.96	461.36	10	4340.61
65	22.98619005	1267.44	820.66	643.73	546.18	483.79	442.74	10	4214.53
66	22.36343533	1233.10	798.43	626.29	531.39	470.68	428.42	10	4098.30
67	21.75755263	1199.69	776.79	609.32	516.99	457.93	416.81	10	3987.53
68	21.16808485	1167.19	755.75	592.81	502.98	445.52	405.52	10	3879.77
69	20.59458725	1135.56	735.27	576.75	489.36	433.45	394.54	10	3774.93
70	20.03662717	1104.80	715.35	561.12	476.10	421.71	383.85	10	3672.93
71	19.49378366	1074.87	695.97	545.92	463.20	410.28	373.45	10	3573.69
72	18.96564717	1045.75	677.12	531.13	450.65	399.17	363.33	10	3477.14
73	18.45181925	1017.41	658.77	516.74	438.44	388.35	353.49	10	3383.21
74	17.95191224	989.85	640.92	502.74	426.56	377.83	343.91	10	3291.82
75	17.46554899	963.03	623.56	489.12	415.01	367.59	334.59	10	3202.91
76	16.99236257	936.94	606.67	475.87	403.76	357.64	325.53	10	3116.40
77	16.53199598	911.56	590.23	462.98	392.82	347.95	316.71	10	3032.24
78	16.0841019	886.86	574.24	450.43	382.18	338.52	308.13	10	2950.36
79	15.64834241	862.83	558.68	438.23	371.83	329.35	299.78	10	2870.70
80	15.22438876	839.46	543.55	426.36	361.75	320.42	291.66	10	2793.20
81	14.81192111	816.71	528.82	414.81	351.95	311.74	283.76	10	2717.79
82	14.41062826	794.59	514.49	403.57	342.42	303.30	276.07	10	2644.43
83	14.02020746	773.06	500.55	392.63	333.14	295.08	268.59	10	2573.06
84	13.64036415	752.12	486.99	382.00	324.11	287.09	261.31	10	2503.62
85	13.27081178	731.74	473.80	371.65	315.33	279.31	254.23	10	2436.06
86	12.91127152	711.91	460.96	361.58	306.79	271.74	247.34	10	2370.33
87	12.56147213	692.63	448.47	351.78	298.48	264.38	240.64	10	2306.38
88	12.2211497	673.86	436.32	342.25	290.39	257.22	234.12	10	2244.17
89	11.89004748	655.61	424.50	332.98	282.52	250.25	227.78	10	2183.64
90	11.56791566	637.84	413.00	323.96	274.87	243.47	221.61	10	2124.75
91	11.25451122	620.56	401.81	315.18	267.42	236.87	215.61	10	2067.46
92	10.94959771	603.75	390.93	306.64	260.18	230.45	209.76	10	2011.71
93	10.65294508	587.39	380.33	298.33	253.13	224.21	204.08	10	1957.48
94	10.36432953	571.48	370.03	290.25	246.27	218.14	198.55	10	1904.72
95	10.08353332	556.00	360.00	282.39	239.60	212.23	193.17	10	1853.39
96	9.810344595	540.93	350.25	274.74	233.11	206.48	187.94	10	1803.45

97	9.544557252	526.28	340.76	267.29	226.79	200.88	182.85	10	1754.86
98	9.285970768	512.02	331.53	260.05	220.65	195.44	177.89	10	1707.58
99	9.034390054	498.15	322.55	253.01	214.67	190.15	173.07	10	1661.59
100	8.789625305	484.65	313.81	246.15	208.85	184.99	168.38	10	1616.85
101	8.55149186	471.52	305.31	239.48	203.20	179.98	163.82	10	1573.31
102	8.319810059	458.75	297.04	233.00	197.69	175.11	159.38	10	1530.96
103	8.094405111	446.32	288.99	226.68	192.33	170.36	155.07	10	1489.75
104	7.87510696	434.23	281.16	220.54	187.12	165.75	150.87	10	1449.66
105	7.702435924	424.70	273.54	214.57	182.05	161.26	146.78	10	1412.90
106	7.545390792	416.05	267.54	208.75	177.12	156.89	142.80	10	1379.15
107	7.391547657	407.56	262.09	204.18	172.32	152.64	138.93	10	1347.72
108	7.240841233	399.25	256.75	200.01	168.54	148.50	135.17	10	1318.23
109	7.093207565	391.11	251.51	195.94	165.11	145.24	131.51	10	1290.42
110	6.948584004	383.14	246.38	191.94	161.74	142.28	128.62	10	1264.11
111	6.806909175	375.33	241.36	188.03	158.44	139.38	126.00	10	1238.54
112	6.668122958	367.67	236.44	184.19	155.21	136.54	123.43	10	1213.49
113	6.532166455	360.18	231.62	180.44	152.05	133.76	120.91	10	1188.95
114	6.398981973	352.83	226.89	176.76	148.95	131.03	118.45	10	1164.91
115	6.268512992	345.64	222.27	173.15	145.91	128.36	116.03	10	1141.37
116	6.140704146	338.59	217.74	169.62	142.94	125.74	113.67	10	1118.30
117	6.015501197	331.69	213.30	166.17	140.02	123.18	111.35	10	1095.70
118	5.892851013	324.93	208.95	162.78	137.17	120.67	109.08	10	1073.57
119	5.772701547	318.30	204.69	159.46	134.37	118.21	106.86	10	1051.88
120	5.655001811	311.81	200.51	156.21	131.63	115.80	104.68	10	1030.64
121	5.539701858	305.45	196.43	153.02	128.95	113.43	102.54	10	1009.83
122	5.426752757	299.23	192.42	149.90	126.32	111.12	100.45	10	989.44
123	5.316106579	293.12	188.50	146.85	123.74	108.86	98.40	10	969.47
124	5.207716367	287.15	184.65	143.85	121.22	106.64	96.40	10	949.91
125	5.101536126	281.29	180.89	140.92	118.75	104.46	94.43	10	930.75
126	4.997520797	275.56	177.20	138.05	116.33	102.33	92.51	10	911.97
127	4.895626238	269.94	173.59	135.23	113.96	100.25	90.62	10	893.58
128	4.795809209	264.44	170.05	132.47	111.63	98.20	88.77	10	875.57
129	4.698027352	259.04	166.58	129.77	109.36	96.20	86.96	10	857.92
130	4.602239171	253.76	163.19	127.13	107.13	94.24	85.19	10	840.63
131	4.508404018	248.59	159.86	124.54	104.94	92.32	83.45	10	823.70
132	4.416482071	243.52	156.60	122.00	102.80	90.43	81.75	10	807.10
133	4.326434323	238.56	153.41	119.51	100.71	88.59	80.09	10	790.85
134	4.238222561	233.69	150.28	117.07	98.65	86.78	78.45	10	774.93
135	4.15180935	228.93	147.21	114.69	96.64	85.01	76.85	10	759.34
136	4.06715802	224.26	144.21	112.35	94.67	83.28	75.29	10	744.06
137	3.984232647	219.69	141.27	110.06	92.74	81.58	73.75	10	729.09
138	3.902998042	215.21	138.39	107.81	90.85	79.92	72.25	10	714.43
139	3.823419731	210.82	135.57	105.61	89.00	78.29	70.77	10	700.07
140	3.745463944	206.52	132.81	103.46	87.18	76.69	69.33	10	686.00
141	3.669097599	202.31	130.10	101.35	85.41	75.13	67.92	10	672.21
142	3.594288289	198.19	127.45	99.28	83.66	73.60	66.53	10	658.71
143	3.521004268	194.14	124.85	97.26	81.96	72.10	65.18	10	645.49
144	3.449214436	190.19	122.30	95.28	80.29	70.63	63.85	10	632.53
145	3.378888329	186.31	119.81	93.33	78.65	69.19	62.55	10	619.84
146	3.309996102	182.51	117.37	91.43	77.05	67.78	61.27	10	607.40
147	3.24250852	178.79	114.97	89.57	75.48	66.40	60.02	10	595.22
148	3.176396945	175.14	112.63	87.74	73.94	65.04	58.80	10	583.29
149	3.111633319	171.57	110.33	85.95	72.43	63.72	57.60	10	571.60
150	3.04819016	168.07	108.08	84.20	70.95	62.42	56.42	10	560.15
151	2.986040546	164.65	105.88	82.48	69.51	61.14	55.27	10	548.93

