

*SCIENTIFIC ACTIVITIES FOR  
THE AFRICAN NETWORKS OF CENTRES OF EXCELLENCE  
(ACE WATER 2)*

*WEFE NEXUS ASSESSMENT IN THE NIGER-DELTA BASIN,  
SOUTHERN NIGERIA*

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### **Acknowledge**

Special thanks goes to our Vice Chancellor Engr. Prof. F. F. O. Orumwense (FNSE) for his leadership and support. Thanks to our centre leader Prof. Anthony Ebeigbe for his exemplary leadership.

Particular thanks go to the following EU-NEPAD research team members who actively participated in this research project: Dr. A. Rawlings (Mrs), Mr. O. Oriakhi, Miss J. Akpejiori, Mr.N. Uwadia, Mr. Christain Pyerin (Intern of the University of Natural Resources and Life Science Vienna), Mr. Simon Schutze (Intern of Christian-Albrecht University Kiel'Germany) who were assigned to our research coordinator Prof. J. O. Ehiorobo by the International Association for the Exchange of Students for Technical Experience (IAESTE). Your efforts in this research are highly appreciated.

Members of the University of Benin EU-NEPAD group who attended meetings and made useful contributions are gratefully acknowledged; particularly Mr. E. Izilein, Mr. I. Inerhunwa. A. I. Agbonaye, Dr. (Mrs) Ngozi Ihimekpen, Mercy Ekun, Mr. S. O. Oladosu and others.

We are particularly grateful to the following agencies for making data available to us and for the contributions of some of their staff; Nigerian Meteorological Agency (NIMET), Central Bank of Nigeria Meteorological data base, Nigeria Hydrological Service Agency (NIHSA), Benin-Owenna River Basin Authority (BORBA), Niger Delta River Basin Authority (NDRBA) and all others.

Finally, we wish to thank EU-NEPAD for their moral and financial support throughout the research.



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### List of Acronyms

ACE	African Centre of Excellence
ACP	African, Caribbean and Pacific
AGRHYMET	Agriculture, Hydrology Meteorology
AMD	Annual Maximum Discharge
BAU	Business as Usual
BCWSS	Benin City Water Supply System
BORBA	Benin-Owenna River Basin Authority
CCP	Change in Cropping Pattern
CCWY	Climatic Change Water Year
CoE	Centre of Excellence
CTA	Centre for Agriculture
DEM	Digital Elevation Model
DPSIR	Driving Force-Pressure-State-Impact-Response
DSS	Decision Support System
EU	European Union
FFA	Flood Frequency Analysis
GCM	Global Climate Model
IPCC	Intergovernmental Panel on Climate Change
IPGR	Increase in Population Growth Rate



ITD	Inter Tropical Discontinuity
IWRM	Integrated Water Resources Management
IWU	Increase in Water Use
m <sup>3</sup> /s	Cubic metre per second
MINT	Minimum Increase in Temperature
MIT	Maximum Increase in Temperature
mm	Millimetre
NDRBA	Niger Delta River Basin Authority
NEPAD	New Partnership for African's Development
NIHSA	Nigeria Hydrological Agency
NIMET	Nigerian Meteorological Agency
NWRI	National Water Resources Institute
REGWS	Removal of Groundwater Source
RIA	Reduction in Irrigation Area
RIG	Reduction in Groundwater
RIP	Reduction in Precipitation
SSTA	Sea Surface Temperature Anomaly
SWAT	Soil and Water Assessment Tool
WEAP	Water Evaluation and Planning
WEFE	Water, Energy, Food and Ecosystems



## 1.0 Introduction

In line with the AU-NEPAD ACEWATER Phase II scope of work, part of the activities involves carrying out research in Water, Energy, Food and Ecosystems (WEFE) nexus assessment in the Niger Delta Basin of Nigeria covering the area from Lokoja in Kogi State down to where the Niger empties into the Atlantic Ocean. It is in Lokoja that the study area overlaps with the part of the Niger Basin being covered by the National Water Resources Institute, Kaduna, the other CoE in Nigeria.

### 1.1 Aim and Objectives

The aim of the study is to provide baseline data for climate variability analysis, climate risk assessment and WEFE Nexus interdependence evaluation for the creation of scenarios and tools for decision making in respect of water, energy and agricultural management in the lower Niger river basin to improve the living condition of the people.

The objectives include

- a) Collect meteorological and hydrological data for climate variability analysis and risk assessment.
- b) Carry out modelling and simulation of climate variability/change induced events particularly flooding and their impacts on food and water security.
- c) Carry out inventory of dams and reservoirs within the study area and the potentials for their use in meeting water demand, for household and industrial use, agriculture and irrigation, hydropower generation and flood control.
- d) Carry out hydrological analysis and modelling of selected sub catchments for scenarios modelling to determine the impact of land cover / modifications on food and water security.

### 1.2 Scope of Work

The scope of work includes but not limited to the following;

- i) Desk studies to identify the data sources, types of data to be collected, data availability etc.



- ii) Collection of meteorological data including rainfall, temperature, relative humidity etc. from relevant agencies.
- iii) Collection of data on topography, land use/land cover including archival satellite images.
- iv) Collection of data on reservoirs and dams covering the study area.
- v) Modelling and analysis for climate variability and extreme events, hydrology and reservoir management agricultural and water supply and water use.

Although the study area is southern Nigeria, emphasis will be placed on the Niger river Basin from the tributary of the Niger-Benue river down to the Gulf of Guinea where the rivers empties into the Atlantic Ocean.

## 2.0 The Study Area

In the Niger Delta Basin of Nigeria, the catchments of interest are the Benin Owena River Basin and the Niger Delta River Basin. These basins consist of a network of meandering rivers and creeks with Mangrove Swamp and Rain Forest vegetation. The lower Basin of the river Niger flows and discharges through a massive delta known as the Niger Delta into the Gulf of Guinea in the Atlantic Ocean. The extent of the basin covers 42,874 square kilometres and is situated on both sides of the Niger River.

The catchment extent is bounded to the North by Niger state, North West by Edo and Kogi states, South by Rivers and Delta states, and East by Anambra state. It is characterized by wide extreme floodplain formed by rivers Niger, Benue and Anambra (see Figure 1). The study will be confined to downstream of River Niger from the confluence between River Niger and River Benue in Kogi state to the Atlantic Deltaic boundary.

The National Water Resources Institute (NWRI) in Nigeria will be working on the upstream section of the Niger River from the country boundary, to the confluence at Kogi state. Output hydrological results from their analysis especially for the Water sub-component of the NEXUS would be used as an input for the downstream section starting from the River Niger and River Benue confluence to the Niger Delta axis to the Atlantic Ocean which we will be considering. The major area of collaboration between our team and the National water resource institute is in the area of data sharing for analysis.

The major agencies for data collection in Nigeria are the Nigerian Meteorological Agency (NIMET) and the Nigeria Hydrological Science Agency (NIHSA), whose head offices are both located in Abuja the federal capital of Nigeria as well as River Basin Development Authorities

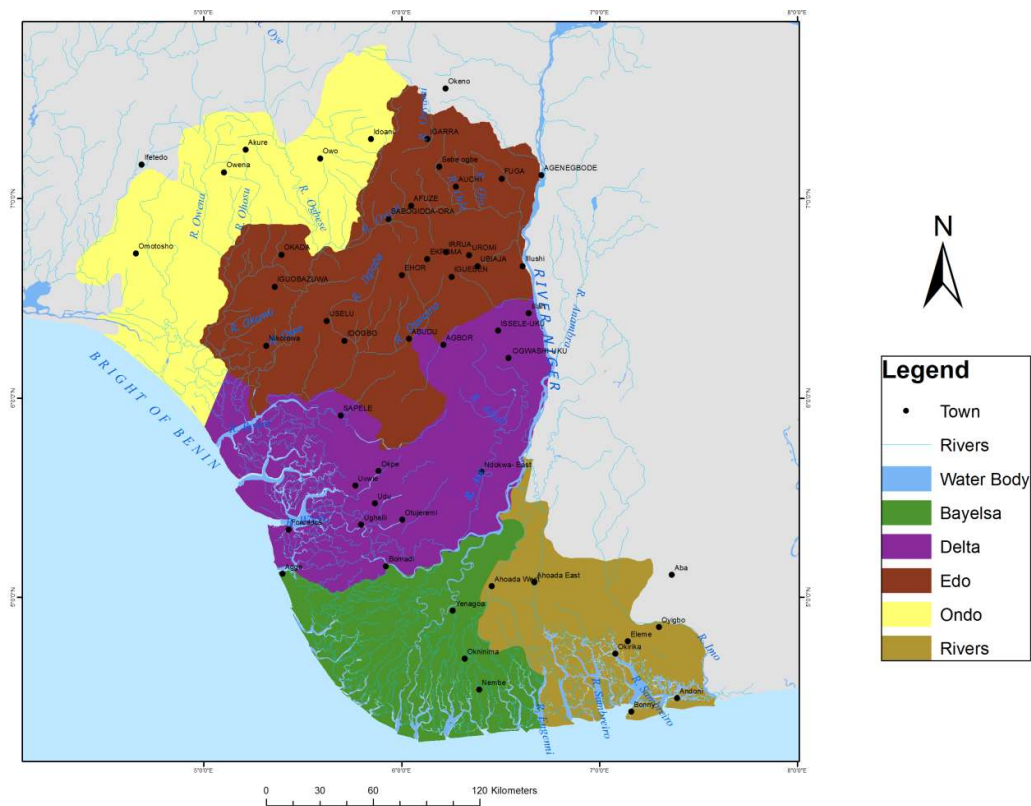




located in different state capitals. Results will be assessed for completeness and reliability by the two teams from Nigeria.

The area of collaboration with AGRHYMET will be to exploit the possibility of filling gaps in data available from local agencies in Nigeria including NIMET and NIHSA. The possibility of acquiring satellite data, and ground observation survey data in respect of hydrology, meteorology and Agriculture will be exploited for possible Drought and Flood modelling, water resources in agriculture and livestock breeding etc.

We intend to collaborate with AGRHYMET and other western African Centers of Excellence (COE) in the development of regional models for hydro-meteorological and crop yield forecasting and water availability for water supply, irrigation and power generation





**Figure 1:** Overview of the Study Area (The flood plain ranges from less than 10meters in the south to 500m above Sea Level in the North).

## 2.1 Climate

The climatic condition around the study area is typically humid tropical climate with high rainfall for most parts of the year and dry harmattan from November to January which accounts for the dense mangrove and rainforest vegetation characterizing the basin. The average annual rainfall is from 1500-2000 mm, temperature range is 22° to 27° during the raining season and between 28° to 35° during dry season.

## 2.2 Hydrology

Nigeria occupies an area of 923,800 square kilometres and 800 square kilometres coastline to the Gulf of Guinea. The surface water resources in the country are grouped into 8 hydrological areas (HAs) while the groundwater resources are also subdivided into 8 hydrogeological areas (HGAs). The study area lies within the Niger-Delta and Benin - Owena River Basin, part of the Lower Niger River Basin Authority and part of Anambra-Imo River Basin (see Fig1). The study area is located in hydrological zone V (see Figure 3) with some overlap into hydrological zone II and III while to the SW and SE, the area overlaps into zones VI and VII respectively.

The Niger Delta and the Benin-Owena River Basins are located partly in hydrological Zones V and VI and comprise of Edo, Delta, Bayelsa, Ondo, Ekiti and Rivers states. For the area within hydrological Zone V, the geology is 90% sedimentary and 10% basement. This area is drained primarily by River Niger, Anambra, Osse, Nun and Forcados rivers. The geology of the areas within Zone VI is 60% basement and 40% sedimentary. Principal rivers within this area include Osse, Ossiomo, Oyan, and Owena. Almost all the Nigerian rivers with the exception of the Chadian system drain into the Gulf of Guinea.

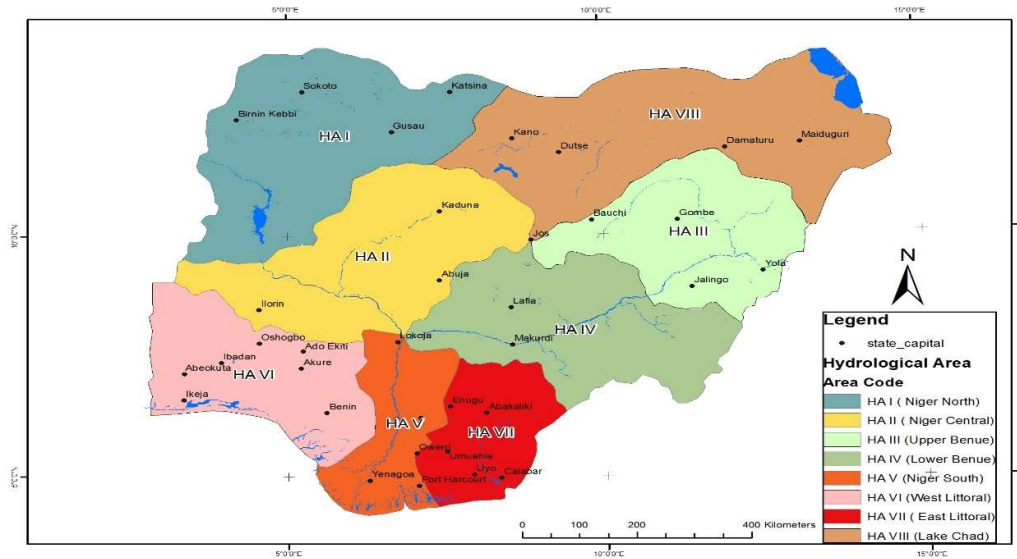
River Niger and Benue have built-up the huge Niger Delta due to the combined action of sea waves and depositional action of the river emptying into the sea. Rivers systems within the proposed study area present rich runoff due to the high annual rainfall from 1500-2000 mm.

The large flood caused by high rainfall intensity often takes place and brings flooding problem in urban areas located in the lower basin. This is particularly the case with coastal towns such as Warri, Port Harcourt, Patani, Forcados, Benin City, Yenegoa etc.

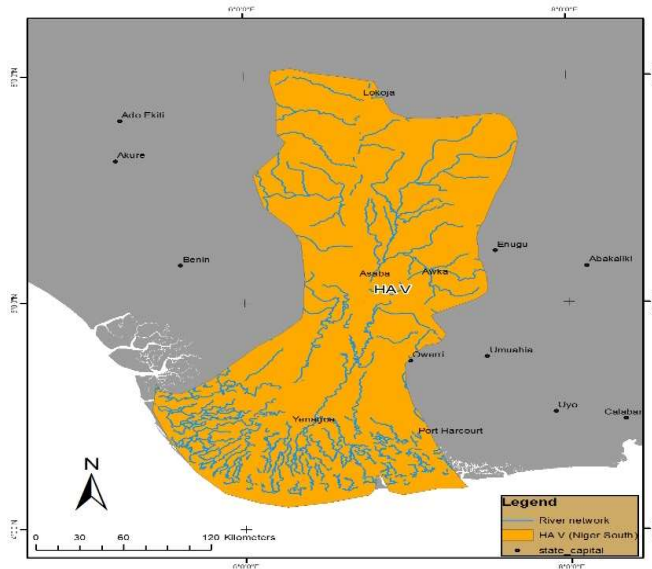
The river's mouth is clogged by transported sediment load from the upstream and a number of lagoons are formed along the coastline. It is to be noted that this is the area in Nigeria where



most of the hydrocarbon exploration and exploitation activities take place and there has been a high level of pollution of both surface and ground water within the study area.



**Figure 2:** Nigeria Hydrological Zones



**Figure 3:** Hydrological Zone V

### 3.0 Meteorological Data Collection and Analysis

#### 3.1 Meteorological Data Collection

The meteorological data that were obtained included Rainfall, Temperature and Relative Humidity, the major sources being:

- Nigerian Meteorological Agency (NIMET).
- Central Bank of Nigeria Meteorological Data Base.

These agencies observe, collate, collect, process and disseminate all meteorological data and information within and outside the country.

#### 3.2 Meteorological Data Processing and Analysis

The data that were gathered (on a monthly basis) including the stations, duration and number of years covered are summarised in Table 1.