152	2.925158101	161.29	103.72	80.80	68.09	59.90	54.15	10	537.94
153	2.865516989	158.00	101.61	79.15	66.70	58.68	53.04	10	527.18
154	2.807091902	154.78	99.53	77.54	65.34	57.48	51.96	10	516.64
155	2.749858045	151.62	97.50	75.96	64.01	56.31	50.90	10	506.31
156	2.69379113	148.53	95.52	74.41	62.70	55.16	49.86	10	496.19
157	2.638867364	145.50	93.57	72.89	61.42	54.04	48.85	10	486.27
158	2.585063441	142.54	91.66	71.41	60.17	52.93	47.85	10	476.56
159	2.532356527	139.63	89.79	69.95	58.95	51.85	46.88	10	467.05
160	2.480724255	136.78	87.96	68.52	57.74	50.80	45.92	10	457.73
161	2.430144715	134.00	86.17	67.13	56.57	49.76	44.98	10	448.60
162	2.380596442	131.26	84.41	65.76	55.41	48.75	44.07	10	439.66
163	2.33205841	128.59	82.69	64.42	54.28	47.75	43.17	10	430.90
164	2.284510021	125.97	81.00	63.10	53.18	46.78	42.29	10	422.32
165	2.237931097	123.40	79.35	61.82	52.09	45.83	41.43	10	413.91
166	2.192301872	120.88	77.73	60.56	51.03	44.89	40.58	10	405.68
167	2.147602982	118.42	76.15	59.32	49.99	43.98	39.75	10	397.61
168	2.103815458	116.00	74.60	58.11	48.97	43.08	38.94	10	389.71
169	2.06092072	113.64	73.08	56.93	47.97	42.20	38.15	10	381.96
170	2.018900563	111.32	71.59	55.77	46.99	41.34	37.37	10	374.38
171	1.977737156	109.05	70.13	54.63	46.04	40.50	36.61	10	366.95
172	1.93741303	106.83	68.70	53.52	45.10	39.67	35.86	10	359.67
173	1.897911075	104.65	67.30	52.43	44.18	38.86	35.13	10	352.54
174	1.859214525	102.52	65.92	51.36	43.28	38.07	34.42	10	345.56
175	1.82130696	100.43	64.58	50.31	42.39	37.29	33.71	10	338.72
176	1.784172293	98.38	63.26	49.28	41.53	36.53	33.03	10	332.01
177	1.747794766	96.37	61.97	48.28	40.68	35.79	32.35	10	325.45
178	1.712158941	94.41	60.71	47.29	39.85	35.06	31.69	10	319.02
179	1.677249695	92.48	59.47	46.33	39.04	34.34	31.05	10	312.72
180	1.643052215	90.60	58.26	45.39	38.25	33.64	30.41	10	306.54
181	1.609551988	88.75	57.07	44.46	37.47	32.96	29.79	10	300.50
182	1.576734798	86.94	55.91	43.55	36.70	32.29	29.19	10	294.58
183	1.544586718	85.17	54.77	42.67	35.95	31.63	28.59	10	288.77
184	1.513094107	83.43	53.65	41.80	35.22	30.98	28.01	10	283.09
185	1.482243598	81.73	52.56	40.94	34.50	30.35	27.44	10	277.52

4. Debit maksimum Rancangan DAS Sungai Deras AirMata Metode Nakayasu Kala Ulang 25 Tahun

Tabel. 26 Debit rancangan kala ulang 25 tahun metode nakayasu

t	U (t,1)	Q akibat hujan netto (m³/dt)						Baseflow	Q banjir
		73.621	46.378	35.393	29.217	25.178	22.296		
(jam)	(m³/det/mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m³/det)	(m³/det)
0	0	0.00						10	10.00
1	0.022608797	1.66	0.00					10	11.66
2	0.119329947	8.79	1.05	0.00				10	19.83
3	0.315768256	23.25	5.53	0.80	0.00			10	39.58
4	0.629827235	46.37	14.64	4.22	0.66	0.00		10	75.90
5	1.075983144	79.21	29.21	11.18	3.49	0.57	0.00	10	133.66
6	1.666634848	122.70	49.90	22.29	9.23	3.00	0.50	10	217.63
7	2.412752384	177.63	77.30	38.08	18.40	7.95	2.66	10	332.02
8	3.324248077	244.73	111.90	58.99	31.44	15.86	7.04	10	479.96
9	4.410212136	324.68	154.17	85.39	48.69	27.09	14.04	10	664.08
10	5.67907308	418.10	204.54	117.66	70.49	41.96	23.99	10	886.74
11	7.138712664	525.56	263.38	156.09	97.12	60.75	37.16	10	1150.07
12	8.796551465	647.61	331.08	201.00	128.85	83.70	53.79	10	1456.04
13	10.6596146	784.77	407.97	252.66	165.93	111.04	74.12	10	1806.48
14	12.73458343	937.53	494.37	311.34	208.57	142.99	98.33	10	2203.13
15	15.02783711	1106.36	590.60	377.28	257.01	179.74	126.62	10	2647.61
16	17.54548654	1291.72	696.96	450.72	311.44	221.48	159.16	10	3141.48
17	20.29340247	1494.02	813.72	531.88	372.07	268.39	196.13	10	3686.21
18	23.27723921	1713.69	941.17	620.99	439.07	320.63	237.67	10	4283.21
19	26.50245463	1951.14	1079.55	718.24	512.63	378.37	283.93	10	4933.86
20	29.97432742	2206.74	1229.13	823.85	592.91	441.76	335.06	10	5639.46
21	33.69797197	2480.88	1390.15	938.00	680.09	510.95	391.19	10	6401.26
22	37.67835133	2773.92	1562.84	1060.88	774.32	586.07	452.46	10	7220.50
23	41.92028859	3086.21	1747.45	1192.67	875.76	667.28	518.99	10	8098.36
24	46.42847698	3418.11	1944.18	1333.55	984.55	754.69	590.90	10	9035.99
25	51.20748874	3769.95	2153.26	1483.68	1100.85	848.45	668.31	10	10034.49
26	56.26178315	4142.05	2374.90	1643.24	1224.79	948.67	751.33	10	11094.97
27	61.59571365	4534.74	2609.31	1812.39	1356.50	1055.47	840.08	10	12218.48
28	67.2135343	4948.33	2856.69	1991.27	1496.13	1168.98	934.65	10	13406.05
29	73.11940561	5383.12	3117.23	2180.06	1643.80	1289.30	1035.17	10	14658.68
30	79.31739982	5839.43	3391.13	2378.89	1799.64	1416.56	1141.72	10	15977.37
31	85.81150573	6317.53	3678.58	2587.92	1963.78	1550.86	1254.41	10	17363.07
32	84.03426948	6186.69	3979.77	2807.28	2136.33	1692.30	1373.34	10	18185.70
33	80.64245049	5936.98	3897.34	3037.13	2317.42	1841.00	1498.59	10	18538.46
34	77.38753323	5697.35	3740.04	2974.22	2507.15	1997.05	1630.27	10	18556.09
35	74.26399201	5467.39	3589.08	2854.18	2455.23	2160.56	1768.46	10	18304.90
36	71.2665242	5246.71	3444.22	2738.98	2356.13	2115.81	1913.25	10	17825.10
37	68.39004117	5034.94	3305.20	2628.43	2261.03	2030.42	1873.63	10	17143.64
38	65.62965971	4831.72	3171.79	2522.34	2169.77	1948.46	1798.00	10	16452.09
39	62.98069367	4636.70	3043.77	2420.53	2082.19	1869.82	1725.43	10	15788.45
40	60.43864608	4449.55	2920.92	2322.83	1998.15	1794.35	1655.79	10	15151.59
41	57.99920145	4269.96	2803.02	2229.08	1917.50	1721.92	1588.96	10	14540.44

42	55.65821849	4097.61	2689.89	2139.11	1840.11	1652.42	1524.82	10	13953.96
43	53.41172307	3932.22	2581.32	2052.77	1765.84	1585.73	1463.28	10	13391.15
44	51.25590143	3773.51	2477.13	1969.91	1694.56	1521.72	1404.22	10	12851.06
45	49.18709378	3621.20	2377.15	1890.40	1626.17	1460.30	1347.54	10	12332.76
46	47.20178803	3475.04	2281.20	1814.10	1560.53	1401.36	1293.15	10	11835.39
47	45.29661385	3334.78	2189.12	1740.88	1497.54	1344.80	1240.96	10	11358.09
48	43.46833693	3200.18	2100.77	1670.61	1437.10	1290.52	1190.87	10	10900.05
49	41.71385354	3071.02	2015.97	1603.18	1379.09	1238.43	1142.80	10	10460.50
50	40.03018518	2947.06	1934.61	1538.47	1323.43	1188.45	1096.68	10	10038.70
51	38.4144736	2828.11	1856.52	1476.38	1270.01	1140.48	1052.41	10	9633.91
52	36.86397591	2713.96	1781.59	1416.79	1218.75	1094.45	1009.93	10	9245.47
53	35.37605992	2604.42	1709.68	1359.60	1169.56	1050.27	969.17	10	8872.71
54	33.94819969	2499.30	1640.67	1304.73	1122.36	1007.88	930.05	10	8514.99
55	32.57797122	2398.42	1574.45	1252.06	1077.05	967.20	892.51	10	8171.70
56	31.26304837	2301.62	1510.90	1201.53	1033.58	928.16	856.49	10	7842.28
57	30.00119887	2208.72	1449.92	1153.03	991.86	890.70	821.92	10	7526.15
58	28.79028056	2119.57	1391.40	1106.49	951.83	854.75	788.74	10	7222.78
59	27.62823773	2034.02	1335.24	1061.83	913.41	820.25	756.91	10	6931.66
60	26.51309766	1951.92	1281.34	1018.97	876.55	787.14	726.36	10	6652.28
61	25.65552427	1888.79	1229.62	977.85	841.17	755.37	697.04	10	6399.83
62	24.96045045	1837.61	1189.85	938.38	807.21	724.88	668.91	10	6176.85
63	24.28420797	1787.83	1157.62	908.03	774.63	695.62	641.91	10	5975.63
64	23.62628662	1739.39	1126.25	883.43	749.58	667.55	616.00	10	5792.19
65	22.98619005	1692.27	1095.74	859.49	729.27	645.95	591.14	10	5623.86
66	22.36343533	1646.42	1066.05	836.21	709.51	628.45	572.02	10	5468.66
67	21.75755263	1601.81	1037.17	813.55	690.29	611.43	556.52	10	5320.77
68	21.16808485	1558.42	1009.07	791.51	671.59	594.86	541.44	10	5176.89
69	20.59458725	1516.19	981.73	770.07	653.39	578.75	526.77	10	5036.90
70	20.03662717	1475.12	955.14	749.20	635.69	563.07	512.50	10	4900.71
71	19.49378366	1435.15	929.26	728.90	618.47	547.81	498.62	10	4768.21
72	18.96564717	1396.27	904.08	709.16	601.71	532.97	485.11	10	4639.30
73	18.45181925	1358.44	879.59	689.94	585.41	518.53	471.96	10	4513.88
74	17.95191224	1321.64	855.76	671.25	569.55	504.48	459.18	10	4391.86
75	17.46554899	1285.83	832.57	653.07	554.12	490.81	446.74	10	4273.14
76	16.99236257	1250.99	810.02	635.37	539.11	477.52	434.63	10	4157.64
77	16.53199598	1217.10	788.07	618.16	524.50	464.58	422.86	10	4045.27
78	16.0841019	1184.13	766.72	601.41	510.29	451.99	411.40	10	3935.95
79	15.64834241	1152.05	745.95	585.12	496.47	439.75	400.26	10	3829.58
80	15.22438876	1120.83	725.74	569.26	483.02	427.83	389.41	10	3726.10
81	14.81192111	1090.47	706.08	553.84	469.93	416.24	378.86	10	3625.42
82	14.41062826	1060.92	686.95	538.84	457.20	404.97	368.60	10	3527.47
83	14.02020746	1032.18	668.34	524.24	444.81	393.99	358.61	10	3432.17
84	13.64036415	1004.22	650.23	510.04	432.76	383.32	348.90	10	3339.46
85	13.27081178	977.01	632.61	496.22	421.04	372.93	339.44	10	3249.25
86	12.91127152	950.54	615.47	482.77	409.63	362.83	330.25	10	3161.49
87	12.56147213	924.79	598.80	469.69	398.53	353.00	321.30	10	3076.11
88	12.2211497	899.73	582.58	456.97	387.73	343.44	312.59	10	2993.04
89	11.89004748	875.36	566.79	444.59	377.23	334.13	304.13	10	2912.22
90	11.56791566	851.64	551.44	432.54	367.01	325.08	295.89	10	2833.60
91	11.25451122	828.57	536.50	420.82	357.07	316.27	287.87	10	2757.10
92	10.94959771	806.12	521.96	409.42	347.39	307.70	280.07	10	2682.67
93	10.65294508	784.28	507.82	398.33	337.98	299.37	272.48	10	2610.26
94	10.36432953	763.03	494.06	387.54	328.82	291.26	265.10	10	2539.81
95	10.08353332	742.36	480.68	377.04	319.91	283.37	257.92	10	2471.28
96	9.810344595	722.25	467.65	366.82	311.25	275.69	250.93	10	2404.59

97	9.544557252	702.68	454.98	356.89	302.81	268.22	244.13	10	2339.72
98	9.285970768	683.64	442.66	347.22	294.61	260.95	237.52	10	2276.60
99	9.034390054	665.12	430.66	337.81	286.63	253.88	231.08	10	2215.19
100	8.789625305	647.10	419.00	328.66	278.86	247.00	224.82	10	2155.45
101	8.55149186	629.57	407.65	319.75	271.31	240.31	218.73	10	2097.32
102	8.319810059	612.51	396.60	311.09	263.96	233.80	212.81	10	2040.77
103	8.094405111	595.92	385.86	302.66	256.81	227.47	207.04	10	1985.75
104	7.87510696	579.77	375.40	294.46	249.85	221.31	201.43	10	1932.22
105	7.702435924	567.06	365.23	286.49	243.08	215.31	195.97	10	1883.14
106	7.545390792	555.50	357.22	278.72	236.49	209.48	190.66	10	1838.08
107	7.391547657	544.17	349.94	272.61	230.09	203.80	185.50	10	1796.11
108	7.240841233	533.08	342.81	267.05	225.04	198.28	180.47	10	1756.73
109	7.093207565	522.21	335.82	261.61	220.45	193.93	175.58	10	1719.60
110	6.948584004	511.56	328.97	256.28	215.96	189.98	171.73	10	1684.48
111	6.806909175	501.13	322.26	251.05	211.56	186.10	168.23	10	1650.33
112	6.668122958	490.91	315.69	245.93	207.24	182.31	164.80	10	1616.89
113	6.532166455	480.90	309.25	240.92	203.02	178.59	161.44	10	1584.13
114	6.398981973	471.10	302.95	236.00	198.88	174.95	158.15	10	1552.03
115	6.268512992	461.49	296.77	231.19	194.82	171.38	154.93	10	1520.59
116	6.140704146	452.08	290.72	226.48	190.85	167.89	151.77	10	1489.79
117	6.015501197	442.87	284.79	221.86	186.96	164.47	148.67	10	1459.62
118	5.892851013	433.84	278.99	217.34	183.15	161.11	145.64	10	1430.06
119	5.772701547	424.99	273.30	212.91	179.41	157.83	142.67	10	1401.11
120	5.655001811	416.33	267.73	208.57	175.75	154.61	139.76	10	1372.75
121	5.539701858	407.84	262.27	204.31	172.17	151.46	136.91	10	1344.96
122	5.426752757	399.52	256.92	200.15	168.66	148.37	134.12	10	1317.74
123	5.316106579	391.38	251.68	196.07	165.22	145.35	131.39	10	1291.08
124	5.207716367	383.40	246.55	192.07	161.85	142.38	128.71	10	1264.96
125	5.101536126	375.58	241.52	188.15	158.55	139.48	126.08	10	1239.37
126	4.997520797	367.92	236.60	184.32	155.32	136.63	123.51	10	1214.31
127	4.895626238	360.42	231.78	180.56	152.15	133.85	120.99	10	1189.75
128	4.795809209	353.07	227.05	176.88	149.05	131.12	118.53	10	1165.70
129	4.698027352	345.87	222.42	173.27	146.01	128.45	116.11	10	1142.13
130	4.602239171	338.82	217.89	169.74	143.04	125.83	113.74	10	1119.05
131	4.508404018	331.91	213.44	166.28	140.12	123.26	111.42	10	1096.44
132	4.416482071	325.15	209.09	162.89	137.26	120.75	109.15	10	1074.29
133	4.326434323	318.52	204.83	159.57	134.46	118.29	106.93	10	1052.59
134	4.238222561	312.02	200.65	156.31	131.72	115.88	104.75	10	1031.33
135	4.15180935	305.66	196.56	153.13	129.04	113.51	102.61	10	1010.51
136	4.06715802	299.43	192.55	150.00	126.41	111.20	100.52	10	990.11
137	3.984232647	293.32	188.63	146.94	123.83	108.93	98.47	10	970.12
138	3.902998042	287.34	184.78	143.95	121.30	106.71	96.46	10	950.55
139	3.823419731	281.48	181.01	141.01	118.83	104.53	94.50	10	931.37
140	3.745463944	275.74	177.32	138.14	116.41	102.40	92.57	10	912.59
141	3.669097599	270.12	173.71	135.32	114.03	100.32	90.68	10	894.18
142	3.594288289	264.62	170.17	132.56	111.71	98.27	88.83	10	876.15
143	3.521004268	259.22	166.70	129.86	109.43	96.27	87.02	10	858.49
144	3.449214436	253.93	163.30	127.21	107.20	94.30	85.25	10	841.19
145	3.378888329	248.76	159.97	124.62	105.01	92.38	83.51	10	824.25
146	3.309996102	243.69	156.71	122.08	102.87	90.50	81.81	10	807.65
147	3.24250852	238.72	153.51	119.59	100.78	88.65	80.14	10	791.38
148	3.176396945	233.85	150.38	117.15	98.72	86.84	78.50	10	775.45
149	3.111633319	229.08	147.31	114.76	96.71	85.07	76.90	10	759.84
150	3.04819016	224.41	144.31	112.42	94.74	83.34	75.34	10	744.56
151	2.986040546	219.84	141.37	110.13	92.80	81.64	73.80	10	729.58