**Table 1:** Summary of Meteorological Data in Niger Delta Basin

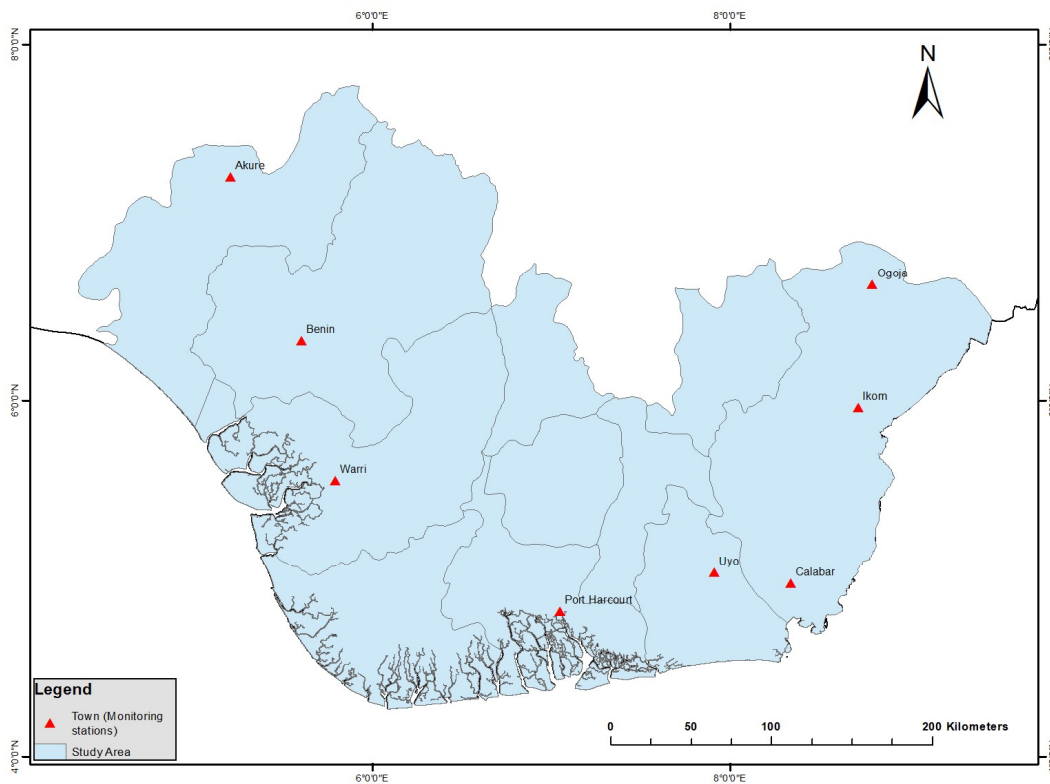
Type of Data	Stations	Latitude (°N)	Longitude (°E)	Duration covered	Number of Years Covered
Rainfall	Akure	7.25	5.19	1981-2016	36
	Benin City	6.35	5.65	1981-2016	36
	Calabar	4.95	8.32	1981-2016	36
	Ikom	5.96	8.71	1981-2016	36
	Lokoja	7.82	6.73	1981-2016	36
	Ogaja	6.65	8.79	1981-2016	36
	Port Harcourt	4.79	7.01	1981-2016	36
	Uyo	5.05	7.93	1981-2016	36
	Warri	5.52	5.75	1981-2016	36
Temperature	Akure	7.25	5.19	1961-2000	40
	Benin City	6.35	5.65	1961-2000	40
	Calabar	4.95	8.32	1980-2010	31
	Warri	5.52	5.75	1961-2000	40
	Port Harcourt	4.79	7.01	1961-2000	40
Relative Humidity	Calabar	4.95	8.32	1980-2010	31
	Port Harcourt	4.79	7.01	1961-2000	40
	Warri	5.52	5.75	1961-2000	40



Only rainfall data were analysed because data were available for more stations, unlike temperature and relative humidity. Rainfall data were analysed in order to evaluate the rainfall seasonality in Niger Delta Basin and these included:

- Assessing the pattern of rainfall distribution in the study area
- Examining the percentage contribution of seasonal rainfall to the total annual rainfall in the study area
- Identifying the causes of the pattern of rainfall distribution in the study area
- Examining rainfall attributes in the study area.

The location of the meteorological stations in which data were available is shown in Figure 4.



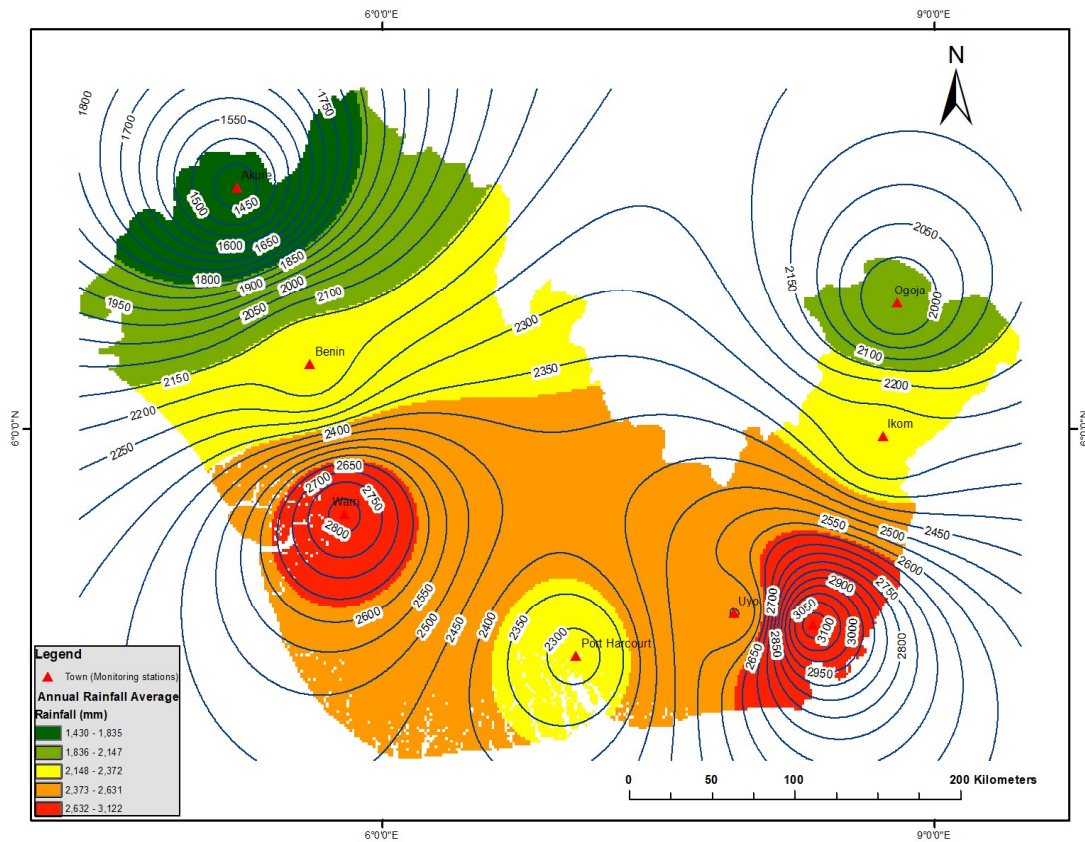
**Figure 4:** Map Showing the Niger Delta Towns with Meteorological Data



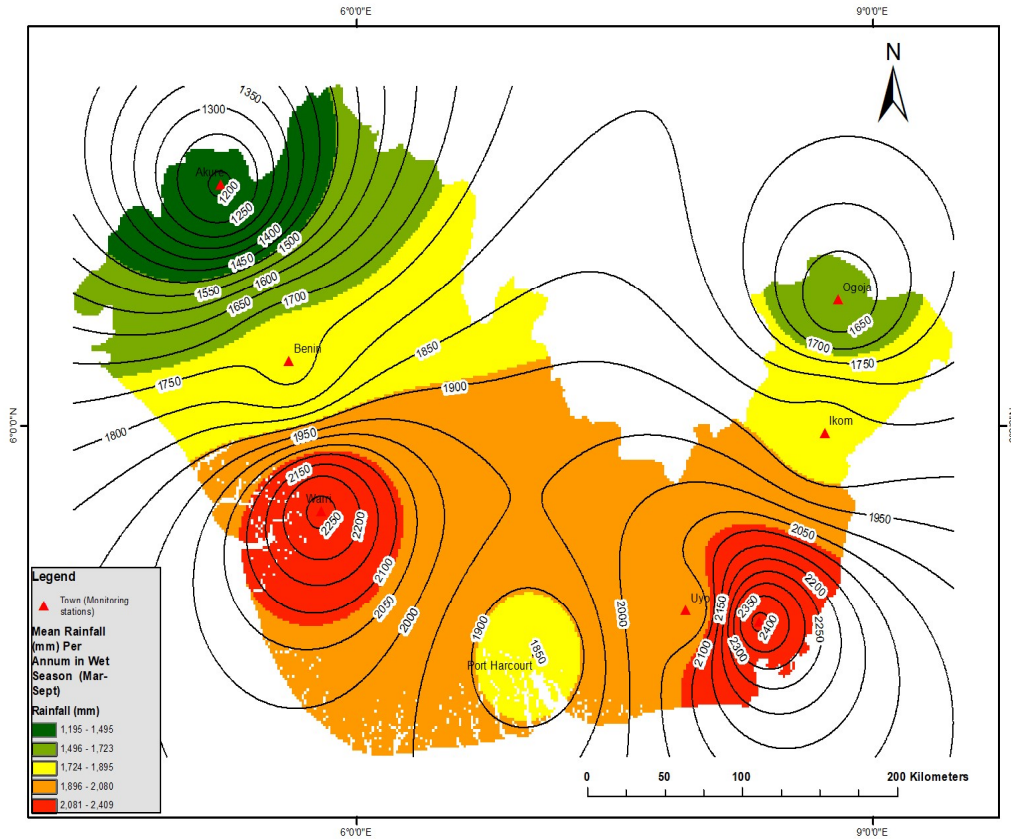


### 3.3 Rainfall Seasonality

Rainfall seasonality is the pattern of distribution of rainfall on monthly basis in a defined geographical area (Ayoade, 1974). The method used to examine rainfall seasonality in the study area involved computing of average monthly and annual rainfall in each of the stations. Percentage of mean was the statistical tool employed for seasonal variation. In this case the mean rainfall figures during the wet season and the dry season months were added to get the wet and dry season totals. The percentages of both the wet and dry season totals in relation to the mean annual totals were calculated. The extent of seasonality period was determined based on Nigeria climatic seasons.



**Figure 5:** Mean Annual Total Rainfall (mm/year) in Niger Delta Basin (1981-2016)



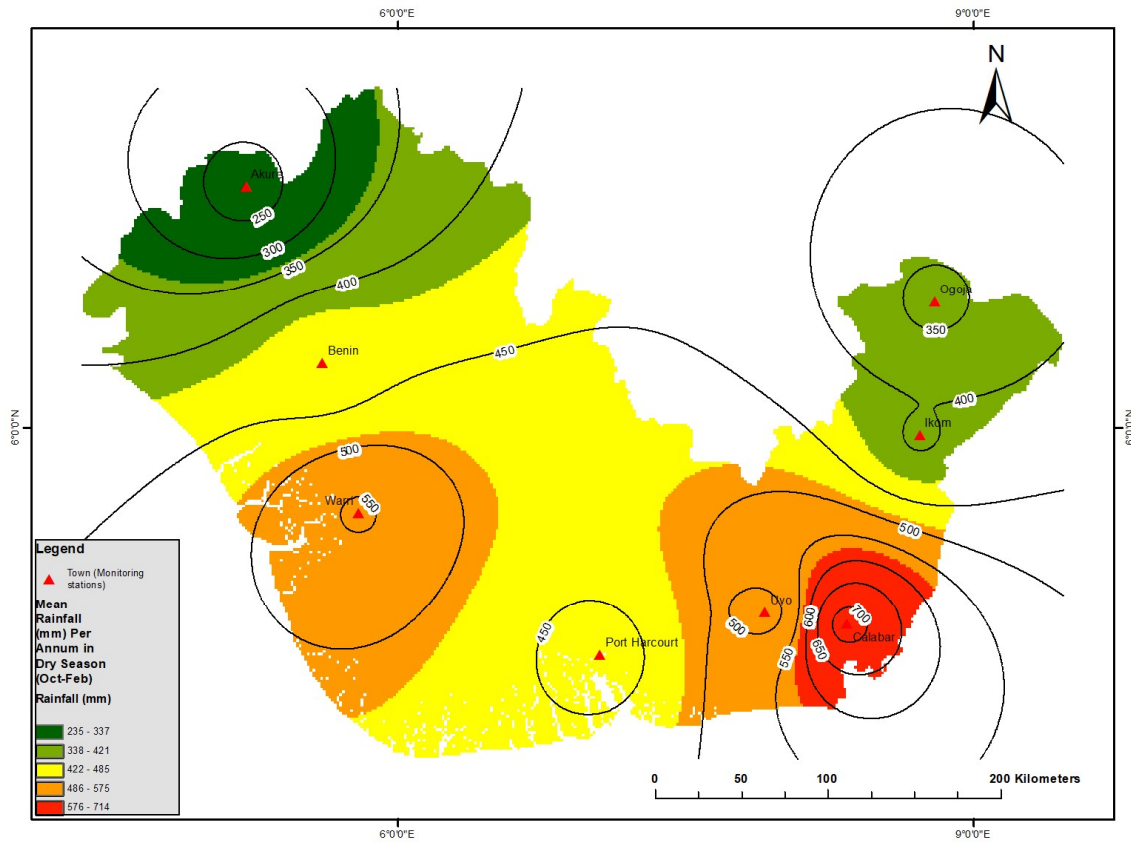
**Figure 6:** Mean Annual Wet Season Rainfall (mm/year) in Niger Delta Basin (1981-2016)

Results (as shown in Figures 5 and 6) indicated a northward increase and then a northward decrease in the mean annual rainfall (mm/year) (from 1981-2016) and the mean wet season rainfall (mm/year) (from 1981-2016). Initially, the increase in the mean annual rainfall was from Ogoja (1955.13 mm and 1613.40mm) to Calabar (3122.81 mm and 2408.56mm) and then the decrease in rainfall was from Uyo (2498.16 mm and 2009.13mm) to Port-Harcourt (2283.61 mm and 1849.43 mm). Thereafter, there was a northward increase in rainfall in Warri (2813.45 mm and 2260.37mm) followed by a sudden decrease from Benin (2171.28 mm and 1738.43 mm) to Akure (1430.04mm and 1194.83 mm). According to Adejuwon (2012), the South-

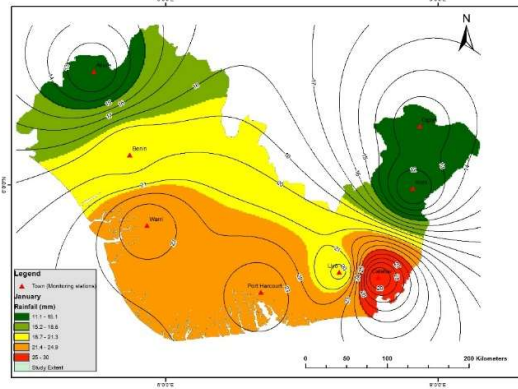




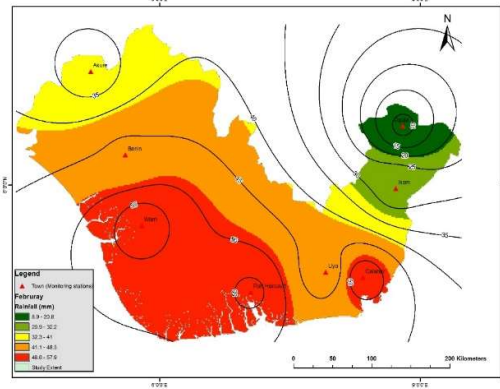
North rate of change in rainfall experienced in the Niger Delta Basin may be attributed to Inter-tropical discontinuity (ITD), which migrates gradually northwards and more rapidly southward through the whole wet season period. Besides ITD, Cameroon mountain may also influence the northward increase in rainfall from Ogoja to Calabar area (Adefolalu, 1983). Relief is another factor that brings about an increase in rainfall when meteorological conditions are favourable (Adejuwon, 2012). Uplift of any air body over high relief affects moist, warm air susceptible to instability and rainfall and as a result of this, relief record maximum influence on rainfall in the wet season. The percentage contribution of mean wet season rainfall (mm/year) (from 1981-2016) to the mean annual rainfall (mm/year) (from 1981-2016) was highest in Akure with 83.55% and lowest in Calabar with 77.13%.



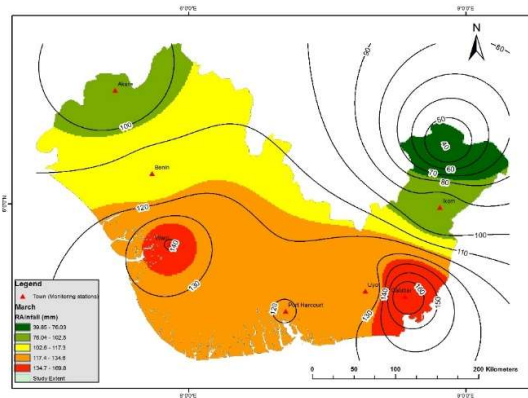
**Figure 7:** Mean Annual Dry Season Rainfall (mm/year) in Niger Delta Basin (1981-2016)



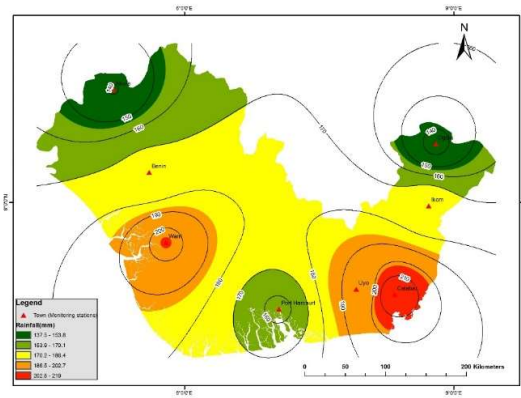
**Figure 8:** Mean January Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)



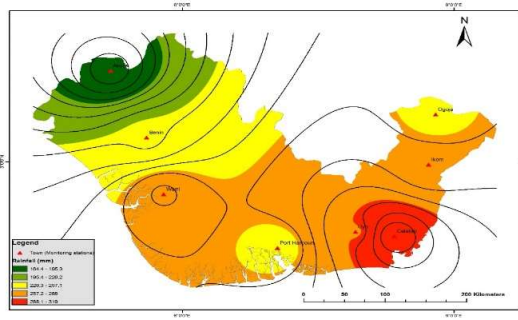
**Figure 9:** Mean February Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)



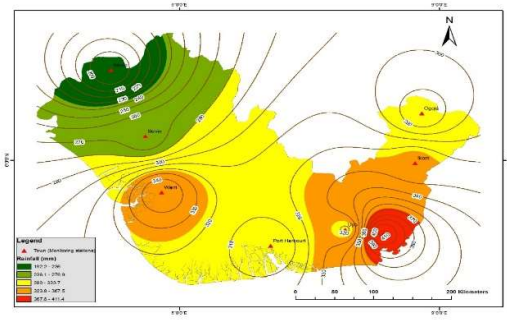
**Figure 10:** Mean March Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)