152	2.925158101	215.35	138.49	107.88	90.91	79.98	72.29	10	714.91
153	2.865516989	210.96	135.66	105.68	89.06	78.34	70.82	10	700.53
154	2.807091902	206.66	132.90	103.53	87.24	76.75	69.38	10	686.46
155	2.749858045	202.45	130.19	101.42	85.46	75.18	67.96	10	672.66
156	2.69379113	198.32	127.53	99.35	83.72	73.65	66.58	10	659.15
157	2.638867364	194.28	124.93	97.33	82.01	72.15	65.22	10	645.92
158	2.585063441	190.31	122.39	95.34	80.34	70.68	63.89	10	632.95
159	2.532356527	186.43	119.89	93.40	78.70	69.24	62.59	10	620.25
160	2.480724255	182.63	117.45	91.49	77.10	67.82	61.31	10	607.81
161	2.430144715	178.91	115.05	89.63	75.53	66.44	60.06	10	595.62
162	2.380596442	175.26	112.71	87.80	73.99	65.09	58.84	10	583.68
163	2.33205841	171.69	110.41	86.01	72.48	63.76	57.64	10	571.98
164	2.284510021	168.19	108.16	84.26	71.00	62.46	56.46	10	560.52
165	2.237931097	164.76	105.95	82.54	69.55	61.19	55.31	10	549.30
166	2.192301872	161.40	103.79	80.86	68.14	59.94	54.18	10	538.30
167	2.147602982	158.11	101.67	79.21	66.75	58.72	53.08	10	527.53
168	2.103815458	154.88	99.60	77.59	65.39	57.52	52.00	10	516.98
169	2.06092072	151.73	97.57	76.01	64.05	56.35	50.94	10	506.64
170	2.018900563	148.63	95.58	74.46	62.75	55.20	49.90	10	496.52
171	1.977737156	145.60	93.63	72.94	61.47	54.07	48.88	10	486.60
172	1.93741303	142.63	91.72	71.45	60.21	52.97	47.88	10	476.88
173	1.897911075	139.73	89.85	70.00	58.99	51.89	46.91	10	467.36
174	1.859214525	136.88	88.02	68.57	57.78	50.83	45.95	10	458.04
175	1.82130696	134.09	86.23	67.17	56.61	49.80	45.01	10	448.90
176	1.784172293	131.35	84.47	65.80	55.45	48.78	44.10	10	439.95
177	1.747794766	128.67	82.75	64.46	54.32	47.79	43.20	10	431.19
178	1.712158941	126.05	81.06	63.15	53.21	46.81	42.32	10	422.60
179	1.677249695	123.48	79.41	61.86	52.13	45.86	41.45	10	414.19
180	1.643052215	120.96	77.79	60.60	51.07	44.92	40.61	10	405.94
181	1.609551988	118.50	76.20	59.36	50.02	44.01	39.78	10	397.87
182	1.576734798	116.08	74.65	58.15	49.00	43.11	38.97	10	389.96
183	1.544586718	113.71	73.13	56.97	48.01	42.23	38.17	10	382.22
184	1.513094107	111.40	71.63	55.81	47.03	41.37	37.40	10	374.63
185	1.482243598	109.12	70.17	54.67	46.07	40.53	36.63	10	367.19

5. Debit maksimum Rancangan DAS Sungai Deras AirMata Metode Nakayasu Kala Ulang 50 Tahun

Tabel. 27 Debit maksimum rancangan kala ulang 50 tahun metode nakayasu

t	U (t,1)	Q akibat hujan netto (m³/dt)						Baseflow	Q banjir
		88.724	55.893	42.654	32.21	30.343	26.87		
(jam)	(m³/det/mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m³/det)	(m³/det)
0	0	0.00						10	10.00
1	0.022608797	2.01	0.00					10	12.01
2	0.119329947	10.59	1.26	0.00				10	21.85
3	0.315768256	28.02	6.67	0.96	0.00			10	45.65
4	0.629827235	55.88	17.65	5.09	0.73	0.00		10	89.35
5	1.075983144	95.47	35.20	13.47	3.84	0.69	0.00	10	158.67
6	1.666634848	147.87	60.14	26.86	10.17	3.62	0.61	10	259.27
7	2.412752384	214.07	93.15	45.89	20.29	9.58	3.21	10	396.19
8	3.324248077	294.94	134.86	71.09	34.66	19.11	8.48	10	573.14
9	4.410212136	391.29	185.80	102.91	53.68	32.65	16.92	10	793.26
10	5.67907308	503.87	246.50	141.79	77.71	50.57	28.91	10	1059.36
11	7.138712664	633.38	317.42	188.11	107.07	73.21	44.78	10	1373.98
12	8.796551465	780.47	399.00	242.24	142.05	100.87	64.83	10	1739.46
13	10.6596146	945.76	491.67	304.49	182.92	133.82	89.32	10	2157.99
14	12.73458343	1129.86	595.80	375.21	229.94	172.32	118.50	10	2631.63
15	15.02783711	1333.33	711.77	454.68	283.34	216.61	152.60	10	3162.32
16	17.54548654	1556.71	839.95	543.18	343.35	266.91	191.82	10	3751.91
17	20.29340247	1800.51	980.67	641.00	410.18	323.44	236.36	10	4402.17
18	23.27723921	2065.25	1134.26	748.39	484.05	386.41	286.42	10	5114.77
19	26.50245463	2351.40	1301.03	865.59	565.14	455.99	342.18	10	5891.34
20	29.97432742	2659.44	1481.30	992.87	653.65	532.38	403.80	10	6733.44
21	33.69797197	2989.82	1675.36	1130.44	749.76	615.76	471.45	10	7642.58
22	37.67835133	3342.97	1883.48	1278.52	853.64	706.30	545.28	10	8620.21
23	41.92028859	3719.34	2105.96	1437.35	965.47	804.16	625.46	10	9667.74
24	46.42847698	4119.32	2343.05	1607.13	1085.41	909.51	712.12	10	10786.55
25	51.20748874	4543.33	2595.03	1788.07	1213.62	1022.50	805.41	10	11977.96
26	56.26178315	4991.77	2862.14	1980.36	1350.25	1143.27	905.46	10	13243.26
27	61.59571365	5465.02	3144.64	2184.20	1495.46	1271.99	1012.42	10	14583.73
28	67.2135343	5963.45	3442.77	2399.79	1649.39	1408.78	1126.40	10	16000.58
29	73.11940561	6487.45	3756.77	2627.30	1812.19	1553.79	1247.53	10	17495.03
30	79.31739982	7037.36	4086.86	2866.93	1984.00	1707.15	1375.95	10	19068.24
31	85.81150573	7613.54	4433.29	3118.84	2164.95	1869.00	1511.75	10	20721.36
32	84.03426948	7455.86	4796.26	3383.20	2355.18	2039.46	1655.08	10	21695.04
33	80.64245049	7154.92	4696.93	3660.20	2554.81	2218.66	1806.03	10	22101.56
34	77.38753323	6866.13	4507.35	3584.40	2763.99	2406.73	1964.72	10	22103.31
35	74.26399201	6589.00	4325.42	3439.72	2706.74	2603.78	2131.26	10	21805.92
36	71.2665242	6323.05	4150.84	3300.89	2597.49	2549.85	2305.76	10	21237.88
37	68.39004117	6067.84	3983.30	3167.66	2492.65	2446.93	2258.00	10	20426.38
38	65.62965971	5822.93	3822.52	3039.80	2392.04	2348.17	2166.86	10	19602.33
39	62.98069367	5587.90	3668.24	2917.11	2295.49	2253.39	2079.40	10	18811.54
40	60.43864608	5362.36	3520.18	2799.37	2202.84	2162.44	1995.47	10	18052.66
41	57.99920145	5145.92	3378.10	2686.38	2113.93	2075.16	1914.93	10	17324.42

42	55.65821849	4938.22	3241.75	2577.95	2028.61	1991.40	1837.64	10	16625.57
43	53.41172307	4738.90	3110.90	2473.90	1946.73	1911.02	1763.47	10	15954.93
44	51.25590143	4547.63	2985.34	2374.05	1868.15	1833.89	1692.29	10	15311.35
45	49.18709378	4364.08	2864.85	2278.22	1792.75	1759.87	1623.99	10	14693.75
46	47.20178803	4187.93	2749.21	2186.27	1720.39	1688.84	1558.44	10	14101.08
47	45.29661385	4018.90	2638.25	2098.03	1650.95	1620.67	1495.54	10	13532.33
48	43.46833693	3856.68	2531.76	2013.35	1584.32	1555.26	1435.17	10	12986.54
49	41.71385354	3701.02	2429.58	1932.08	1520.37	1492.48	1377.25	10	12462.78
50	40.03018518	3551.64	2331.51	1854.10	1459.00	1432.24	1321.66	10	11960.15
51	38.4144736	3408.29	2237.41	1779.26	1400.12	1374.44	1268.31	10	11477.82
52	36.86397591	3270.72	2147.10	1707.45	1343.60	1318.96	1217.12	10	11014.95
53	35.37605992	3138.71	2060.44	1638.53	1289.37	1265.72	1167.99	10	10570.76
54	33.94819969	3012.02	1977.27	1572.40	1237.33	1214.64	1120.85	10	10144.51
55	32.57797122	2890.45	1897.47	1508.93	1187.39	1165.61	1075.61	10	9735.46
56	31.26304837	2773.78	1820.88	1448.03	1139.46	1118.56	1032.20	10	9342.91
57	30.00119887	2661.83	1747.39	1389.58	1093.47	1073.42	990.54	10	8966.22
58	28.79028056	2554.39	1676.86	1333.49	1049.34	1030.09	950.55	10	8604.72
59	27.62823773	2451.29	1609.18	1279.67	1006.98	988.51	912.19	10	8257.82
60	26.51309766	2352.35	1544.23	1228.02	966.34	948.61	875.37	10	7924.92
61	25.65552427	2276.26	1481.90	1178.45	927.33	910.33	840.04	10	7624.31
62	24.96045045	2214.59	1433.96	1130.89	889.91	873.58	806.13	10	7359.07
63	24.28420797	2154.59	1395.11	1094.31	853.99	838.32	773.59	10	7119.92
64	23.62628662	2096.22	1357.32	1064.66	826.36	804.49	742.37	10	6901.42
65	22.98619005	2039.43	1320.54	1035.82	803.98	778.47	712.41	10	6700.64
66	22.36343533	1984.17	1284.77	1007.76	782.19	757.37	689.36	10	6515.63
67	21.75755263	1930.42	1249.96	980.45	761.00	736.86	670.69	10	6339.38
68	21.16808485	1878.12	1216.09	953.89	740.39	716.89	652.52	10	6167.90
69	20.59458725	1827.23	1183.15	928.05	720.33	697.47	634.84	10	6001.06
70	20.03662717	1777.73	1151.09	902.90	700.81	678.57	617.64	10	5838.75
71	19.49378366	1729.57	1119.91	878.44	681.82	660.19	600.91	10	5680.83
72	18.96564717	1682.71	1089.57	854.64	663.35	642.30	584.63	10	5527.20
73	18.45181925	1637.12	1060.05	831.49	645.38	624.90	568.79	10	5377.72
74	17.95191224	1592.77	1031.33	808.96	627.89	607.97	553.38	10	5232.30
75	17.46554899	1549.61	1003.39	787.04	610.88	591.50	538.38	10	5090.81
76	16.99236257	1507.63	976.20	765.72	594.33	575.47	523.80	10	4953.16
77	16.53199598	1466.78	949.75	744.98	578.23	559.88	509.61	10	4819.24
78	16.0841019	1427.05	924.02	724.79	562.57	544.71	495.80	10	4688.94
79	15.64834241	1388.38	898.99	705.16	547.32	529.96	482.37	10	4562.18
80	15.22438876	1350.77	874.63	686.05	532.50	515.60	469.30	10	4438.85
81	14.81192111	1314.17	850.94	667.46	518.07	501.63	456.58	10	4318.86
82	14.41062826	1278.57	827.88	649.38	504.03	488.04	444.21	10	4202.12
83	14.02020746	1243.93	805.45	631.79	490.38	474.82	432.18	10	4088.54
84	13.64036415	1210.23	783.63	614.67	477.09	461.95	420.47	10	3978.05
85	13.27081178	1177.44	762.40	598.02	464.17	449.44	409.08	10	3870.54
86	12.91127152	1145.54	741.75	581.82	451.59	437.26	398.00	10	3765.95
87	12.56147213	1114.50	721.65	566.05	439.36	425.42	387.21	10	3664.19
88	12.2211497	1084.31	702.10	550.72	427.45	413.89	376.72	10	3565.19
89	11.89004748	1054.93	683.08	535.80	415.87	402.68	366.52	10	3468.87
90	11.56791566	1026.35	664.57	521.28	404.61	391.77	356.59	10	3375.16
91	11.25451122	998.55	646.57	507.16	393.64	381.15	346.93	10	3283.99
92	10.94959771	971.49	629.05	493.42	382.98	370.83	337.53	10	3195.29
93	10.65294508	945.17	612.01	480.05	372.60	360.78	328.38	10	3108.99
94	10.36432953	919.56	595.43	467.04	362.51	351.01	319.49	10	3025.03
95	10.08353332	894.65	579.29	454.39	352.69	341.50	310.83	10	2943.35
96	9.810344595	870.41	563.60	442.08	343.13	332.24	302.41	10	2863.88