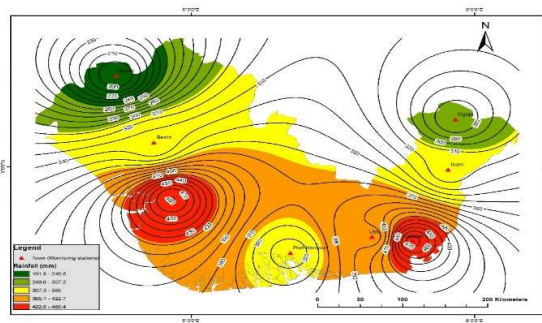
**Figure 11:** Mean April Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)



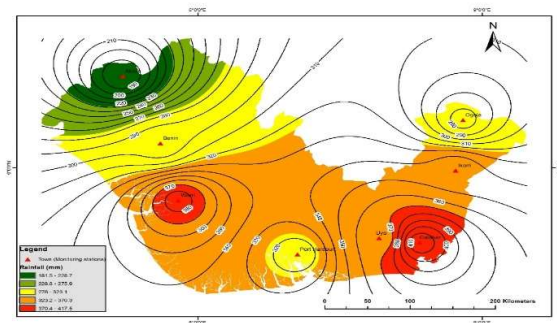
**Figure 12:** Mean May Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)



**Figure 13:** Mean June Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)

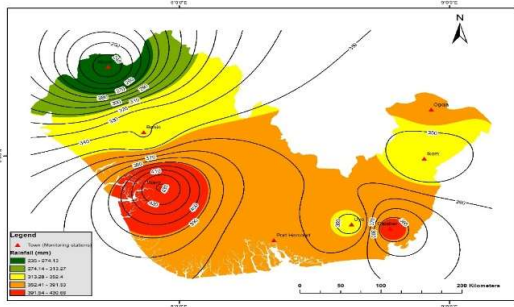


**Figure 14:** Mean July Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)

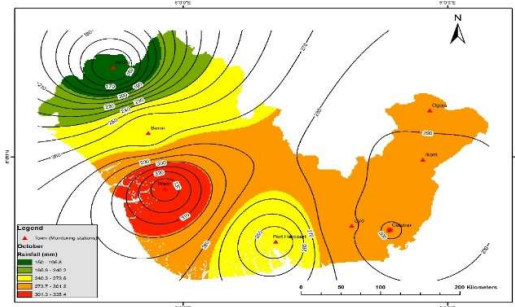


**Figure 15:** Mean August Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)

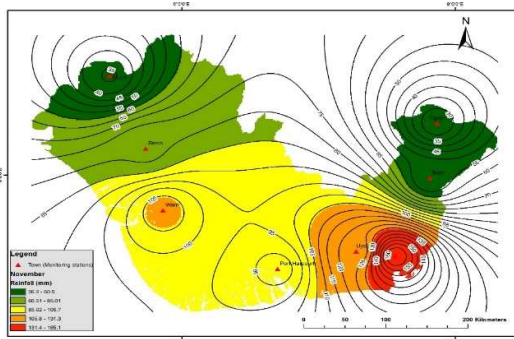




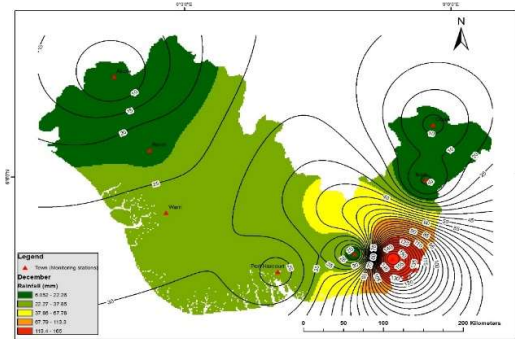
**Figure 16:** Mean September Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)



**Figure 17:** Mean October Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)



**Figure 18:** Mean November Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)

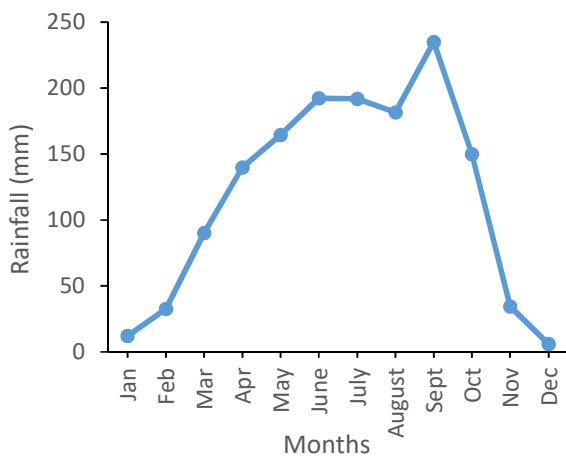


**Figure 19:** Mean December Rainfall (mm) Distribution Pattern in Niger Delta Basin (1981-2016)

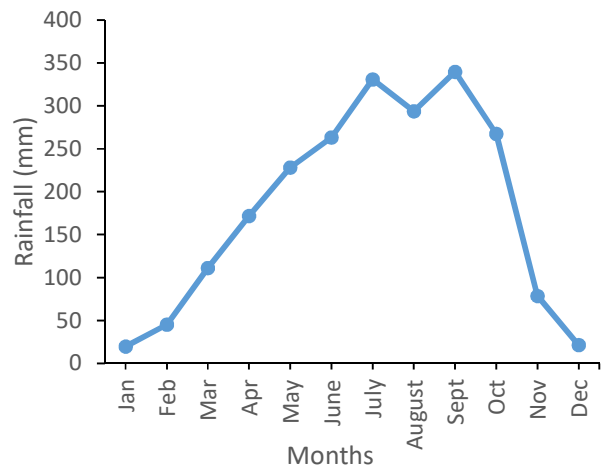
Generally, dry season is characterized by low rainfall. Like the mean annual rainfall and the mean wet season rainfall (from 1981-2016), during the dry season period, results (as shown in Figure 7) indicated that the mean dry season rainfall also increases northward from Ogoja (341.72mm) to Calabar (714.25mm) and then decreases from Uyo (489.025mm) to Port-Harcourt (434.18mm). There was an increase in total dry season rainfall again in Warri



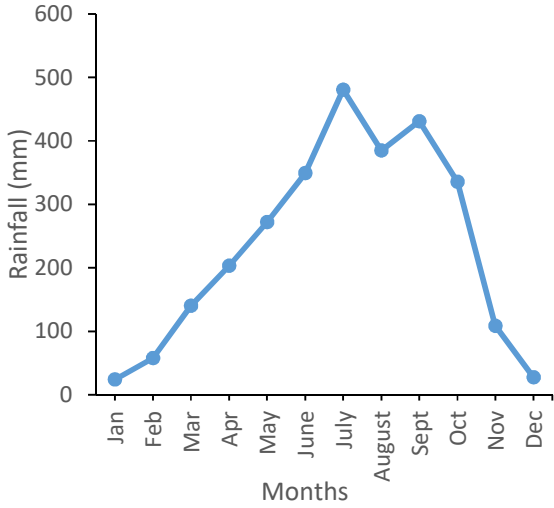
(553.08mm) and then a decrease from Benin (432.84mm) to Akure (235.21mm). Hence, the mean rainfall, the mean wet season rainfall and the mean dry season rainfall indicate a similar rainfall distribution pattern. Akure experiences longer dry season than most of the stations in the region, possibly because of its location at the northern extreme and therefore responsible for the low rainfall amount received at this location during the dry season. The position of the ITD greatly determines the length of the dry season. The ITD is only a few kilometres from the coast in December when the whole region is under the influence of the dry harmattan and only a few showers occur along the coast (Adejuwon, 2012). The seasonal distribution of rainfall (Figure 8 to 19) shows that December and January rainfall are more restricted to the coastal stations like Calabar and Warri. At this period of the year, the ITD is located furthest south and most of the region is covered by the dry tropical continental air mass. By February, the areas receiving rainfall extend inland. The ITD remains in this coastal area until late February to early March when the northward movement begins (Adejuwon, 2012; Gbuyiro and Adefisan, 2007; Obasi, 1965). The percentage contribution of the total dry season rainfall (mm/year) (from 1981-2016) to the mean annual rainfall (mm/year) (from 1981-2016) was highest in Calabar with 22.87% and lowest in Akure with 16.45%.



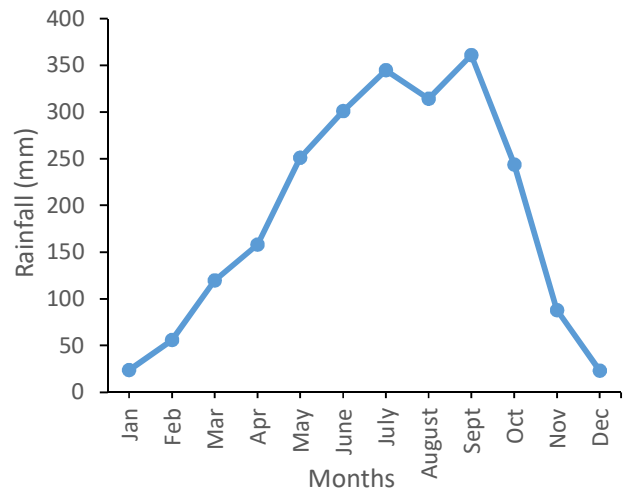
**Figure 20:** Monthly Mean Rainfall(mm/year) Values in Akure (1981-2016)



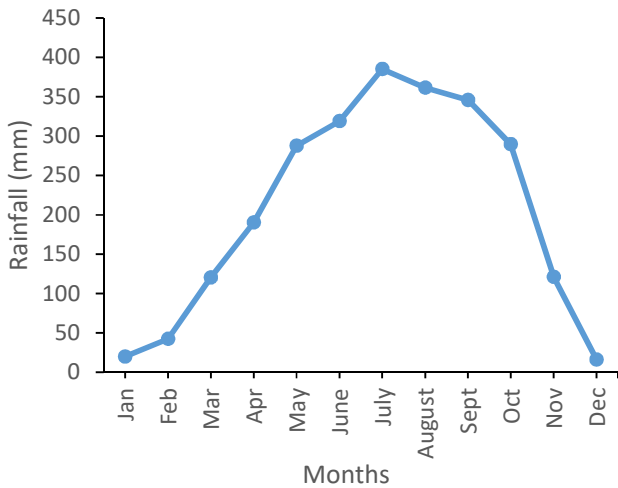
**Figure 21:** Monthly Mean Rainfall (mm/year) Values in Benin City (1981-2016)



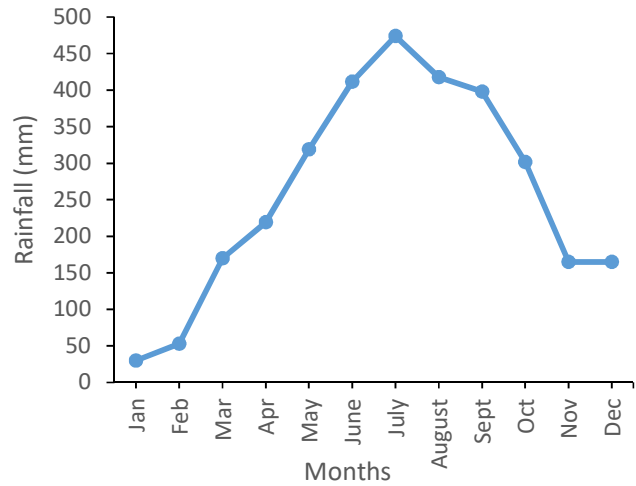
**Figure 22:** Monthly Mean Rainfall (mm/year) Values in Warri (1981-2016)



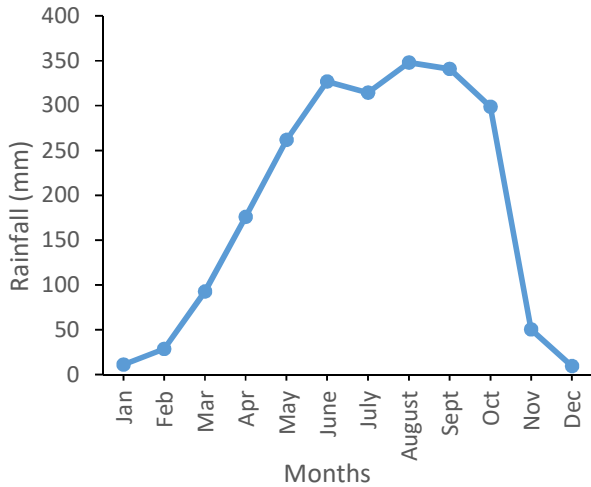
**Figure 23:** Monthly Mean Rainfall (mm/year) Values in Port-Harcourt (1981-2016)



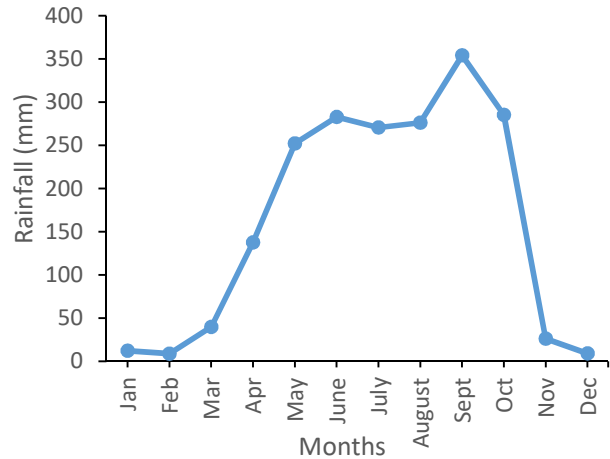
**Figure 24:** Monthly Mean Rainfall (mm/year) Values in Uyo (1981-2016)



**Figure 25:** Monthly Mean Rainfall (mm/year) Values in Calabar (1981-2016)



**Figure 26:** Monthly Mean Rainfall (mm/year) Values in Ikom (1981-2016)



**Figure 27:** Monthly Mean Rainfall (mm/year) Values in Ogoja (1981- 2016)

From Figure 20 to 27, results indicated that the monthly mean rainfall (mm/year) in the Niger Delta Basin (1981-2016) was lowest in December and January which is in accordance with previous work done by Adejuwon (2012). There was a monotonic increase in rainfall at all stations until August when there is a modest general reduction in the amount of rainfall except for Ikom and Ogoja. The reduction may be attributed to the little dry season (July-August rainfall) at this period. July/ September marks the peak period of rainfall in all stations. In September there was an increase in rainfall in all stations followed by a general decrease till December. By this time, the whole Niger Delta Basin is under the influence of the dry harmattan air from the Sahara Desert. Hence, the climate of Niger Delta Basin is characterised as seasonal with a short dry season. The location of the ITD is at the coast. Beside these factors, other dominant factors controlling rainfall in the Niger Delta Basin include sea surface temperature anomaly (SSTA), and the local factors. According to Palmer (1986), the SSTA arises from the warming of the Tropical Atlantic Ocean south of the ITD and therefore leads to the weakening of the pattern of circulation of the atmosphere over the tropics. The weakened circulation reduces the intensity of the southwest monsoon flow into West and Central Africa and, consequently the rainfall over southern Nigeria (Bello, 2008). Local features also influence





rainfall in the Niger Delta Basin. Heavy rainfall would be expected during wet season because the coast is crossed obliquely by rain bearing wind (Adejuwon, 2012).

### **3.4 Impact of Rainfall Seasonality on Agriculture**

Climate change has altered not only the overall magnitude of rainfall but also its seasonal distribution and inter-annual variability worldwide (Feng et al., 2013; Easterling, 2000; Zeng et al., 1999). In the tropics, seasonal rainfall has distinctly shaped a mosaic of highly diverse ecosystem from the tropical dry forests to open woodland forests to savannahs (Dirzo, 2011), that support species with a variety of adaptive strategies. Most of these ecosystems are extremely sensitive not only to the annual rainfall amount but also to other aspects of seasonal rainfall such as the arrival of rain at the beginning of the wet season, which determines the timing of important life stages such as leaf flushing and flowering; and the wet season length, which contributes to the timing of leaf fall and thus the total transpiration period (Borchert, 1994 and Schwartz, 2003). The same rainfall seasonality, with its associated drought and flood risks, also poses huge challenges to local populations, making agricultural efforts and sustainable management of soil and water resources more difficult (Rockstrom et al., 2003 and Wani, et al., 2009).

According to Bewket (2009), in Sub-Saharan Africa, rainfall is the most important climatic factor influencing the growth characteristics of crops. Rainfall provides the water that serves as a medium through which nutrients are transported for crop development. In view of this significant role, clearly, inadequate water supply has adverse effects on efficient crop growth, resulting in low productivity. Von Braun (1991), has observed that a 10% decrease in seasonal rainfall from the long-term average generally translates into a 4.4% decrease in food production. Also, Wood (1977), and Pankhurst and Johnson (1988), have observed that food shortages and famines in sub-Saharan Africa are mostly a result of rainfall uncertainties and associated drought. Considering that the farmers in the Niger Delta Region rely solely on rain-fed agriculture, crop production is vulnerable to rainfall variability. Extreme variations to agro-climatic conditions, such as droughts and floods could directly affect the livelihood of the people in the region.

The Niger Delta area of Nigeria, which contains one of the highest concentrations of biodiversity on the planet, in addition to supporting abundant flora and fauna, arable terrain that can sustain a wide variety of crops, agricultural trees, and more species of freshwater fish than any ecosystem in West Africa, could experience a loss of about 40% of its inhabitable terrain in the next thirty years (Finance and Development (F&D), 2008). This perceived situation can be attributed to unfavourable farm practices found in the area among other factors (including the carelessness of oil industries in oil spillage, natural gas flaring, over exploitation



of natural resources and natural disaster like flooding). As majority of the people living in the Niger Delta are farmers and fishermen, the environmental and social consequences of climate change is putting livelihoods at serious risks.