97	9.544557252	846.83	548.33	430.10	333.84	323.24	294.22	10	2786.56
98	9.285970768	823.89	533.47	418.45	324.79	314.48	286.24	10	2711.33
99	9.034390054	801.57	519.02	407.11	315.99	305.96	278.49	10	2638.15
100	8.789625305	779.85	504.96	396.08	307.43	297.68	270.94	10	2566.94
101	8.55149186	758.72	491.28	385.35	299.10	289.61	263.60	10	2497.67
102	8.319810059	738.17	477.97	374.91	291.00	281.76	256.46	10	2430.27
103	8.094405111	718.17	465.02	364.76	283.11	274.13	249.51	10	2364.70
104	7.87510696	698.71	452.42	354.87	275.44	266.70	242.75	10	2300.91
105	7.702435924	683.39	440.16	345.26	267.98	259.48	236.18	10	2242.45
106	7.545390792	669.46	430.51	335.90	260.72	252.45	229.78	10	2188.82
107	7.391547657	655.81	421.73	328.54	253.66	245.61	223.55	10	2138.90
108	7.240841233	642.44	413.14	321.84	248.10	238.95	217.50	10	2091.96
109	7.093207565	629.34	404.71	315.28	243.04	233.72	211.60	10	2047.69
110	6.948584004	616.51	396.46	308.85	238.08	228.95	206.96	10	2005.81
111	6.806909175	603.94	388.38	302.55	233.23	224.28	202.74	10	1965.12
112	6.668122958	591.62	380.46	296.38	228.47	219.71	198.61	10	1925.26
113	6.532166455	579.56	372.70	290.34	223.81	215.23	194.56	10	1886.21
114	6.398981973	567.74	365.10	284.42	219.25	210.84	190.59	10	1847.95
115	6.268512992	556.17	357.66	278.62	214.78	206.54	186.71	10	1810.48
116	6.140704146	544.83	350.37	272.94	210.40	202.33	182.90	10	1773.77
117	6.015501197	533.72	343.22	267.38	206.11	198.21	179.17	10	1737.81
118	5.892851013	522.84	336.22	261.93	201.91	194.16	175.52	10	1702.58
119	5.772701547	512.18	329.37	256.59	197.79	190.21	171.94	10	1668.07
120	5.655001811	501.73	322.65	251.35	193.76	186.33	168.43	10	1634.26
121	5.539701858	491.50	316.08	246.23	189.81	182.53	165.00	10	1601.15
122	5.426752757	481.48	309.63	241.21	185.94	178.81	161.64	10	1568.70
123	5.316106579	471.67	303.32	236.29	182.15	175.16	158.34	10	1536.92
124	5.207716367	462.05	297.13	231.47	178.43	171.59	155.11	10	1505.79
125	5.101536126	452.63	291.07	226.75	174.80	168.09	151.95	10	1475.29
126	4.997520797	443.40	285.14	222.13	171.23	164.66	148.85	10	1445.42
127	4.895626238	434.36	279.33	217.60	167.74	161.31	145.82	10	1416.15
128	4.795809209	425.50	273.63	213.16	164.32	158.02	142.84	10	1387.48
129	4.698027352	416.83	268.05	208.82	160.97	154.80	139.93	10	1359.40
130	4.602239171	408.33	262.59	204.56	157.69	151.64	137.08	10	1331.88
131	4.508404018	400.00	257.23	200.39	154.47	148.55	134.28	10	1304.93
132	4.416482071	391.85	251.99	196.30	151.32	145.52	131.55	10	1278.53
133	4.326434323	383.86	246.85	192.30	148.24	142.55	128.86	10	1252.66
134	4.238222561	376.03	241.82	188.38	145.22	139.65	126.24	10	1227.33
135	4.15180935	368.37	236.89	184.54	142.25	136.80	123.66	10	1202.51
136	4.06715802	360.85	232.06	180.78	139.35	134.01	121.14	10	1178.19
137	3.984232647	353.50	227.33	177.09	136.51	131.28	118.67	10	1154.38
138	3.902998042	346.29	222.69	173.48	133.73	128.60	116.25	10	1131.04
139	3.823419731	339.23	218.15	169.94	131.00	125.98	113.88	10	1108.19
140	3.745463944	332.31	213.70	166.48	128.33	123.41	111.56	10	1085.79
141	3.669097599	325.54	209.35	163.08	125.72	120.89	109.28	10	1063.86
142	3.594288289	318.90	205.08	159.76	123.15	118.43	107.06	10	1042.37
143	3.521004268	312.40	200.90	156.50	120.64	116.01	104.87	10	1021.32
144	3.449214436	306.03	196.80	153.31	118.18	113.65	102.74	10	1000.70
145	3.378888329	299.79	192.79	150.18	115.77	111.33	100.64	10	980.50
146	3.309996102	293.68	188.86	147.12	113.41	109.06	98.59	10	960.72
147	3.24250852	287.69	185.01	144.12	111.10	106.84	96.58	10	941.33
148	3.176396945	281.82	181.23	141.18	108.83	104.66	94.61	10	922.34
149	3.111633319	276.08	177.54	138.31	106.61	102.53	92.68	10	903.74
150	3.04819016	270.45	173.92	135.49	104.44	100.44	90.79	10	885.52
151	2.986040546	264.93	170.37	132.72	102.31	98.39	88.94	10	867.67

152	2.925158101	259.53	166.90	130.02	100.23	96.38	87.13	10	850.18
153	2.865516989	254.24	163.50	127.37	98.18	94.42	85.35	10	833.05
154	2.807091902	249.06	160.16	124.77	96.18	92.49	83.61	10	816.27
155	2.749858045	243.98	156.90	122.23	94.22	90.61	81.90	10	799.83
156	2.69379113	239.00	153.70	119.73	92.30	88.76	80.23	10	783.73
157	2.638867364	234.13	150.56	117.29	90.42	86.95	78.60	10	767.95
158	2.585063441	229.36	147.49	114.90	88.57	85.18	77.00	10	752.50
159	2.532356527	224.68	144.49	112.56	86.77	83.44	75.43	10	737.36
160	2.480724255	220.10	141.54	110.26	85.00	81.74	73.89	10	722.53
161	2.430144715	215.61	138.66	108.02	83.26	80.07	72.38	10	708.00
162	2.380596442	211.22	135.83	105.81	81.57	78.44	70.91	10	693.77
163	2.33205841	206.91	133.06	103.66	79.90	76.84	69.46	10	679.83
164	2.284510021	202.69	130.35	101.54	78.27	75.27	68.04	10	666.17
165	2.237931097	198.56	127.69	99.47	76.68	73.74	66.66	10	652.79
166	2.192301872	194.51	125.08	97.44	75.12	72.23	65.30	10	639.69
167	2.147602982	190.54	122.53	95.46	73.58	70.76	63.97	10	626.85
168	2.103815458	186.66	120.04	93.51	72.08	69.32	62.66	10	614.27
169	2.06092072	182.85	117.59	91.60	70.61	67.91	61.38	10	601.95
170	2.018900563	179.12	115.19	89.74	69.17	66.52	60.13	10	589.88
171	1.977737156	175.47	112.84	87.91	67.76	65.16	58.91	10	578.06
172	1.93741303	171.90	110.54	86.11	66.38	63.84	57.71	10	566.48
173	1.897911075	168.39	108.29	84.36	65.03	62.53	56.53	10	555.13
174	1.859214525	164.96	106.08	82.64	63.70	61.26	55.38	10	544.01
175	1.82130696	161.59	103.92	80.95	62.40	60.01	54.25	10	533.13
176	1.784172293	158.30	101.80	79.30	61.13	58.79	53.14	10	522.46
177	1.747794766	155.07	99.72	77.69	59.89	57.59	52.06	10	512.01
178	1.712158941	151.91	97.69	76.10	58.66	56.41	51.00	10	501.78
179	1.677249695	148.81	95.70	74.55	57.47	55.26	49.96	10	491.75
180	1.643052215	145.78	93.75	73.03	56.30	54.14	48.94	10	481.93
181	1.609551988	142.81	91.84	71.54	55.15	53.03	47.94	10	472.31
182	1.576734798	139.89	89.96	70.08	54.02	51.95	46.96	10	462.88
183	1.544586718	137.04	88.13	68.65	52.92	50.89	46.01	10	453.65
184	1.513094107	134.25	86.33	67.25	51.84	49.86	45.07	10	444.60
185	1.482243598	131.51	84.57	65.88	50.79	48.84	44.15	10	435.74

Tabel. 28 Debit maksimum rancangan kala ulang tahun metode nakayasu

No	2 tahun	5 tahun	10 tahun	25 tahun	50 tahun
	Q banjir	Q banjir	Q banjir	Q banjir	Q banjir
	(m^3/det)	(m^3/det)	(m^3/det)	(m^3/det)	(m^3/det)
1	10.00	10.00	10.00	10.00	10.00
2	10.55	10.95	11.25	11.66	12.01
3	13.23	15.64	17.37	19.83	21.85
4	19.71	26.96	32.16	39.58	45.65
5	31.62	47.77	59.35	75.90	89.35
6	50.58	80.88	102.61	133.66	158.67
7	78.13	129.01	165.50	217.63	259.27
8	115.66	194.58	251.18	332.02	396.19
9	164.21	279.38	361.98	479.96	573.14
10	224.62	384.91	499.88	664.08	793.26
11	297.68	512.54	666.64	886.74	1059.36
12	384.09	663.48	863.86	1150.07	1373.98
13	484.49	838.86	1093.02	1456.04	1739.46
14	599.48	1039.74	1355.49	1806.48	2157.99
15	729.63	1267.09	1652.56	2203.13	2631.63
16	875.48	1521.87	1985.46	2647.61	3162.32
17	1037.54	1804.95	2355.34	3141.48	3751.91
18	1216.28	2117.19	2763.32	3686.21	4402.17
19	1412.18	2459.39	3210.45	4283.21	5114.77
20	1625.68	2832.34	3697.76	4933.86	5891.34
21	1857.20	3236.78	4226.22	5639.46	6733.44
22	2107.18	3673.44	4796.78	6401.26	7642.58
23	2376.00	4143.03	5410.35	7220.50	8620.21
24	2664.05	4646.21	6067.83	8098.36	9667.74
25	2971.71	5183.66	6770.07	9035.99	10786.55
26	3299.36	5756.00	7517.91	10034.49	11977.96
27	3647.33	6363.86	8312.16	11094.97	13243.26
28	4015.99	7007.85	9153.62	12218.48	14583.73
29	4405.67	7688.56	10043.05	13406.05	16000.58
30	4816.70	8406.56	10981.22	14658.68	17495.03
31	5249.41	9162.43	11968.86	15977.37	19068.24
32	5704.10	9956.71	13006.69	17363.07	20721.36
33	5974.04	10428.24	13622.81	18185.70	21695.04
34	6089.79	10630.43	13887.00	18538.46	22101.56
35	6095.58	10640.54	13900.20	18556.09	22103.31
36	6013.16	10496.56	13712.08	18304.90	21805.92
37	5855.72	10221.54	13352.73	17825.10	21237.88
38	5632.11	9830.93	12842.35	17143.64	20426.38
39	5405.19	9434.54	12324.40	16452.09	19602.33
40	5187.43	9054.14	11827.37	15788.45	18811.54
41	4978.45	8689.10	11350.39	15151.59	18052.66
42	4777.92	8338.79	10892.67	14540.44	17324.42
43	4585.47	8002.62	10453.42	13953.96	16625.57
44	4400.79	7680.02	10031.90	13391.15	15954.93

45	4223.57	7370.44	9627.39	12851.06	15311.35
46	4053.50	7073.36	9239.21	12332.76	14693.75
47	3890.30	6788.26	8866.70	11835.39	14101.08
48	3733.68	6514.68	8509.22	11358.09	13532.33
49	3583.38	6252.13	8166.17	10900.05	12986.54
50	3439.15	6000.18	7836.97	10460.50	12462.78
51	3300.74	5758.41	7521.05	10038.70	11960.15
52	3167.92	5526.39	7217.89	9633.91	11477.82
53	3040.46	5303.73	6926.96	9245.47	11014.95
54	2918.14	5090.07	6647.78	8872.71	10570.76
55	2800.77	4885.02	6379.86	8514.99	10144.51
56	2688.12	4688.26	6122.76	8171.70	9735.46
57	2580.03	4499.43	5876.03	7842.28	9342.91
58	2476.30	4318.23	5639.27	7526.15	8966.22
59	2376.75	4144.34	5412.06	7222.78	8604.72
60	2281.22	3977.46	5194.02	6931.66	8257.82
61	2189.55	3817.33	4984.78	6652.28	7924.92
62	2106.71	3672.63	4795.70	6399.83	7624.31
63	2033.54	3544.81	4628.70	6176.85	7359.07
64	1967.52	3429.48	4478.00	5975.63	7119.92
65	1907.33	3324.33	4340.61	5792.19	6901.42
66	1852.09	3227.84	4214.53	5623.86	6700.64
67	1801.16	3138.88	4098.30	5468.66	6515.63
68	1752.64	3054.11	3987.53	5320.77	6339.38
69	1705.43	2971.64	3879.77	5176.89	6167.90
70	1659.49	2891.40	3774.93	5036.90	6001.06
71	1614.80	2813.34	3672.93	4900.71	5838.75
72	1571.32	2737.39	3573.69	4768.21	5680.83
73	1529.02	2663.49	3477.14	4639.30	5527.20
74	1487.87	2591.60	3383.21	4513.88	5377.72
75	1447.83	2521.66	3291.82	4391.86	5232.30
76	1408.88	2453.61	3202.91	4273.14	5090.81
77	1370.98	2387.41	3116.40	4157.64	4953.16
78	1334.10	2323.00	3032.24	4045.27	4819.24
79	1298.23	2260.34	2950.36	3935.95	4688.94
80	1263.33	2199.37	2870.70	3829.58	4562.18
81	1229.37	2140.05	2793.20	3726.10	4438.85
82	1196.34	2082.34	2717.79	3625.42	4318.86
83	1164.20	2026.20	2644.43	3527.47	4202.12
84	1132.93	1971.57	2573.06	3432.17	4088.54
85	1102.50	1918.43	2503.62	3339.46	3978.05
86	1072.91	1866.73	2436.06	3249.25	3870.54
87	1044.11	1816.42	2370.33	3161.49	3765.95
88	1016.09	1767.48	2306.38	3076.11	3664.19
89	988.83	1719.87	2244.17	2993.04	3565.19
90	962.31	1673.54	2183.64	2912.22	3468.87
91	936.51	1628.47	2124.75	2833.60	3375.16
92	911.41	1584.62	2067.46	2757.10	3283.99
93	886.99	1541.96	2011.71	2682.67	3195.29
94	863.23	1500.46	1957.48	2610.26	3108.99
95	840.11	1460.08	1904.72	2539.81	3025.03
96	817.63	1420.79	1853.39	2471.28	2943.35
97	795.74	1382.57	1803.45	2404.59	2863.88
98	774.46	1345.38	1754.86	2339.72	2786.56
99	753.75	1309.21	1707.58	2276.60	2711.33

100	733.60	1274.01	1661.59	2215.19	2638.15
101	713.99	1239.76	1616.85	2155.45	2566.94
102	694.92	1206.44	1573.31	2097.32	2497.67
103	676.36	1174.03	1530.96	2040.77	2430.27
104	658.31	1142.49	1489.75	1985.75	2364.70
105	640.74	1111.81	1449.66	1932.22	2300.91
106	624.64	1083.68	1412.90	1883.14	2242.45
107	609.85	1057.85	1379.15	1838.08	2188.82
108	596.08	1033.79	1347.72	1796.11	2138.90
109	583.16	1011.22	1318.23	1756.73	2091.96
110	570.98	989.94	1290.42	1719.60	2047.69
111	559.45	969.80	1264.11	1684.48	2005.81
112	548.25	950.23	1238.54	1650.33	1965.12
113	537.27	931.06	1213.49	1616.89	1925.26
114	526.52	912.28	1188.95	1584.13	1886.21
115	515.99	893.89	1164.91	1552.03	1847.95
116	505.67	875.86	1141.37	1520.59	1810.48
117	495.57	858.21	1118.30	1489.79	1773.77
118	485.67	840.92	1095.70	1459.62	1737.81
119	475.97	823.97	1073.57	1430.06	1702.58
120	466.47	807.38	1051.88	1401.11	1668.07
121	457.16	791.12	1030.64	1372.75	1634.26
122	448.04	775.19	1009.83	1344.96	1601.15
123	439.11	759.59	989.44	1317.74	1568.70
124	430.36	744.31	969.47	1291.08	1536.92
125	421.79	729.34	949.91	1264.96	1505.79
126	413.40	714.67	930.75	1239.37	1475.29
127	405.17	700.30	911.97	1214.31	1445.42
128	397.12	686.23	893.58	1189.75	1416.15
129	389.22	672.44	875.57	1165.70	1387.48
130	381.49	658.93	857.92	1142.13	1359.40
131	373.92	645.70	840.63	1119.05	1331.88
132	366.50	632.74	823.70	1096.44	1304.93
133	359.23	620.05	807.10	1074.29	1278.53
134	352.11	607.61	790.85	1052.59	1252.66
135	345.13	595.42	774.93	1031.33	1227.33
136	338.30	583.49	759.34	1010.51	1202.51
137	331.61	571.79	744.06	990.11	1178.19
138	325.05	560.34	729.09	970.12	1154.38
139	318.62	549.12	714.43	950.55	1131.04
140	312.33	538.13	700.07	931.37	1108.19
141	306.17	527.36	686.00	912.59	1085.79
142	300.13	516.81	672.21	894.18	1063.86
143	294.21	506.48	658.71	876.15	1042.37
144	288.42	496.35	645.49	858.49	1021.32
145	282.74	486.44	632.53	841.19	1000.70
146	277.18	476.72	619.84	824.25	980.50
147	271.73	467.21	607.40	807.65	960.72
148	266.40	457.89	595.22	791.38	941.33
149	261.17	448.75	583.29	775.45	922.34
150	256.05	439.81	571.60	759.84	903.74
151	251.03	431.04	560.15	744.56	885.52
152	246.12	422.46	548.93	729.58	867.67
153	241.30	414.05	537.94	714.91	850.18
154	236.59	405.81	527.18	700.53	833.05