According to IPCC (2007b) recent studies indicate that increased frequency of heat stress, droughts and floods negatively affect crop yields and livestock beyond the impacts of mean climate change, creating the possibility for surprises, with impacts that are larger, and occurring earlier, than predicted using changes in mean variables alone. This is especially the case for subsistence sectors at low latitudes. According to Technical Centre for Agriculture and Rural Cooperation, CTA (2008) the principal impacts of climate change on cropping systems which has direct effect on food production include:

- Reduced production due to changing rainfall pattern
- Emerging diseases, pests and vectors
- Spatial redistribution of pests and

The impacts of climate change are not limited to cropping and agro-pastoralism, it is being felt on fisheries and aquaculture. There is need to focus on the impact on fisheries ecosystems and the food and nutritional security and livelihoods of fish dependent communities. In African, Caribbean and Pacific (ACP) countries, fishing communities are impoverished and ill-prepared to adapt to the negative impacts of climate change. According to CTA (2008) the main impacts of climate change on fisheries and aquaculture include:

- Disturbances in fish fertility;
- Increased mortality among young fish due to rising water temperatures, particularly in lagoons and rivers;
- Effects of strong salinity in these surroundings exacerbated by the penetration of sea water that seriously affects fishery resources and already fragile ecologies; and
- Frequent fish migration into deep water.

Hence, evaluating rainfall seasonality will be useful for agricultural planning.

#### **4.0 Hydrological Data Collection and Analysis**

##### **4.1 Hydrological Data Collection**

River discharge data were obtained from Nigeria Hydrological Service Agency (NIHSA), Benin-Owenna River Basin Authority (BORBA) and Niger Delta River Basin Authority



(NDRBA) and they included daily stream flow measurement obtained from the different gauge stations.

#### 4.2 Hydrological Data Processing and Analysis

The stations with hydrological data are shown in Table 2.

**Table 2:** Summary of River Discharge Data in Niger Delta Basin

Type of Data	Gauging Stations	Rivers	Latitude (°N)	Longitude (°E)	Duration covered	Number of Years Covered
Discharge	Benin City	Ikpoba	6.35	5.65	1989-2000	12
	Ologbo	Ossiomo	6.05	5.67	1989-2000	12
	Owena	Owena	7.20	5.02	1989-2000	12
	Onitsha	Niger	6.17	6.75	1960-2014	55
	Lokoja	River Niger	7.82	6.73	1960-2013	54
	Ossisa	Adofi	5.92	6.47	1989-1997	9
	Ugbonoba	Okhuwan	6.19	5.51	1989-2008	20
	Owan	Owan	6.77	5.77	1989-1999	11

Daily stream flow measurement obtained from the different gauge stations (Lokoja, Onitsha and Ugbonoba) were analysed. The data were used for flood frequency analysis, hence estimation of extreme flood discharge of known return period is paramount in the design of hydraulic structures such as culverts, dams, bridges and drainage systems. Owing to the stochastic nature of the hydrologic phenomena that governs extreme flood discharge, it is fundamental that we investigate most hydrologic processes such as rainfall and droughts by simply analysing their records of observations (Ehiorobo and Izinyon, 2013). Effective analysis and determination of extreme flood discharge requires the use of statistical frequency analysis or fitting of probability distribution models to the series of recorded annual maximum discharge



(AMD) (Sharma and Singh, 2010). One of the widely used statistical frequency analysis methods is univariate frequency analysis technique. Univariate frequency analysis is widely used for analyzing hydrologic data, including rainfall characteristics, peak discharge series and low flow record of observations. Univariate frequency analyses are primarily employed in the estimation of exceedance probabilities and variable magnitudes. The basic assumption is that the data to be used must be satisfactorily homogeneous, otherwise the estimated probabilities or variable magnitude will be inaccurate (Sharma and Singh, 2010). The versatility of statistical frequency analysis makes it the most commonly used procedure for the analysis of flood data. Due to its wide application in the analysis of flood data, univariate statistical frequency analysis is sometime designated flood frequency analysis (FFA).

### 4.3. Flood Frequency Analysis

The flood frequency analysis was carried out by employing three probability distribution models namely; Generalized Extreme Value (GEV), Generalized Logistic (GLO) and Generalized Pareto (GPA) distribution all of which have three parameters each. The parameters of the distributions were estimated using the *L*-moment method. The annual maximum discharge data at each location were ranked in ascending order of magnitude and the corresponding probability weighted moments ie  $b_0$ ,  $b_1$ ,  $b_2$  and  $b_3$  for the sample data were computed using the following equations:

$$b_0 = \frac{1}{N} \sum_{j=1}^n X_{(j:n)} \quad (1)$$

$$b_1 = \frac{1}{N} \sum_{j=2}^n X_{(j:n)} \left[ \frac{(j-1)}{(n-1)} \right] \quad (2)$$

$$b_2 = \frac{1}{N} \sum_{j=3}^n X_{(j:n)} \left[ \frac{(j-1)(j-2)}{(n-1)(n-2)} \right] \quad (3)$$

$$b_3 = \frac{1}{N} \sum_{j=4}^n X_{(j:n)} \left[ \frac{(j-1)(j-2)(j-3)}{(n-1)(n-2)(n-3)} \right] \quad (4)$$

where

$X_{(j)}$  represents the ranked annual maximum discharge series in which  $X_{(1)}$  is the smallest stream flow data and  $X_{(n)}$  is the largest. The samples estimates of the *L*-moment (i.e.  $\lambda_1, \lambda_2, \lambda_3$  and  $\lambda_4$ ) were computed by replacing  $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  of equations 5, 6, 7 and 8 with  $b_0, b_1, b_2$  and  $b_3$  respectively.

$$\lambda_1 = L_1 = b_0 \quad (5)$$



$$\lambda_2 = L_2 = 2b_1 - b_0 \quad (6)$$

$$\lambda_3 = L_3 = 6b_2 - 6b_1 + b_0 \quad (7)$$

$$\lambda_4 = L_4 = 20b_3 - 30b_2 + 12b_1 - b_0 \quad (8)$$

The corresponding L-moment ratios (L-CV, L-Skewness and L-kurtosis ) are described as follows:

- $L\text{-CV}$  (Coefficient of variability) =  $\tau_2$
- $L\text{-Skewness}$  =  $\tau_3$
- $L\text{-kurtosis}$  =  $\tau_4$

$L\text{-CV}$  is a dimensionless measure of variability. For a distribution or sample data that only has positive values,  $L\text{-CV}$  is normally in the range of  $0 < L\text{-CV} < 1$ . Negative values of  $L\text{-CV}$  are possible if the at-site mean has negative value. The descriptions of the relative magnitude of variability used is presented in Table 3.

**Table 3:** Magnitude of  $L\text{-CV}$

Range of $L\text{-CV}$	Description of Relative Magnitude of $L\text{-CV}$
$0.000 < L\text{-CV} < 0.025$	Minimal variability
$0.025 < L\text{-CV} < 0.075$	Minor variability
$0.075 < L\text{-CV} < 0.15$	Moderate variability
$0.015 < L\text{-CV} < 0.400$	Large variability
$0.400 < L\text{-CV}$	Very large variability

$L\text{-Skewness}$  is a dimensionless measure of asymmetry, which may take on positive or negative values. For a distribution or sample data,  $L\text{-skewness}$  is in the range of  $0 < L\text{-skewness} < 1$  (Bayliss and Reed, 2001). The descriptions of the relative magnitude of asymmetry used is presented in Table 4.

**Table 4:** Relative Magnitude of Asymmetry.

Range of $L\text{-Skewness}$	Description of Relative Magnitude of $L\text{-Skewness}$
$L\text{-CV} = 0.0$	Symmetrical distribution
$0.000 < L\text{-skewness} < 0.050$	Minor skewness
$0.05 < L\text{-skewness} < 0.150$	Moderate skewness
$0.015 < L\text{-skewness} < 0.300$	Large skewness
$0.300 < L\text{-skewness}$	Very large skewness



*L*-Kurtosis refers to any measure of peakedness of the probability distribution of a real valued random variable. The parameters ( $\tau_2, \tau_3, \tau_4$ ) were computed using the equation below (Hosking and Wallis, 1997; Gubareva and Gartsman, 2010).

$$\tau_2 = \frac{\lambda_2}{\lambda_1} = \frac{L_2}{L_1} \quad (9)$$

$$\tau_3 = \frac{\lambda_3}{\lambda_2} = \frac{L_3}{L_2} \quad (10)$$

$$\tau_4 = \frac{\lambda_4}{\lambda_2} = \frac{L_4}{L_2} \quad (11)$$

Three probability distribution models: Generalized Extreme Value (GEV), Generalized Logistic (GLO) and Generalized Pareto (GPA) distribution selected for the study were fitted to the observed annual maximum discharge data. The probability distribution models, their quantile functions and the equations for estimating their parameters by the method of *L*-moments is presented in Table 5.

**Table 5:** L-Moment parameter estimates for selected probability distributions (Sabri *et. al*,2011)

Distribution	Quantile Function	Parameter Estimates
<b>GEV</b>	$X(F) = \xi + \frac{\alpha}{K} \{1 - (-\ln F)^k\}$	$\alpha = \frac{l_2 K}{\Gamma(1+K) \Gamma(1-2^{-K})}$ $\xi = l_1 + \frac{\alpha (\Gamma(1+K)-1)}{K}$ $K = 7.8590C + 2.9554 C^2$ $C = \frac{2}{3+\tau_3} - \frac{\ln 2}{\ln 3}$
<b>GLO</b>	$X(F) = \xi + \frac{\alpha}{K} \left\{1 - \left(\frac{1-F}{F}\right)^K\right\}$	$\alpha = \frac{l_2}{\Gamma(1+k) \Gamma(1-k)}$ $\xi = l_1 + \frac{(l_2 - \alpha)}{K}$ $K = -\tau_3$
		$\alpha = l_2 [(K+1)(K+2)]$



GPA	$X(F) = \xi + \frac{\alpha}{K} \{1 - (1 - F)^K\}$	$\xi = l_1 - l_2 (K + 2)$ $K = \frac{4}{\tau_3 + 1} - 3$
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The adequacies of the fitted probability distribution models were evaluated by the use of four (4) goodness of fit (GOF) criteria namely: Root Mean Square Error (RMSE), Relative Root Mean Square (RRMSE), Mean Absolute Deviation Index (MADI), Maximum Absolute Error (MAE). The definitions of the goodness of fit criteria are presented in Table 6.

**Table 6:** Definitions of Goodness of fit statistics

S/N	TEST	ABBREVIATIONS	MATHEMATICAL EQUATIONS
1	Root Mean Square Error	RMSE	$RMSE = \left( \frac{\sum (x_i - y_i)^2}{(n - m)} \right)^{\frac{1}{2}}$
2	Relative Root Mean Square Error	RRMSE	$RRMSE = \left( \frac{\sum \left( \frac{x_i - y_i}{x_i} \right)^2}{(n - m)} \right)^{\frac{1}{2}}$
3	Mean Absolute Deviation Index	MADI	$MADI = \frac{1}{N} \sum_{i=1}^N \left  \frac{x_i - y_i}{x_i} \right $
4	Maximum Absolute Error	MAE	$MAE = \max  (x_i - y_i) $

Flood frequency analysis focused on the following stations; River Niger at Lokoja, River Niger at Onitsha and Okhuwan at Ugonoba, the results obtained in the previous study by Izinyon and Ehiorobo (2014) was adopted for Okhuwan at Ugonoba. For each of data availability, the maximum discharge was determined. The time series are not fully complete as they present missing data. Where the number of missing values exceeds 20 percent of the number of daily data in a year, it is considered that it is not reasonable to compute the maximum for that year and thus considered as missing data. Consequently, the two-time series of annual maxima of





River Niger at Lokoja and River Niger at Onitsha is 44 years and 24 years respectively after removal of all missing values.

The descriptive statistics of the annual maximum series of the observed discharge data are given in Table 7.

**Table 7:** Descriptive statistics of Annual Maximum series of Daily discharge data

Gauging station	Mean ( $\bar{X}$ )	Standard deviation (S)	Skewness Coefficient (G)	Coefficient of Variation ( $S/\bar{X}$ )
Lokoja	18756.06	3632.70	-0.1721	0.1937
Onitsha	18,365	4087.57	0.1993	0.2226

The probability weighted moments (PWMs) and *L*-moments and *L*-moment ratios for each sample data were computed using MS- EXCEL programming and the results are presented in Tables 8 and 9 respectively.

**Table 8:** Computed sample probability weighted moments

Station	River	Sample probability weighted moments.			
		$b_0$	$b_1$	$b_2$	$b_3$
Lokoja	Niger	18756.06	10,398.46	7257.74	5605.15
Onitsha	Niger	18,365	10,368.13	7328.02	5701.69

**Table 9:** Computed sample *L*- moment values and *L*-moment ratios at stations

Station	River	Sample <i>L</i> -moment values				<i>L</i> -moment ratios		
		$L_1$	$L_2$	$L_3$	$L_4$	L-Cv ( $\tau$ )	L-Cs( $\tau_3$ )	L-Ck( $\tau_4$ )
Lokoja	Niger	18,756.1	2040.86	-88.26	396.26	0.1088	-0'0432	0.1942
Onitsha	Niger	18365	2371.26	112.34	245.76	0.1291	0.0474	0.1036

The parameters of the best fit probability distributions at the stations were estimated using governing equations given in Table 5 (using MS-EXCEL programme). The parameters of the best fit probability distribution models namely: location ( $\xi$ ), scale ( $\alpha$ ) and shape ( $k$ ) obtained for the stations ( River Niger at Lokoja and Onitsha) are as presented in Table 10.





**Table 10:** Estimated Parameters of the best fit probability distribution model at stations

Station	Distribution	Parameters		
		shape (k )	scale ( $\alpha$ )	location ( $\xi$ )
R. Niger at Onitsha	GEV	0.2747	135.34	18,316.5
R. Niger at Lokoja	GLO	0.0432	2034.70	18,898.69

The observed and predicted discharges for River Niger at Lokoja and Onitsha stations based on GEV, GLO and GPA distributions using the *L*-moments approach and using R scripts making use of *lmom* (Hosking, 2017) and *lmomPi* (Cordano, 2017) R packages (are presented in Tables 11 and 12 respectively).

**Table 11:** Observed and Predicted values for River Niger at Lokoja by Distributions

Year	Observed discharge LOKOJA	Pp	GEV	GLO	GPA
1961	18776	0.466667	18589.23	18628.67	18546.43
1962	25929.41	0.955556	24573.15	24746.87	23950.09
1963	22075.76	0.822222	22227.3	21916.09	22693.94
1964	24706.06	0.933333	24024.41	23975.38	23763.74
1965	20442	0.711111	20954.83	20698.62	21486.62
1966	22514.14	0.866667	22840.26	22559.38	23143.13
1967	21598	0.8	21949.56	21638.77	22461.22
1968	20748	0.733333	21190.29	20914.94	21736.16
1969	27018	0.977778	25330.63	26003.27	24119.68
1970	23547.48	0.911111	23575.77	23405.64	23565.6
1971	19150	0.511111	19010.45	18991.49	19103.7
1972	15614	0.2	15677.24	15994.34	15041.59
1973	14714	0.133333	14635.92	14934.4	14128.42
1974	19762	0.644444	20282.03	20095.69	20717.79
1975	22138.38	0.844444	22522.57	22220.08	22921.44
1976	15104	0.177778	15359.01	15679.71	14738.68



1977	18164	0.355556	17495.08	17675.47	17117.37
1978	19830	0.666667	20501.75	20290.47	20977.24
1979	19354	0.555556	19429.81	19352.96	19651.87
1980	17722	0.311111	17024.73	17255.67	16532.66
1981	19524	0.6	19852	19718.9	20190.19
1982	12699	0.066667	13129.65	13213.31	13202.46
1983	11166.4	0.044444	12360.69	12225.81	12891.09
1984	9978.4	0.022222	11182.13	10535.96	12578.41
1985	18810	0.488889	18800.37	18810.61	18826.16
1986	14745	0.155556	15014.54	15330.24	14434.28
1987	13505	0.088889	13720.95	13919.58	13512.49
1988	17892	0.333333	17263.21	17469.52	16825.89
1989	18572	0.4	17943.26	18068.91	17694.82
1990	15897.33	0.222222	15974.72	16281.97	15342.99
1991	19535.33	0.622222	20065.7	19905.5	20455.4
1992	18640	0.422222	18161.34	18258.63	17980.69
1999	22827.27	0.888889	23187.57	22947.24	23358.21
2000	18266	0.377778	17721.45	17874.87	17407.03
2001	18742	0.444444	18376.43	18444.94	18264.59
2002	17359.33	0.288889	16778.37	17032.25	16237.71
2004	16124	0.244444	16255.49	16548.23	15642.83
2005	13846	0.111111	14211.22	14474.25	13821.15
2006	20170	0.688889	20725.69	20491	21233.57
2007	19422	0.577778	19640.25	19534.99	19922.31
2008	19328.5	0.533333	19220.07	19172.04	19378.96
2009	21530	0.777778	21685.8	21382.16	22223.76
2010	20986	0.755556	21433.4	21141.96	21981.97
2011	16794.08	0.266667	16522.59	16797.27	15941.08



**Table 12:** Observed and Predicted values for River Niger at Onitsha by Distributions

Year	Observed discharge <b>ONITSHA</b>	pp	GEV	GLO	GPA
1960	25000	0.92	24561.99	24311.47	24682.6
1961	18300	0.6	19219.06	19128.11	19488.11
1962	26100	0.96	26207.23	26323.99	25524.49
1963	22400	0.8	21891.37	21555.03	22542.49
1964	24500	0.88	23464.36	23118.43	23924.46
1965	21200	0.72	20696.24	20446.31	21269.62
1966	23100	0.84	22608.81	22250.28	23216.06
1971	20800	0.68	20173.91	19975.68	20661.44
1972	16300	0.28	15736.77	15985.61	15178.14
1975	22000	0.76	21263	20965.61	21895.43
1976	14600	0.2	14739.44	15004.45	14167.54
1980	17900	0.52	18336.51	18350.08	18360.97
1981	18815	0.64	19684.34	19539.61	20068.26
1982	13018	0.12	13508.44	13694.88	13176.92
1983	12078	0.08	12692.53	12749.39	12688.41
1984	11494	0.04	11515.6	11250.58	12204.12
1985	17880	0.48	17909.3	17972.19	17811.72
1986	14725	0.24	15256.3	15520.39	14670.19
1987	13566	0.16	14167.71	14411.78	13669.88
1988	17480	0.4	17061.43	17213.73	16737.6
1989	17773	0.44	17485.67	17595.05	17270.83
1991	18159	0.56	18771.56	18733.63	18919.42
2000	16629	0.32	16192.63	16416.14	15691.75
2001	16943	0.36	16632.11	16822.85	16211.42

Based on Tables 11 and 12, the best fit from amongst the probability distribution models fitted to the observed data at the stations were selected by subjecting the respective predicted discharge values (based on GEV, GLO and GPA distributions) to statistical goodness of fit tests



as defined in Table 6. The computed goodness of fit statistics for the distributions for River Niger at Lokoja and Onitsha stations are as presented in Tables 13 and 14 respectively.