| 155	231.97	397.74	516.64	686.46	816.27
156	227.44	389.84	506.31	672.66	799.83
157	223.01	382.09	496.19	659.15	783.73
158	218.67	374.50	486.27	645.92	767.95
159	214.41	367.07	476.56	632.95	752.50
160	210.24	359.79	467.05	620.25	737.36
161	206.16	352.66	457.73	607.81	722.53
162	202.16	345.67	448.60	595.62	708.00
163	198.24	338.83	439.66	583.68	693.77
164	194.40	332.13	430.90	571.98	679.83
165	190.64	325.56	422.32	560.52	666.17
166	186.96	319.12	413.91	549.30	652.79
167	183.35	312.82	405.68	538.30	639.69
168	179.82	306.65	397.61	527.53	626.85
169	176.36	300.60	389.71	516.98	614.27
170	172.96	294.67	381.96	506.64	601.95
171	169.64	288.87	374.38	496.52	589.88
172	166.39	283.18	366.95	486.60	578.06
173	163.20	277.61	359.67	476.88	566.48
174	160.07	272.16	352.54	467.36	555.13
175	157.01	266.81	345.56	458.04	544.01
176	154.02	261.58	338.72	448.90	533.13
177	151.08	256.45	332.01	439.95	522.46
178	148.20	251.42	325.45	431.19	512.01
179	145.39	246.50	319.02	422.60	501.78
180	142.63	241.68	312.72	414.19	491.75
181	139.92	236.95	306.54	405.94	481.93
182	137.27	232.33	300.50	397.87	472.31
183	134.68	227.79	294.58	389.96	462.88
184	132.14	223.35	288.77	382.22	453.65
185	129.65	219.00	283.09	374.63	444.60
186	127.21	214.74	277.52	367.19	435.74

5. Grafik Hidrograf

Hidrograf merupakan penggambaran secara grafik variasi debit atau permukaan air menurut waktu. Sedangkan hidrograf satuannya adalah limpasan langsung yang di akibatkan oleh volume hujan efektif, yang terbagi dalam ruang dan waktu.
Hidrograf sendiri merupakan respon dari hujan yang terjadi pada suatu wilayah. Karena sebab itulah untuk masing-masing wilayah atau DAS memiliki bentuk hidrograf yang berbeda tergantung kondisi DAS dan karakteristiknya.
Hidrograf memiliki tiga bagian yang penting, yaitu : bagian naik, bagian puncak, dan bagian turun seperti pada gambar . Hidrograf satuan merupakan penggambaran hujan efektif yang diubah menjadi limpasan langsung di outlet pengeluaran catchment area.

Grafik Hidrograf Debit Banjir Metode Nakayasu

Legend:
- 2 tahun Q banjir (m3/det)
- 5 tahun Q banjir (m3/det)
- 10 tahun Q banjir (m3/det)
- 25 tahun Q banjir (m3/det)
- 50 tahun Q banjir (m3/det)
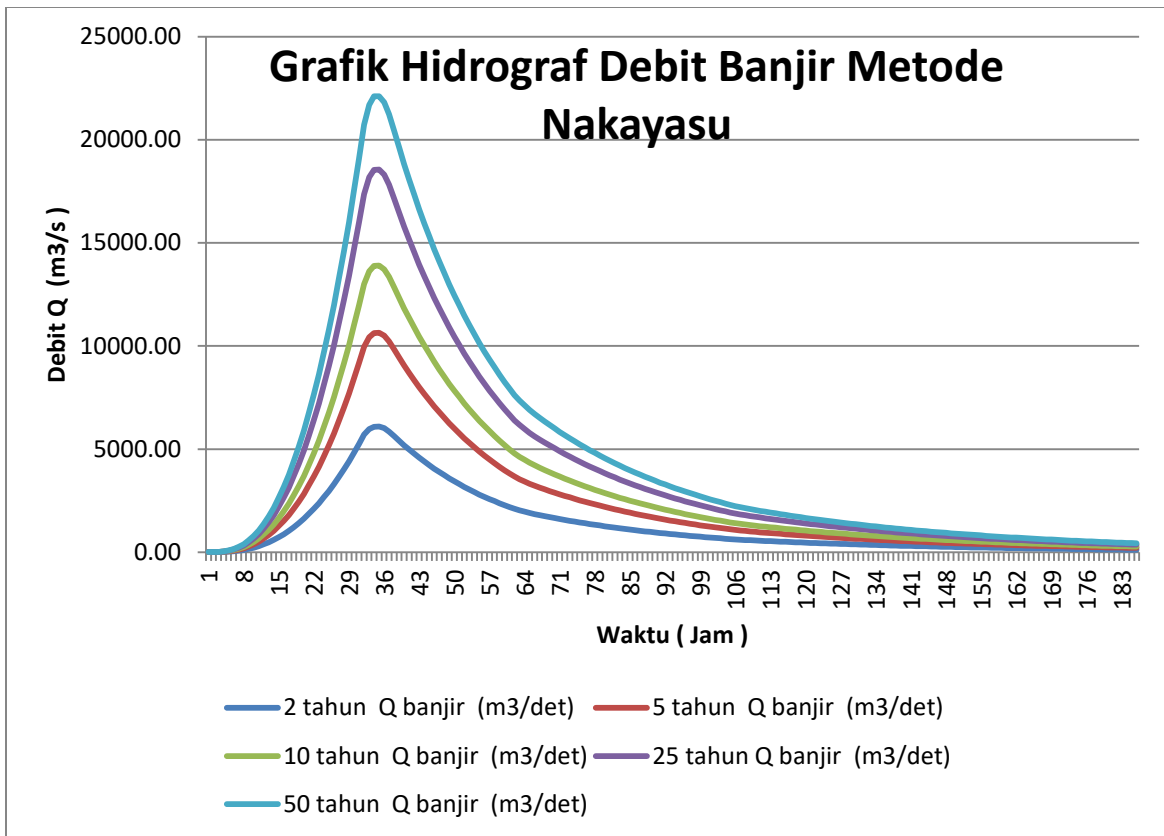
Kesimpulan

Dalam membuat data analisi dapat digunkan metoe gumbel maupun metode log pearson yang keduanya di bandingkan untuk emndapatai data yang memeuni syarat. Hasil analisis curah hujan dapat digunakan untuk membuat Intensitas hujan dengan metode Monobe . Dengan adanya data-data tersebut maka nilai debit maksimal yang terjadi saat hujan maupun banjir dapat diprediksi sejak awal dengan menggunakan metode rasional dan nakayasu . Debit banjir maksimum dapat digunakan untuk perencanaan bangunan air. Pemilihan periode ulang dipengaruhi oleh beberapa factor, diantaranya jenis bangunan air yang direncanakn , karekteristik sungai, jumlah penduduk, periode kejadian bencana. Semua ini direncanakan untuk pembuatan fasilitas infrastruktur air yang memenuhi kriteria di lapangan.