**Table 13:** Goodness of fit test results for distributions of River Niger at Lokoja

Test Criteria	Distribution values		
	GEV	GLO	GPA
RMSE	586.66	460.61	1029.37
RRMSE	0.03542	0.02822	0.0641
MAE	1687.4	1182.54	2898.32
MADI	0.02478	0.02055	0.04439

**Table 14:** Goodness of fit test results for distributions of River Niger at Onitsha

Test Criteria	Distribution values		
	GEV	GLO	GPA
RMSE	588.64	713.13	661.460
RRMSE	0.03273	0.03853	0.03920
MAE	1035.64	1381.57	1253.26
MADI	0.02712	0.03201	0.02883

The overall goodness of fit of each distribution was judged based on a scoring and ranking scheme by comparing the relative magnitudes of the statistical test results obtained for the three distributions as presented in Tables 13 and 14. The distribution with the lowest values of RMSE, RRMSE, MAE and MADI is considered the best with respect to the test criteria and is assigned a score of 3, the next is assigned a score of 2 and highest values is assigned a score of 1. The overall score of each distribution is obtained by summing the individual point scores and the distribution with the highest total point score is selected as the best distribution model. Hence from the results given in Tables 15 and 16, the best fit distribution model for River Niger at Lokoja and Onitsha stations is GLO and GEV distributions respectively.

**Table 15:** Scoring and Ranking scheme for River Niger at Lokoja

Test Criteria	Distribution values		
	GEV	GLO	GPA
RMSE	2	3	1
RRMSE	2	3	1
MAE	2	3	1

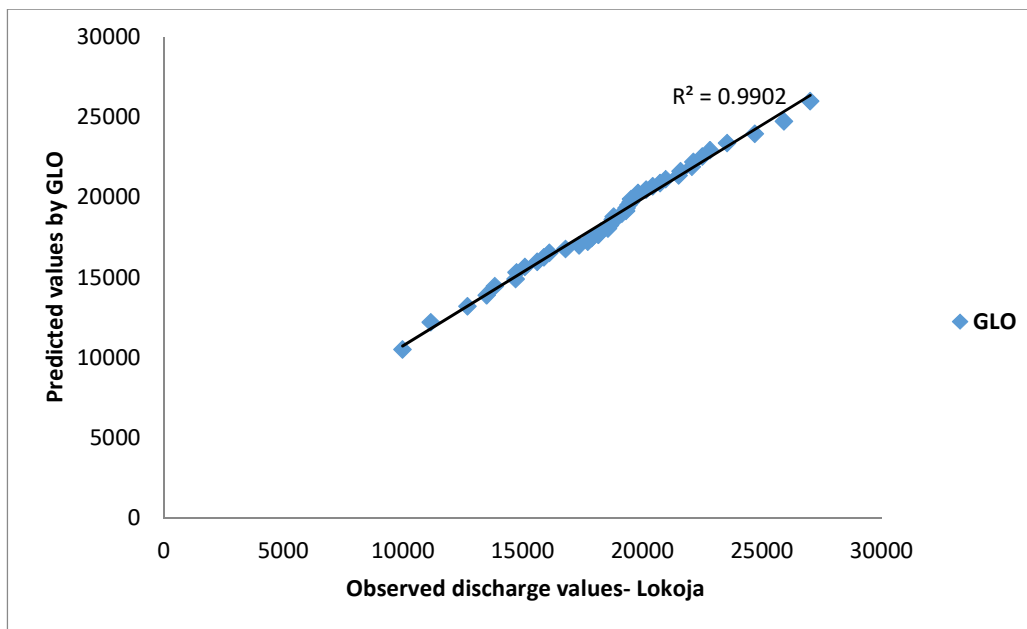


<b>MADI</b>	2	3	1
<b>Total score</b>	<b>8</b>	<b>12</b>	<b>4</b>
<b>Rank</b>	<b>2<sup>nd</sup></b>	<b>1<sup>st</sup> (Best)</b>	<b>3<sup>rd</sup></b>

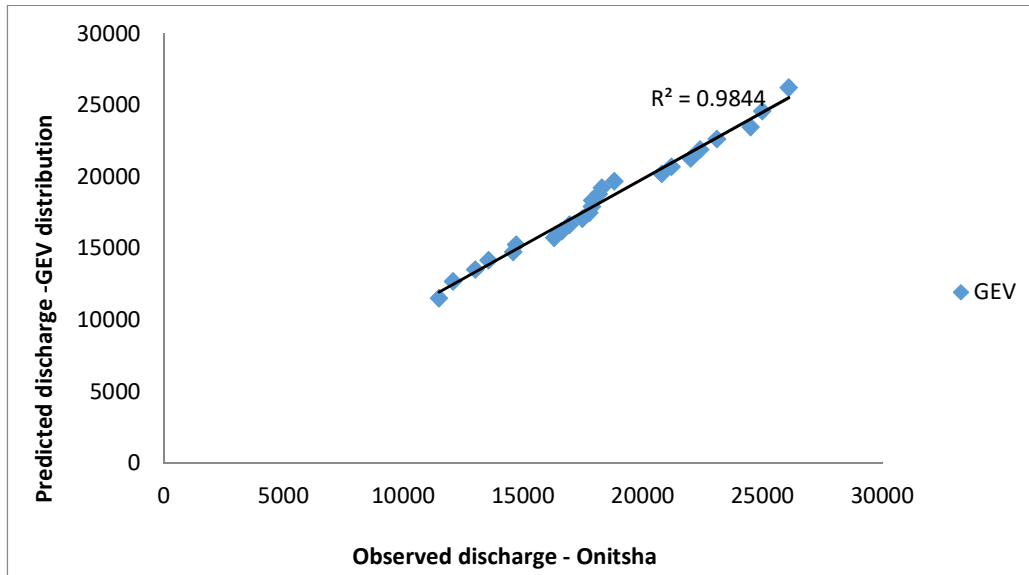
**Table 16:** Scoring and Ranking scheme for River Niger at Onitsha

Test Criteria	Distribution values		
	GEV	GLO	GPA
<b>RMSE</b>	3	1	2
<b>RRMSE</b>	3	2	1
<b>MAE</b>	3	1	2
<b>MADI</b>	3	1	2
<b>Total score</b>	<b>12</b>	<b>5</b>	<b>7</b>
<b>Rank</b>	<b>1<sup>st</sup> (Best)</b>	<b>3<sup>rd</sup></b>	<b>2<sup>nd</sup></b>

The plots of the observed and predicted values for the stations using the best fit probability distribution models for the stations is as given in Figures 28 and 29



**Figure 28:** Plot of Observed vs Predicted discharge by GLO distribution (Lokoja)



**Figure 29:** Plot of Observed vs. Predicted discharge by GEV distribution (Onitsha)

The best fit probability distribution model at a station was utilized to estimate quantiles for different return periods. The return periods of interest that were utilized are T= 2 years, 5 years, 10 years, 25 years, 50 years, 100 years and 200 years and are summarized in Table 17.

**Table 17:** Predicted values for different return periods for River Niger at Lokoja and Onitsha.

Station	Best fit Distribution	Predicted gauge heights for return periods						
		T=2yrs	T=5yrs	T=10yrs	T=25yrs	T=50yrs	T=100yrs	T=200yrs
Lokoja	GLO	18,898.69	21,636.58	23,163.58	24,940.82	26,187.49	27,378.85	28,526.28
Onitsha	GEV	18,363.69	18,482.88	18,543.66	18,604.55	18,640.94	18,669.94	18694.16

In a previous study, Izinyon and Ehiorobo (2014) carried out flood frequency Analysis of River Okhuwan at Ugonoba in Benin Owena River Basin in Nigeria based on annual maximum discharge data at the site for 20 years (1989 - 2008) and utilizing three selected 3 parameter probability distribution models ( namely Generalized Extreme Value (GEV) distribution, Generalized Logistic (GLO) distribution and Generalized Pareto(GPA) distribution ) whose parameters were estimated by method of *L*-Moments. In the study, the best fit probability



distribution model to the observed data at the site was found to be GPA, followed by GLO and GEV after subjecting the predicted discharge values by the distributions to four goodness of fit criteria namely: RMSE, RRMSE, MADI and PPCC (Probability plot correlation coefficient) and a scoring and ranking scheme. The quantiles predicted by the three probability distributions for the station for selected return periods of 2 years, 5 years, 10 years, 25 years, 50 years, 100 years and 200 years as adapted from Izinyon and Ehiorobo (2014) are as presented in Table 18.

**Table 18-:** Quantile Estimates for River Okhuwan at Ugonoba for selected return periods (Izinyon and Ehiorobo, 2014)

Return Period (years)	2	5	10	25	50	100	200
$F = (1 - 1/T)$	0.5	0.8	0.9	0.96	0.98	0.99	0.995
$X(F) = Q_T (m^3/s)$ -GPA	69.81	100.27	107.27	110.38	111.12	111.39	111.49
$X(F) = Q_T (m^3/s)$ -GEV	68.68	95.80	107.35	117.26	122.27	125.87	128.48
$X(F) = Q_T (m^3/s)$ -GLO	68.39	92.85	105.75	120.09	129.73	138.62	146.87

As GPA is upper bounded beyond return period of 25 years (the distribution produces very minimal differences in quantile estimates beyond return period of 25 years), the study recommended that GPA should be utilized for analysis of annual maximum series data at the site up to 25 years return period and for return periods beyond 25 years, the GLO was recommended for use.

#### 4.4 Impact of Flooding on the Ecosystem and Agriculture

In Nigeria, the Niger Delta region (infrastructures, people, assets etc.) suffered the most extensive devastation of flood because of its location in the lowest part of Nigeria where the Niger and Benue rivers empty their waters into the Atlantic Ocean (Akpokodje and Giadom, 2014). Flooding of low-lying areas have uprooted settlement in the coastal region. In some places, especially in Forcados, some oil wells have been lost to the ocean due to flooding. Flooding poses serious problem for the economic activities in the Niger Delta especially natural sectors such as farming and fisheries (about 50% of the fishes consumed in Nigeria is from the Niger Delta). Coastal vegetation especially the mangroves have been lost to flooding.

Generally, rise in sea level will exacerbate flooding of the coastal areas there by dislodging coastal fishing settlements and infrastructure, as well as changing the general inshore and ocean dynamics. Coastal mangroves which serve as nursery grounds for a large variety of fishery





organisms will also be decimated. Increased salinity of ground water, estuaries, creeks and deforestation are other adverse impacts of expected sea level rise. Flooding brings changes in salinity of the aquatic environment of the Niger Delta. There are three main ecological delineations based on salinity: fresh, brackish and marine water environments. Highly important commercial fish species of the Niger Delta region such as the clupeids (*Ethmalosa fimbriata*), catfishes (*Clarias* and *Bagrus* spp.) and cartilaginous fishes such as sharks, skates and rays has adapted to these different salinity ranges. In the Niger Delta region, sea level results in increased salinity of both surface and underground water due to the intrusion of sea water (Adelye and Rustum, 2011). This will lead to the death of aquatic plants and animals that cannot tolerate high salinity. Most aqua-cultural facilities in the Niger Delta are impounded with water using mainly groundwater. The implications of this is that salt water intrusion in fresh water ponds beyond the tolerable limits due to flood water inflow from the sea unto the land leads to either impaired development or outright mortality of the cultured fish species. In most cases, because most mortality cases of cultured fish species are not subjected to post mortem examinations and water quality monitoring is not adequately done in the Niger Delta fish farms, establishing a link between them and salt water intrusion induced salinity changes is rarely implicated. This analogy elucidates an indirect ecological consequence of flooding that may have been very salient, but significantly and adversely affecting aquaculture yield in the Niger Delta region (Adelye and Rustum, 2011).

Rising temperatures and more frequent floods can compromise food security. Increase in malnutrition is expected to be especially severe in countries where large populations depend on rain-fed subsistence farming. In addition, flooding can be followed by outbreaks of diseases, such as cholera, especially when water and sanitation services are damaged or destroyed. Storms and floods are already among the most frequent and deadly forms of natural disasters. Flooding and heavy rainfall can cause overflows from sewage treatment plants into fresh water sources. Overflows could contaminate certain food crops with pathogen-containing faeces (USGCRP, 2009).

The economy can also be severely affected by flooding. Businesses may lose stock, patronage, data and productivity and disruption to utilities and transport infrastructure can have knock-on effects to a wider area. Tourism, farming and livestock can equally be affected. Vital infrastructure may also be damaged or disrupted. Electricity and gas supplies can be interrupted to individual properties but also to wider communities if sub stations and transformers themselves are flooded. Road links, railways, canals etc., may be blocked causing disruption to the wider transport network and accessibility severely disrupted for local inhabitants, especially amongst those considered most vulnerable and loss of communications networks (Adelye and Rustum, 2011).





Hence, flood frequency analysis will help to effectively manage flood. The results from the studies indicated that the Generalized Logistic (GLO) and Generalized Extreme Value (GEV) distribution can be used to describe the discharge data for some areas within the Niger Delta Basin (Lokoja-GLO and Onitsha-GEV). Also, both the Generalized Pareto (GPA) and the Generalized Logistic (GLO) distribution can be used for analysis of annual maximum series data at River Okhuwan at Ugonoba in Benin Owena River Basin. Thus, these distributions can be used for future flood prediction within these areas.

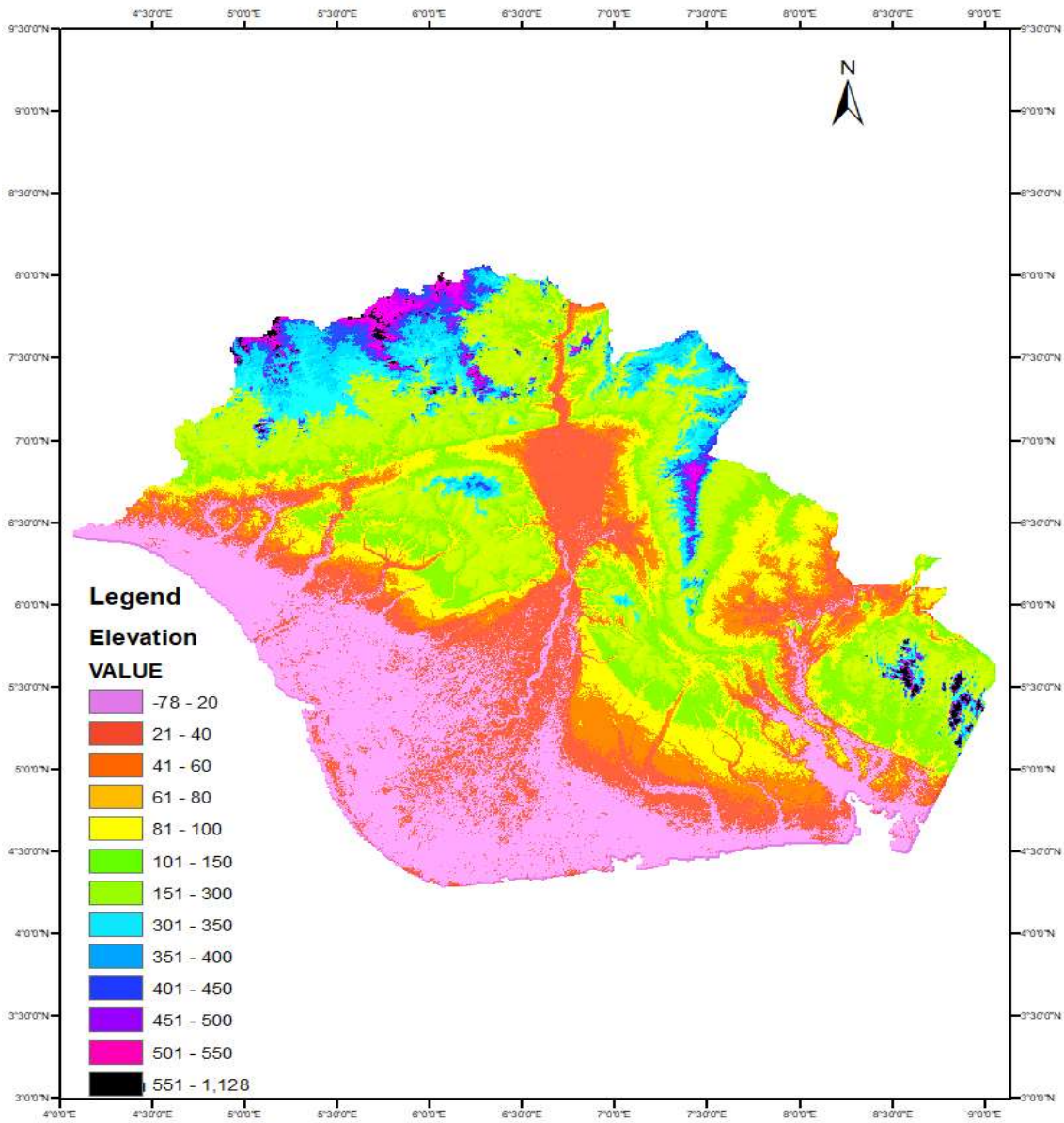
#### **4.5 Effect of Topography and Land-Use on Flooding**

The study area (Niger Delta River Basin) consist of a network of meandering rivers and creeks with mangrove swamp and rain forest vegetation. The lower basin of the river Niger flows and discharges through a massive delta known as the Niger Delta into the Gulf of Guinea in the Atlantic Ocean. The lowest elevation in the area is about 7.8 meters below sea level and rises to as high as 500 meters above sea level. The soil type in this region is lightly or average saturated ferralitic soils. In this region, the lower Delta River Basin formation is a layer of sedimentary origin which is Cretaceous deposits found from Onitsha. The tertiary marine layer which crosses the cretaceous layer and Quaternary sediments are found from the coastal plain and the Delta (Andersen, Dione, Jarosewich-Holder, & Olivry, 2005).

The Digital Elevation Model (DEM) for the study area was obtained from the Shuttle Radar Topographic Mission database (SRTM) at a spatial resolution of 30m with the use of Google Earth Engine interface. This was then used to delineate the sub-watersheds of the lower Niger Delta River Basin and extract major streams within the area (using ArcHydro extension in ArcGIS). The DEM with the defined streams and the delineated sub watersheds is shown in Figure 30 and 31.



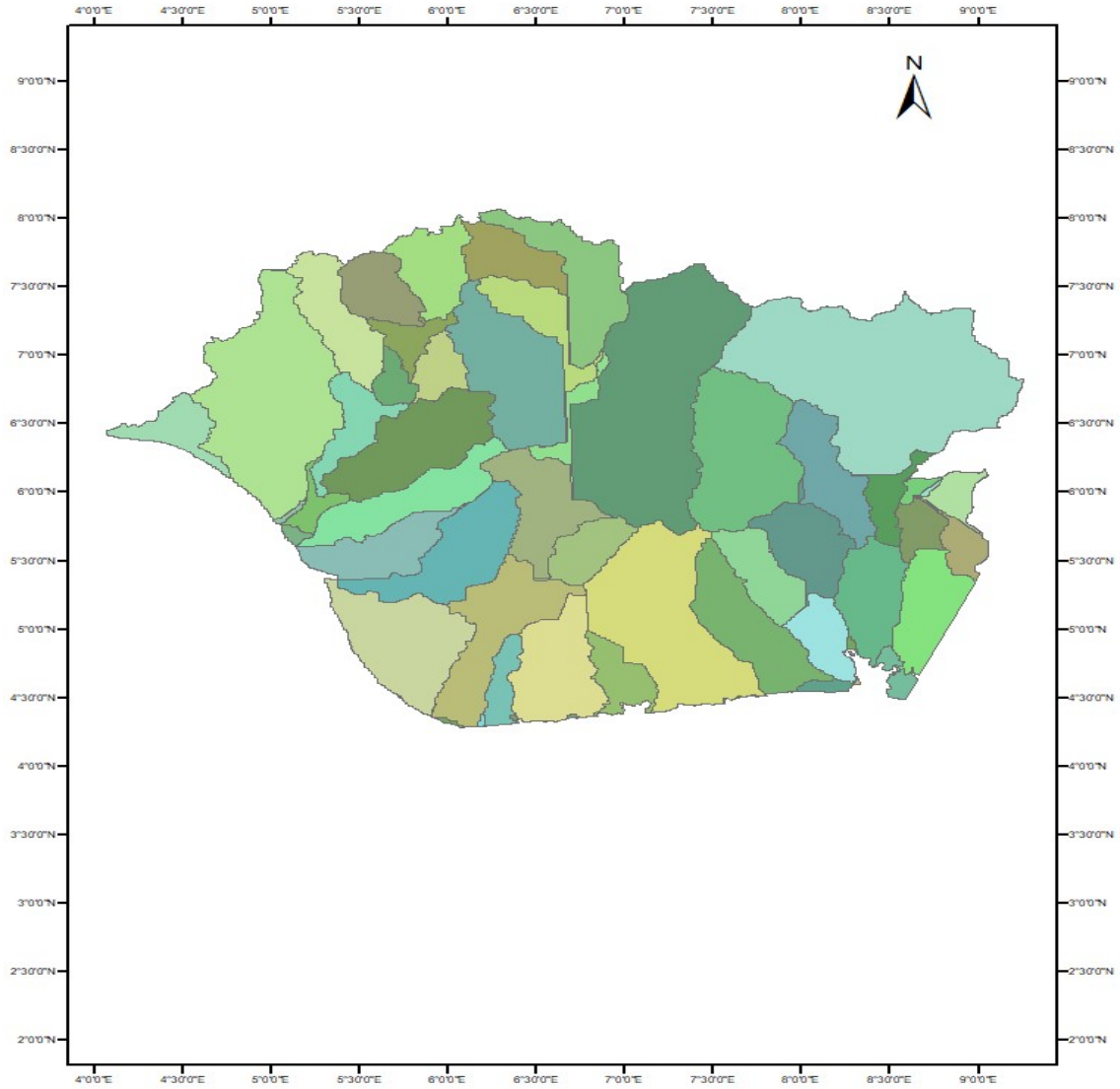
## Digital Elevation Model



**Figure 30:** Digital Elevation Model (DEM) for Niger Delta River Basin



### Sub-watersheds



**Figure 31:** Sub-watersheds of the Lower Niger Delta River Basin



## **5.0 Dams and Reservoirs Operations for Efficient Water Use Within the Study Area**

In a country like Nigeria, the demand for water, food and energy will continue to rise as a result of increase in population growth. With the rapid decline in revenue from crude oil (almost the sole export commodity) and mismanagement of the economy over the last few years, coupled with continuous bombing and destruction of crude oil and gas facilities, Nigeria slid into recession. Although the country is out of recession new security challenges are impacting on the nation food security.

The unstable prices of crude oil, the lack of coordinated National policy on agriculture and the summersault from a rebranded largest economy in Africa coupled with current security challenges are bringing back fears about food security.

There are increasing concerns on the demand side as essential food commodities are disappearing from the market and prices of available commodities are now outside the reach of the average Nigerian. Today, much of the energy supply in the country is expected to come from Hydropower as a result of the current unstable gas supply.

In order to derive the needed energy supply, many more multi-purposes Dams need to be developed not only for water supply but Hydropower generation as well as for irrigation and fishery. In this complex system, reservoirs are expected to be used for irrigation (by use of pumps and irrigation ditches), provide potable water supply to communities and Power turbine for energy generation. As water becomes scarce as a result of the multiple usages there is competition between energy, agriculture and domestic water availability (Ehiorobo and Izinyon 2016).

There is therefore the need to develop effective cross-sectorial mechanism to address the problem and ensure that decisions taken on water release and water use are coordinated in such a way as to provide an integrated multi sectorial strategy. Data and geomatics support tools are key components within cross sectorial outcome and acts as a key support mechanism for the development of an integrated multi-sectorial strategy for effective water use.

### **5.1 Existing Dams in the Lower Niger Basin**

A compendium of Nigeria Dams compiled by the Department of Dams and Reservoir Operation put the number of Dams in Nigeria at 198 (Federal Ministry of Agriculture and Water Resources 2007).



**Table 19:** Classification of Dams in Nigeria Based on I COLD Classification

Dam Size	Dam Height (Meters)	Reservoir Capacity (million cubic meter)	Flood discharge (cubic meters per second)	Crest Length (meters)
Large	>15	>1	>2000	>700
Small	<15	<1	<2000	<500

Nigeria is divided into 8 hydrological zones and the number (as shown in Figure 2) of large and small dam in each hydrological zone are shown in Table 20.

**Table 20:** Distribution of Dams Per Hydrological Zone

S/N	Hydrological Zone	No. of Large Dams	No. of Small Dams	Total No. of Dams	Remarks
1	1	8	15	23	
2	2	26	14	40	
3	3	3	4	7	
4	4	12	21	33	
5	5	1	6	7	
6	6	13	35	48	
7	7	2	9	11	
8	8	13	16	29	

From Table 20, it can be seen that zones 3 and 5 have the least number of dams while zones 2 and 6 have the highest number of dams. The limited number of dams in hydrological zone 3 and 5 is mainly due to the nearness of the area to sea level as well as the topographical and geological characteristics of the region (Ehiorobo, 2016).



Dams in the study area (Niger Delta Basin) exist within hydrological zone 6 and out of a total number of 48 dams in this zone, about 14 (comprising of both large and small dams) are in Niger Delta Basin. Table 21 shows the existing dams in the study area.

**Table 21:** Existing Dams and Reservoirs in Niger Delta Basin

S/ N	Name	Category and Type	Geographical Location		Hydrolo gical Zone (HA)	River	Stat e	Reserv oir Capacit y	Purpose and Owner
			Longit ude (°E)	Latitu de (°N)					
1	Aparik o- Aisegb a dam	Large (Homogeneo us)	5°27'E	7°34' N	6	Aparik o	Ekit i	4.7 MCM	Irrigation & Water Supply
2	Awara dam	Small (Homogeneo us)	5°40'E	7°30' N	6	Ashodi	Ond o	-	Water supply & Irrigatio n (OSWC)
3	Ayede dam	Small (Homogenou s)	5°56'E	7°53' N	6	Ayede	Ekit i	1.5MC M	Water supply (EKWC)
4	Ikara dam	Medium	5°45'E	7°15' N	6	Asande	Ond o	7.7MC M	Water supply (OSWC)
5	Ikpoba dam	Small (Earth filled)	5°38'E	6°22' N	6	Ikpoba	Edo	1.5MC M	Water supply (ESUWB)
6	Itapayi dam	Large (Homogeneo us)	5°27'E	7°57' N	6	Ele	Ekit i	1.5MC M	Water supply (ESUWB)





7	Egbe dam	Large (Concrete)	5°58'E	7°20' N	6	Little Osse	Ekiti	2.3MCM	Water supply (ESUWB)
8	Little Osse dam	Large Concrete (Homogenous)	5°34'E	7°36' N	6	Little Osse	Ondo	-	Water supply (ESUWB)
9	Ojirami dam	Large Earth fill (Homogenous)	6°09'E	7°17' N	6	Oyanmi	Edo	4.5 MCM	Water supply (ESUWB)
10	Osse (Egbe) dam	Large Concrete/Earth Filled	5°34'E	7°36' N	6	Little Osse	Ekiti/Ondo	0.42 MCM	Water supply (ESWC)
11	Ogwasahi-Uku dam (Under Construction)	Large	-	-	6	Ubu	Delta	18 MCM	Water supply & Irrigation (BORBDA)
12	Owena dam	Large Earth fill (Homogenous)	5°01'E	7°11' N	6	Owena	Ondo (Idanre LGA)	36.25MCM	Multipurpose (BORBDA)
13	Owena Multipurpose dam	Large Earth fill (Homogenous)	5° 13'E	7°16' N	6	Owena	Ondo (Ifedore LGA)	36.25 MCM	Multipurpose (BORBDA)





14	Ukhun/ Erha dam	Small	6° 10'E	6° 51' N	6	Okweg o	Edo	0.8MC M	Irrigation
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## 5.2 Multi-Purpose Utilization of Dams and Reservoirs- A Case Study of Ikpoba Dam in Benin City

For effective utilisation of dams and reservoirs in Niger Delta Basin, there is need for more detailed hydrological data collection as well as Geomatics support in order to ensure mapping of river basins at appropriate scales, continuous monitoring and evaluation of the Dam and Reservoir in the following areas:

- Provision of sufficient potable and qualitative water from Reservoir
- Groundwater recharge from Reservoir
- Effectiveness of Dams and Reservoir utilization for hydropower development
- Study of siltation in Reservoirs
- Effective utilization of Dams in flood control and regulation of river flow
- Water storage in reservoir for water supply, irrigation and hydropower supply.

Within the Niger Delta Region, surface and groundwater represent the two main sources of water supply for the region as a result of its geographical location in the middle of southern Nigeria. For instance, in Benin City, Edo State, Nigeria, the surface water source is obtained from the reservoirs across the Ikpoba river operated by Edo state urban water board and ground water sourced from boreholes drilled to aquiferous Benin formation.

Therefore, to ascertain the viability of the lower Niger river to meet the Water Demand for water supply, food production, energy generation and environmental sustainability taking cognizance of climate change and variability, the Water Evaluation and Planning System (WEAP) was used to assess the water use impact on the Lower Niger River Basin in Nigeria.

## 6.0 Hydrological Modelling of the Water Demand and Supply of the Lower Niger River Basin in Nigeria

In order to ascertain the viability of the lower Niger river to meet the Water Demand for water supply, food production, energy generation and environmental sustainability taking cognizance of climate change and variability, the Water Evaluation and Planning System (WEAP) model was used to carry out water demand and supply modelling of the Lower Niger River Basin.



WEAP is a river basin simulation software which includes opportunities for scenario evaluation as well as water balance calculations (Amato et al., 2006). In this study, the objectives are:

To model the impact for the current water demands and supply situations in the lower Niger River Basins and States in Nigeria.

To study the impacts of future scenarios on the study area to measure sustainability of the research aim

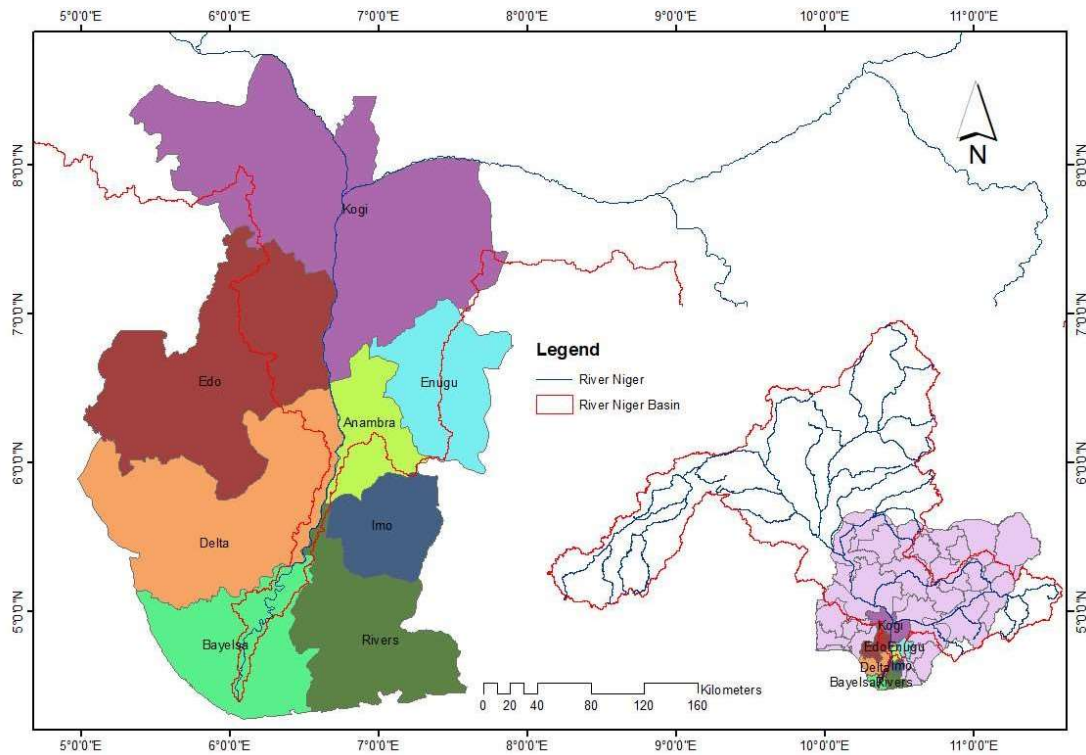
To predict future and possible water demand impacts on the Lower Niger River

To create various model scenarios for climate change, dam application, variation of water demand and population growth.

### **6.1 Study Area for WEAP Assessment**

The Lower Niger River Basin consist of a network of meandering rivers and creeks with Mangrove Swamp and Rain Forest vegetation. It stretches from the confluence point of the Niger River and the Benue River in Lokoja in Kogi State and discharges through a massive delta known as the Niger Delta into the Gulf of Guinea in the Atlantic Ocean. The region cuts across eight states; Kogi, Edo, Anambra, Enugu, Imo, Delta, Bayelsa and Rivers, as depicted in Figure 3 2 .

The Lower Niger River receives only few tributaries, including the Anambra river on the left bank, which drains into a basin with significant rainfall of about 200 km downstream of Lokoja. It is gauged at Onitsha as the last monitoring station in the Lower Niger River (Olivry *et al.*, 2005). The Lower Niger flows for another 100 km and the lower valley progressively transforms into the vast Niger Delta with no fewer than 30 outlets to the Gulf of Guinea (Olivry *et al.*, 2005).



**Figure 32:** Distribution of States in the Lower Niger River Basin in Nigeria

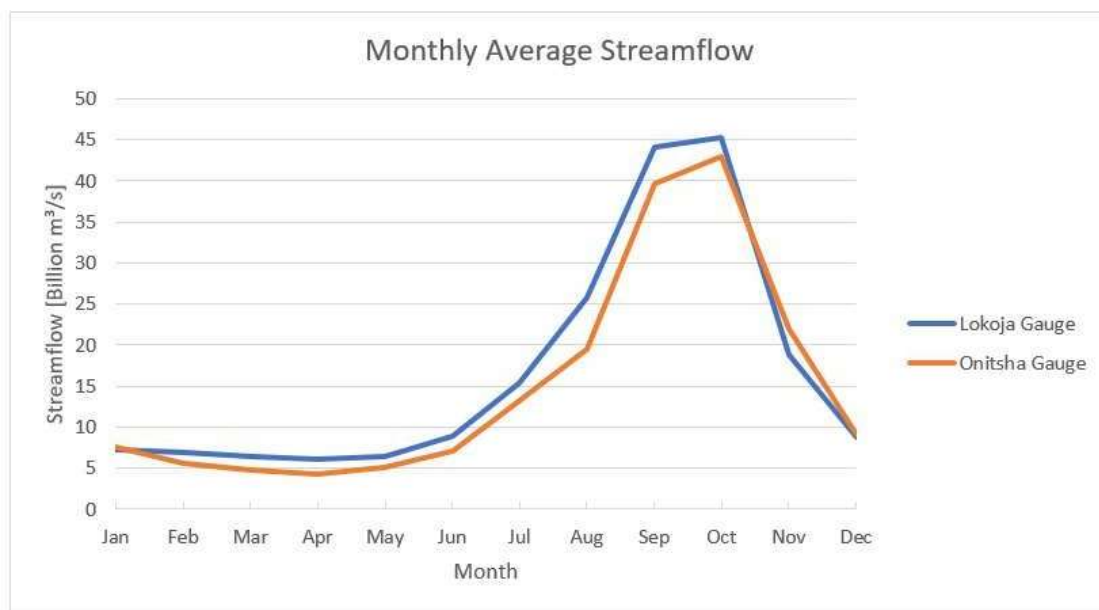
## 6.2 Data Sources and Data Preparation

The data required for the modeling of the water demand and supply were adopted from articles and reports, others are hypothetical. The modeling of the water demand was carried out based on survey data of the domestic water demand, earth observation data for the agricultural water demand, an estimation of the industrial water demand and on calculations of the minimum environmental flow of the Niger River. The modeling of the water supply was carried out based on gauge data (from Lokoja Gauge Station and Onitsha Gauge Station), climate data and earth observation data of the Lower Niger Basin.



### 6.3 Hydrological Characteristics and Water Supply of the Niger River

To calibrate the streamflow of the Lower Niger River two streamflow curves were entered in the WEAP model (Figure 33). As the model observes the surface runoff in the Lower Niger River Basin below Lokoja only, the average monthly streamflow curve of Lokoja Gauge Station was entered



**Figure 33:** Average Monthly Streamflow at Gauge Stations Along the Lower Niger River

as the head flow for the Lower Niger River. Additionally, monthly streamflow data from Onitsha Gauge Station were used. The gauge data were obtained from Nigeria Hydrological Service Agency (NIHSA) and Niger Basin Authority (NBA).

For estimating the Environmental Flow, the original average monthly streamflow curve of Onitsha Gauge Station was shifted by a number of percentiles using the Global Environmental Flow Calculator (GEFC). Therefore, the compliance of the modeled streamflow with the calculated environmental flow can be checked at Onitsha Gauge Station.



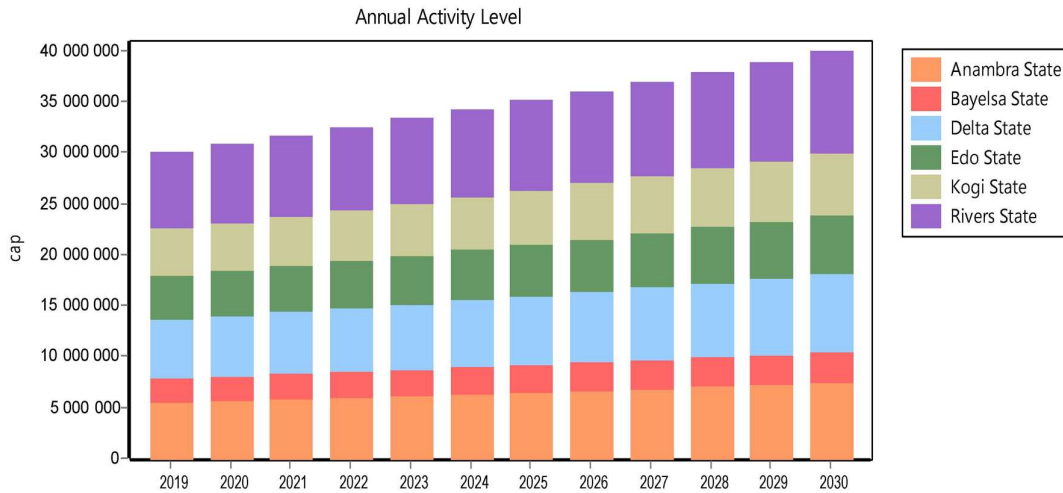
## 6.4 Domestic Water Demand

The Domestic Water Demand describes the water demand of the households which is used for cooking, sanitation, cleaning and health. To simulate the Domestic Water Demand, the Annual Activity Level, the Annual Water Use Rate, the Monthly Variation of Water Use and the Consumption Rate were used.

Annual Activity Level: This refers to the level of activity driving demand using water for domestic purpose. The level of activity changes based on the population of the area. The annual activity was divided into the different states which are part of the Lower Niger Delta Basin. It was generously assumed that the entire states cover their water demand through the Niger River. Table 22 shows the population of the states and therefore their annual activity level. A Human Population Growth Rate of 2,6 % (data.worldbank.org) was defined. Figure 34 presents the growth of the population and makes the change of the Annual Activity Level visible.

**Table 22:** Population of the States in the Lower Niger River Basin (WASH-Report 2018)

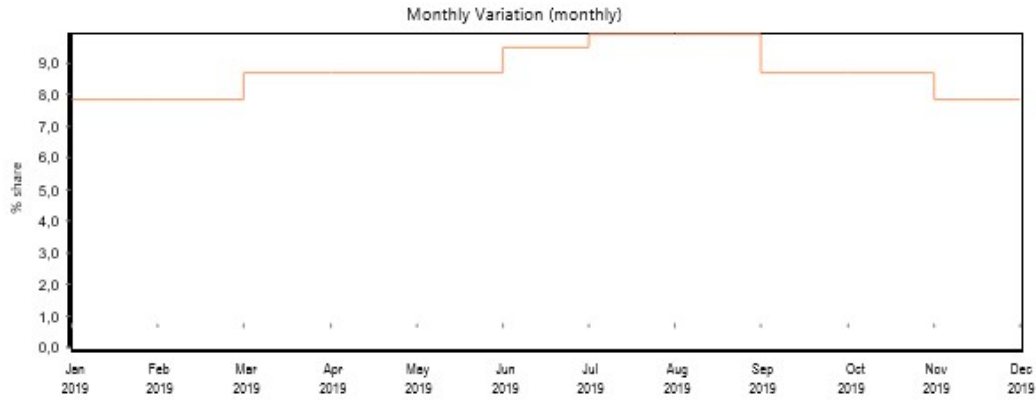
S/N	States	Population
1	Kogi State	4.453.904
2	Edo State	4.220.264
3	Delta State	5.685.052
4	Bayelsa State	2.268.571
5	Rivers State	7.262.510
6	Anambra State	5.506.409



**Figure 34:** Growth of the Population of the States in the Lower Niger River Basin

**Annual Water Use Rate:** An Annual Water Use Rate per unit of activity was used to calculate the total volume of water needed for the demand site. This study adopted the WHO standard for Nigeria which is 120L/c/d (43,92 m<sup>3</sup>/c/year).

**Monthly Variation:** This variable requires a monthly water demand rate in percentage. It considers the seasonal variation of the water demand as more water is demanded during the dry season than for the wet season. The study assumed the following hypothetical monthly variation values (Figure 35).



**Figure 35:** Monthly Shares of the Yearly Water Demand

Consumption Rate: The Consumption Rate is the percentage of inflow consumed or lost from the system. For example, evapotranspiration. In this model an average value of 15 % for the whole year was assumed.

### 6.5 Industrial Water Demand

The simulation of the Industrial Water Demand was undertaken like the simulation of the Domestic Water Demand using the Annual Activity Level, the Annual Water Use Rate, the Monthly Variation of Water Use and the Consumption Rate.

Annual Activity Level: This refers to the level of activity driving water demand for industrial production. For each state one production unit was defined. It was generously assumed that the entire states cover their water demand through the Niger River.

Annual Water Use Rate: An Annual Water Use Rate per unit of activity was used to calculate the total volume of water needed for the demand site. Due to lack of data, the industrial water use rate for each state was estimated. Splitting the annual industrial water usage in Nigeria of 1,97 billion m<sup>3</sup> in 2010 (AQUASTAT 2019) into water usage rates relative to the GDP of the Nigerian states (C-GIDD 2010), it was assumed that the industrial water withdrawal of the states is relative to the GDP of these states resulting in the values as shown in Table 23.





**Table 23:** Estimated Industrial Water Use of the States in the Lower Niger River Basin

S/N	Industries	Annual Water Use of Industry [million m <sup>3</sup> / year]
1	Kogi Industry	31,975398
2	Edo Industry	81,887878
3	Delta Industry	115,37181
4	Bayelsa Industry	29,874472
5	Rivers Industry	145,156735
6	Anambra Industry	46,592329

To estimate the industrial growth a rate of 1,9 % (World bank, 2019) was selected which equals the GDP growth rate.

Monthly Variation: This variable requires a monthly water demand rate in percentage. The monthly variation for the industry that was set as the Industrial Water Demand does not depend on the season, unlike the Domestic Water Demand.

Consumption Rate: The percentage of inflow consumed or lost from the system (such as evapotranspiration) is assumed to be an average value of 5 % for the whole year. This value depicts the net Consumption to withdrawal ratio for the Nigerian industry (AQUASTAT 2019).

## 6.6 Agricultural Water Demand

The Agricultural Water Demand was calculated on a catchment scale taking the land use and climate into account.

A classification of the Land Cover in the project area was done according to the European Space Agency's Climate Change Initiative Land Cover database (Defourney et al., 2015). The Land Cover Classifications were assigned to the respective areas in the Lower Niger River Basin.

The climate data for the project area was directly accessed through WEAP. The global climate dataset was set up by the Terrestrial Hydrology Group at Princeton University including daily data since 1948 (Princeton Climate Data, 2006).



Area: This refers to the land area for each land cover type. It is automatically calculated in the Catchment Delineation Mode of the WEAP.

Precipitation: A monthly precipitation time-series was used.

Kc-Value: The crop coefficient (Kc), presents the evapotranspiration of a certain crop relative to the reference crop. Usually Kc-Values are used for crops, other Kc-values for non-agricultural land cover types have been calculated. Kc-Values have been adopted in Table 24 according to a study of Amato, et al. (2006).

**Table 24:** Land Cover Classification in the Lower Niger River Basin and their Kc-Values

S/N	Land Cover Classification	Kc-Value [-]
1	Agriculture	0,88
2	Forest	0,35
3	Grassland	0,53
4	Wetland	0,9
5	Urban	0,77
6	Shrubland	0,45
7	Barren or Sparse Vegetation	0,3
8	Open Water	1

ETref: The monthly evapotranspiration for a reference land class has been adopted according to Amato, et al. (2006).

**Table 25:** Land Cover Classification in the Lower Niger River Basin and their ETref

S/N	Land Cover Classification	ETref [mm]
1	Agriculture	1346
2	Forest	1272
3	Grassland	642
4	Wetland	1578



5	Urban	1048
6	Shrubland	616
7	Barren or Sparse Vegetation	616
8	Open Water	1578

### 6.7 Water Demand for Sustainable Environmental Flow

The amount of water required to sustain aquatic life and other water use downstream of the Lower Niger River was adopted for the Environmental Flow. This flow parameter is assumed to sustain the flow regime in both the wet and excessive dry season.

To estimate the recommended streamflow, the Global Environmental Flow Calculator (GEFC) developed by the International Water Management Institute (IWMI) was used. It shifts the flow duration curve of the natural flow by a certain number of percentiles places, each representing an Environmental Management Class (Table 26):

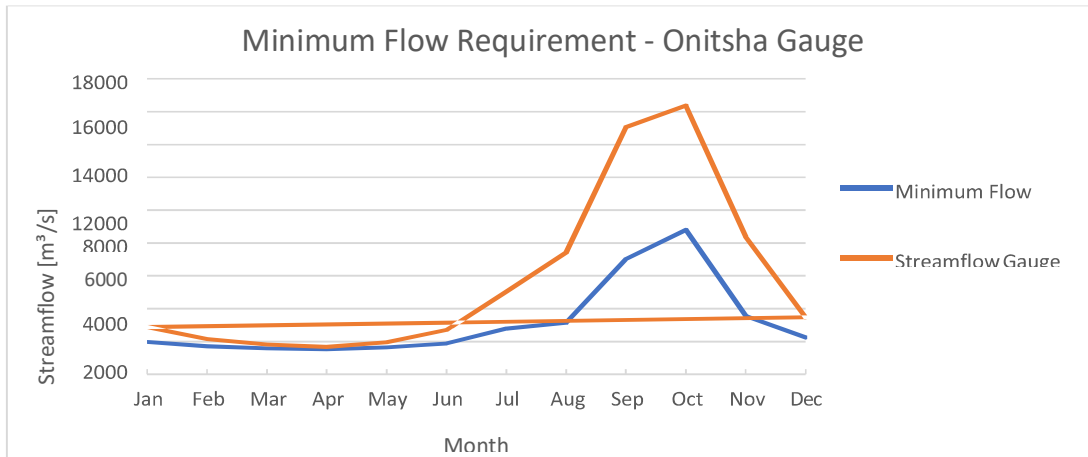
**Table 26:** Environmental Management Classes (Smakhtin and Anputhas, 2006)

Environmental Management Class	Percentile Places to Shift	Description
No Change	0	Pristine condition.
A: Natural Flow	1	Minor modification of instream and riparian Habitat.
B: Slightly Modified	2	Largely intact biodiversity and habitats despite water resources development or basin modifications.
C: Moderately Modified	3	The habitats and dynamics of the biota have been disturbed, but basic ecosystem functions are still intact. Some sensitive species are lost or reduced in extent. Alien species present.



D: Largely Modified	4	Large changes in natural habitat, biota and basic ecosystem functions have occurred. A clearly lower than expected species richness. Much lowered presence of intolerant species. Alien species prevail.
E: Seriously Modified	5	Habitat diversity and availability have declined. A lower than expected species richness. Only tolerant species remain. Indigenous species can no longer breed. Alien species invaded the ecosystem.
F: Critically Modified	6	Modifications have reached a critical level and ecosystem has been completely modified with almost total loss of natural habitat and biota. In the worst case, the basic ecosystem functions were destroyed and the changes are irreversible.

For our study the Environmental Management Class B was selected. Therefore, a shift of the flow duration curve was undertaken by 2 percentile places. In Figure 36 the average monthly streamflow at Onitsha Gauge Station is shown in comparison to the Minimum Flow Requirement.



**Figure 36:** Minimum Flow Requirement of the Streamflow at the Onitsha Gauge Station

### 6.8 Modelling the Water Demand of the Lower Niger River Basin

The WEAP model was used to carry out water demand and supply modeling of the Lower Niger River Basin. Then, a calibration and validation of the model was undertaken to ensure that the model represents the catchment hydrology adequately. Finally, the analysis of various scenarios was undertaken. The final WEAP model is shown in Figure 37.

The Catchment Delineation Mode from WEAP was used to define the boundaries of the Lower Niger River Basin and the catchments within the basin. It uses HydroSHEDS digital elevation data to automatically delineate catchments and rivers (Lehner et al., 2008). Six (6) river tributaries with their corresponding drainage areas were identified for the project area of the Niger River Basin below Lokoja. Their catchments were called: Obajana Shed, Ero Shed, Ubo Shed, Orle Shed, Ohordua Shed and Anambra Shed. Further smaller catchment areas were added up to three (3) further catchments along the Niger River: Niger Section 1, Niger Section 2 and Niger Section 3. The catchment characteristics were abstracted and they are the basin area, elevation bands, land use patterns and precipitation data.

Each states' water demand was divided into three parts: Domestic Water Demand, Industrial Water Demand and Agricultural Water Demand. Each was inputted as an owned demand site on the model.



While the Agricultural Water Demand was modeled directly in the catchment areas, Domestic Water Demand and Industrial Water Demand were added with demand nodes.

By modeling the Agricultural Water Demand with catchment areas, it is possible to apply various hydrological runoff computational methods such as the Rainfall Runoff Method (Simplified Coefficient Method) which was used here. It calculates evapotranspiration for different land use types using crop coefficients. Precipitation which is not consumed by evapotranspiration will runoff with a Runoff Link to a river in this model.

For Domestic Water Demand and Industrial Water Demand the model represents each demand site as a node with a transmission link serving as medium for conveying surface water to the various demand site such as a pipe network system to convey water for water supply. The domestic and industrial water demand is covered by withdrawal from rivers only and the characteristics of the demand nodes build on state level statistics-based factors like Annual Activity Level and Annual Water Use Rate. Return Flow Links serve as medium for conveying the unconsumed water from the demand sites back to the Niger River. The demand nodes provide for domestic and agricultural water demand for regions inside and outside the catchment boundaries of the Lower Niger River Basin (within the states' boundaries only). These regions are drained by smaller river basin into the delta region.

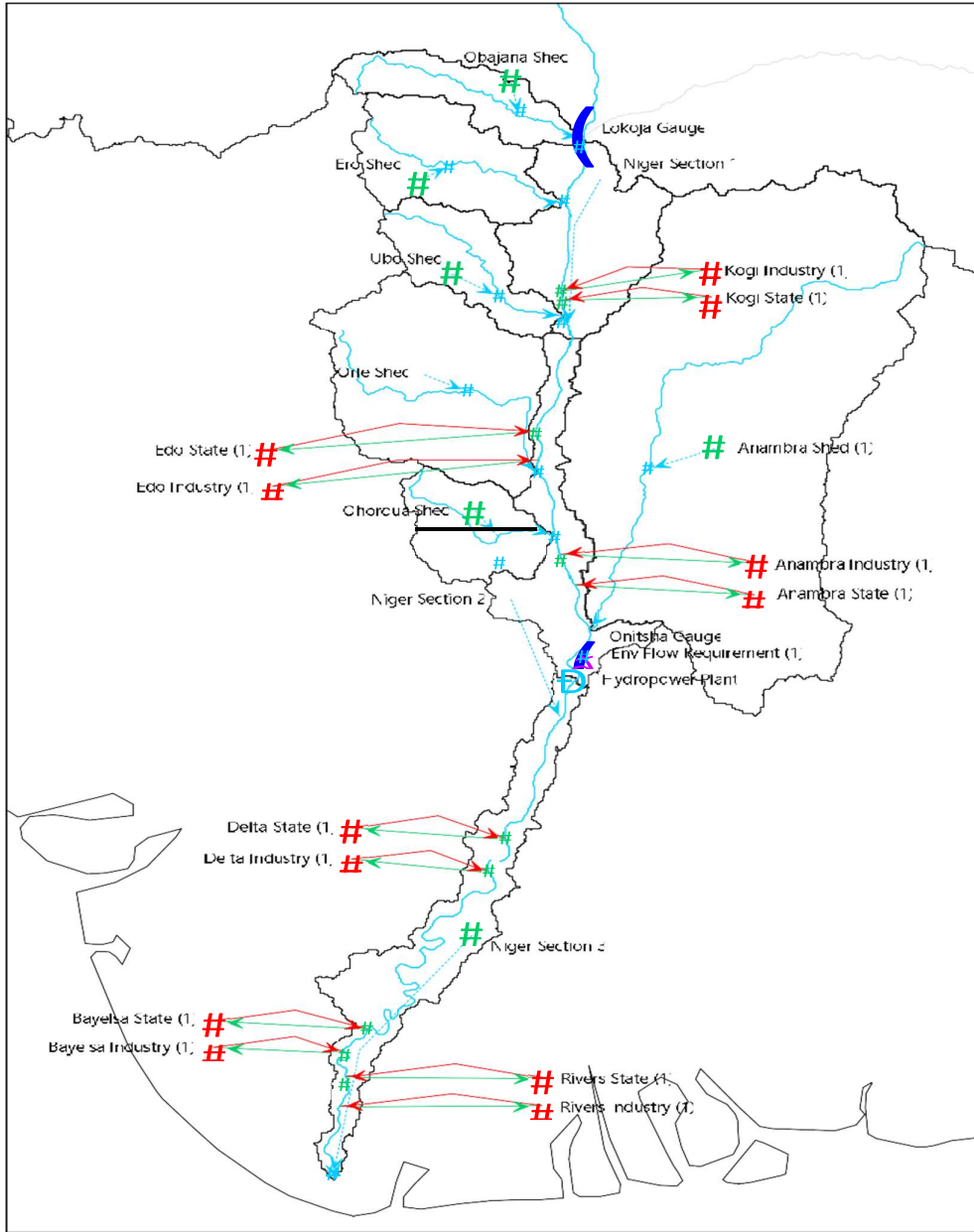


Figure 37: Schematic View of the Lower Niger River Basin in WEAP

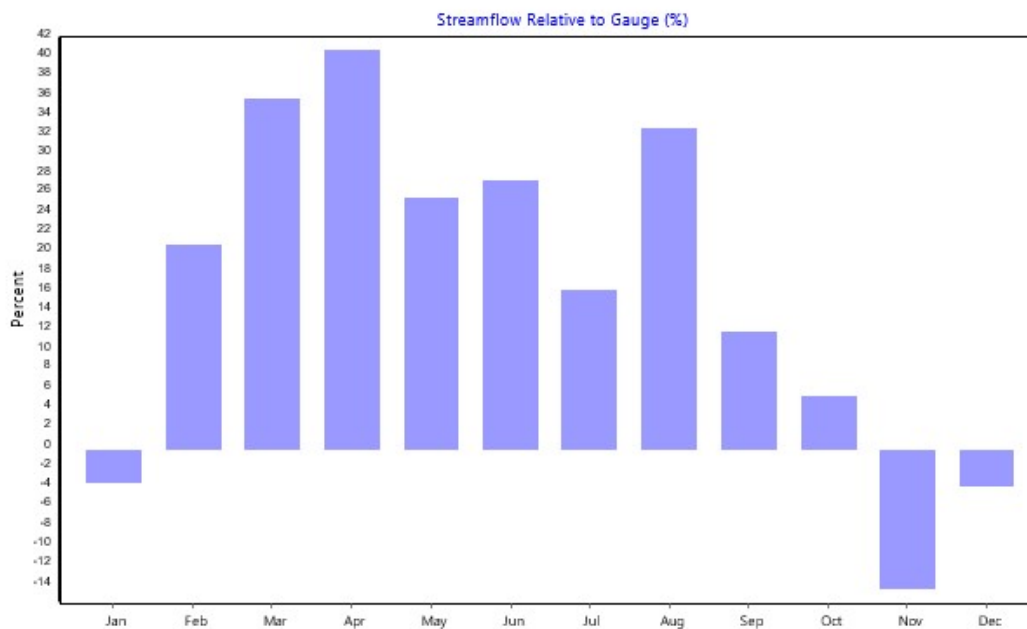




## 6.9 Evaluation of WEAP Model

To evaluate the WEAP model, the modeled streamflow curve can be compared with the monthly streamflow curve from Onitsha Gauge Station from NIHSA/NBA (see Figure 38).

The calculated streamflow in the model deviates to the measured streamflow at the Onitsha Gauge Station by  $-14\%$  to  $+41\%$ . Reasons could be the quality of the available input data, simplifications, assumptions or the level of detail of the model.



**Figure 38:** Modeled Streamflow Compared to Measured Streamflow for Onitsha Gauge Station

## 7.0 Water, Energy, Food and Ecosystem (WEFE) Linkages Analysis

The analysis of the linkages in the Water, Energy, Food and Ecosystems nexus (WEFE) was undertaken for the status quo (Current Accounts) and for different scenarios covering developmental, economic and climatic changes for the next 10 years, as shown in Table 27.



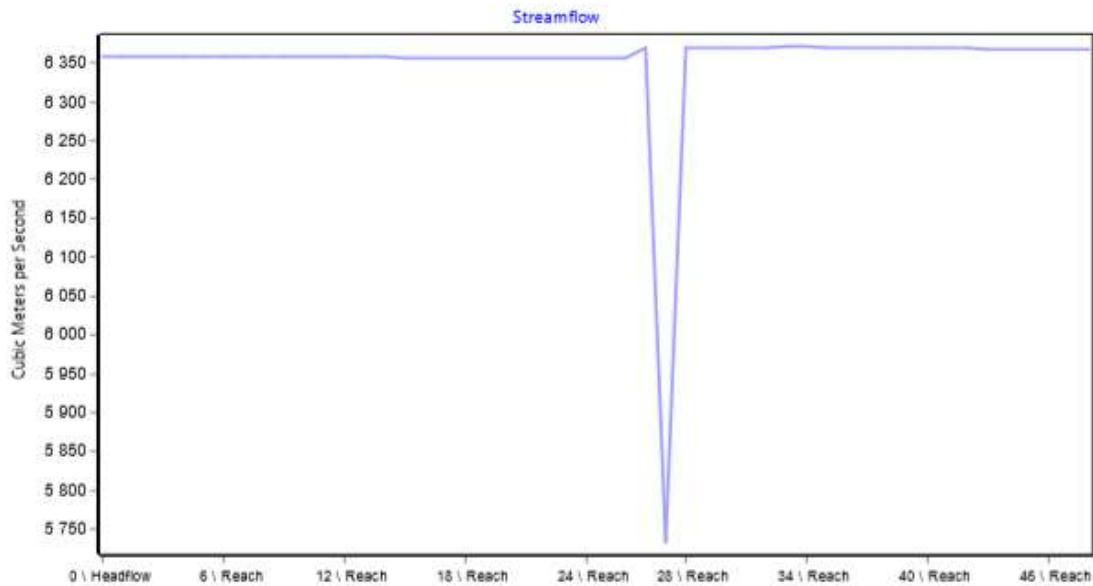
**Table 27:** Scenarios Covering Development, Economic and Climate Change for Next Ten Years

S/N	Scenario	Years	Description
0	Current Accounts	2019	Status quo.
1	Reference	2020 - 2030	Current developments prevail and only predicted changes in the study area take place, e.g. current population growth rate remains constant.
2	Increase of Population Growth Rate	2020 - 2030	Increase of the population growth rate from 2,6 % to 3,6 %.
3	Increase in Water Demand	2020 - 2030	Increase in the water demand from 120 L/c/d to 135 L/c/d.
4	Draught	2020 - 2030	Extreme climate event with a sequence of several dry to very dry years.
5	Hydropower in Onitsha	2020 - 2030	Construction of a new Run of River Hydropower Plant downstream of Onitsha.

### 7.1 Water Demand Coverage through the Niger River

The water demand of the Lower Niger River Basin was divided into the three main sectors of water usage in Nigeria. Generally, the model shows that the water demand of every sector is currently met in all states. The unmet demand is steadily at 0 % and the coverage is always at 100 %. Even in the dry season, when the least amount of water is flowing through the Niger River and the water demand is at its highest, the unmet demand is still at 0 %. This can be explained by the high modeled streamflow.

The modeled streamflow along the Lower Niger River is depicted in Figure 39. A yearly average streamflow of about 6300 m<sup>3</sup>/s exists at Lokoja Gauge Station. Throughout the Lower Niger River, the streamflow does not change remarkably. The dent in the streamflow curve in Figure 39 shows the actual streamflow at Onitsha Gauge Station which was adapted in the model at that point only.



**Figure 39:** Current Streamflow Along Lower Niger River According to WEAP Model.

The lack of change in the streamflow can be explained by the low water input and output along the river.

The contribution of water, mainly due to tributaries, is relatively low and does not affect the streamflow of the Lower Niger River strongly. This is explainable with the high evapotranspiration in the watersheds. Except for the months of June and September, the evapotranspiration is generally exceeding the precipitation, which means that there is nearly no runoff into the tributaries and therefore into the Niger River. Based on this model, water will not flow in the tributaries most of the time. There was no data available to check whether this unlikely assumption is correct.

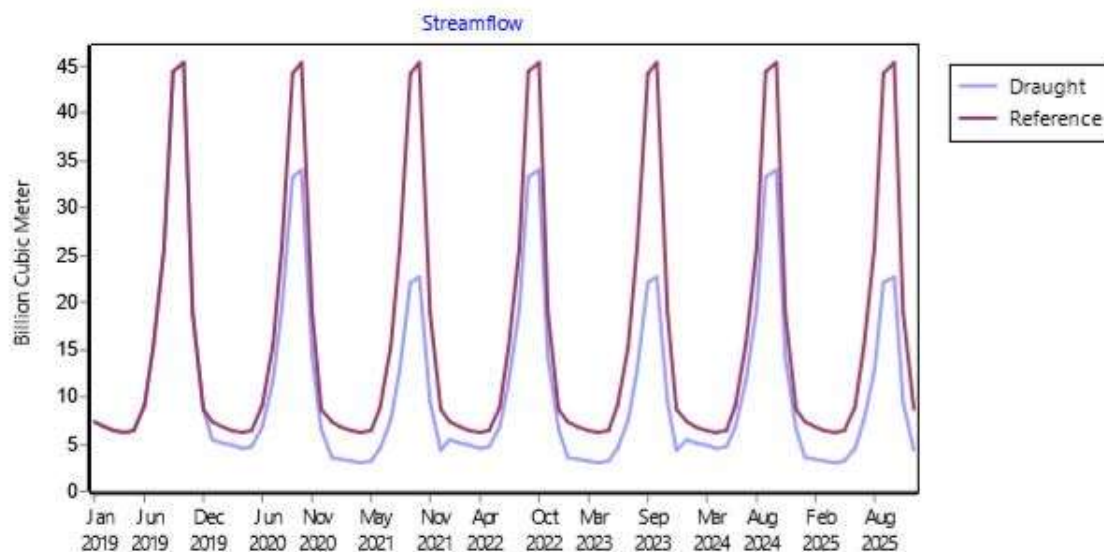
The water withdrawal is relatively low, too. It never exceeds 0,1 % of the streamflow. This can be explained by the fact that most of the domestic water use is met by groundwater and the agriculture is not irrigated and the industry is only using the water to cool their machines. The industry has a consumption rate of 5 %, which means that 95 % of the water that is extracted by the industry flows back into the Lower Niger River. Therefore, the streamflow does not change much compared to the initial stage.



In Conclusion, there is a very steady streamflow in the Lower Niger River. The input in the study area is relatively low based on the high evapotranspiration. The output of water is also relatively low because generally not much water is used. If water is used, it is either groundwater or water that returned into the river after fulfilling its function.

If the developments in the study area remain unchanged there will be no shortage in the water demand coverage. It is expected that streamflow of the Niger River can always cover the water withdrawal at 100 %. Even in case of an increase in the population growth rate or the domestic water demand, the water withdrawal will always be met according to the model.

In the case of the scenario “Draught” which assumes a series of five dry to very dry years in the entire Niger River Basin, a huge change in the predicted streamflow was modeled which is shown in Figure 40.



**Figure 40:** Predicted Streamflow at Onitsha Gauge Station

Nevertheless, this reduction of the streamflow does not lead to any shortages in the water demand coverage of households and industries in the Lower Niger River Basin. Therefore, even in a case of draught the Niger River delivers a streamflow high enough to meet the industrial and domestic water demand of all states.



## 7.2 Environmental Issues Along the Niger River

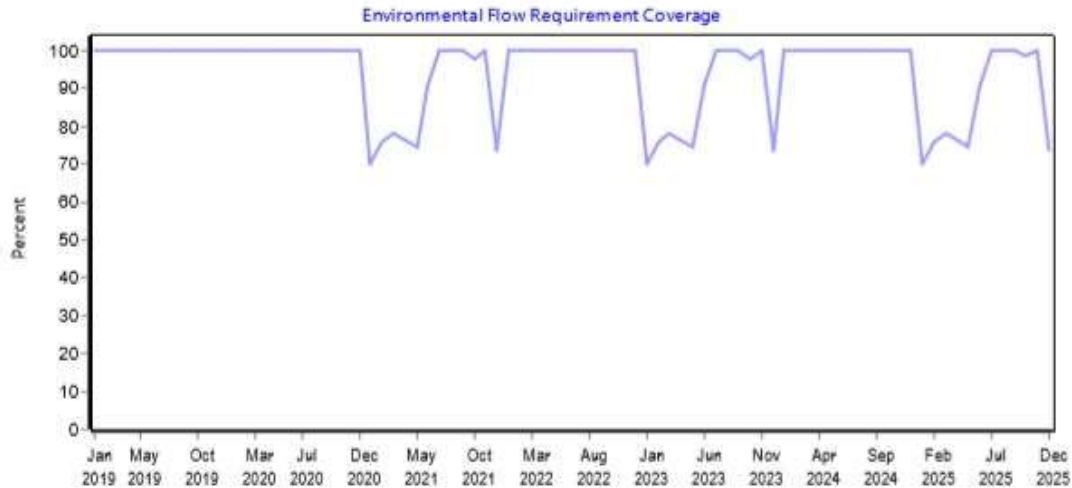
Large floods caused by high rainfall intensity often take place and result in flooding problems in urban areas located in the Lower Niger River Basin. This is particularly the case with coastal towns such as Warri, Port Harcourt, Patani, Forcados, Benin City, Yenegoa, etc.

Climate change has altered not only the overall magnitude of rainfall but also its seasonal distribution and inter-annual variability worldwide (Feng et al., 2013; Easterling, 2000; Zeng et al., 1999). In the tropics, seasonal rainfall has distinctly shaped a mosaic of highly diverse ecosystem from the tropical dry forests to open woodland forests to savannahs (Dirzo et al., 2011), that support species with a variety of adaptive strategies. Most of these ecosystems are extremely sensitive not only to the annual rainfall amount but also to other aspects of seasonal rainfall such as the arrival of rain at the beginning of the wet season, which determines the timing of important life stages such as leaf flushing and flowering; and the wet season length, which contributes to the timing of leaf fall and thus the total transpiration period (Borchert, 1994 and Schwartz, 2003). The same rainfall seasonality, with its associated drought and flood risks, also poses huge challenges to local populations, making agricultural efforts and sustainable management of soil and water resources more difficult (Rockstrom et al., 2003 and Wani, et al., 2009).

The chapter “Data Preparation and Data Sources” stated that the water withdrawal is never exceeding 0,1 % of the streamflow in the Niger River. With a yearly average streamflow of 6300 m<sup>3</sup>/s, the water supply by the Niger River is highly exceeding the water withdrawal of the states so that the calculated minimum environmental flow is always met.

If the current status prevails and the population and industrial growth rate remains unchanged, the Environmental Flow will be met at all times.

In the case of a sequel of dry to very dry years as described in the “Draught” scenario, the Environmental Flow will not be covered in the Lower Niger River. Therefore, the Environmental Management Class “B: Slightly Modified” will not be reached anymore, as depicted in Figure 41.



**Figure 41:** Coverage of the Environmental Flow Requirement at Onitsha Gauge Station as calculated in the “Draught” – scenario

The scenario “Hydropower in Onitsha” simulates the operation of a Run of River Hydropower Plant in Onitsha and its power production, but environmental issues arising through the construction of a hydropower plant could not be modeled solely with WEAP.

Dams fundamentally alter river courses. Construction of dams particularly large dams involve trade-off between economic, social and environmental benefits and costs, with respect to environmental issues, local conditions and the size and type of dam (all influence the environmental impact). It has been suggested that while reservoir have few negative effects on human water supply, they have a substantial impact on aquatic biodiversity and ecosystems. Such impacts can occur both upstream and downstream of the dam and in reservoirs.

Essentially, impact occur consequent upon inundation storage, changes to flow and the flow regime, water quality impact, and changes to the morphology of the river system. Other environmental consideration may be those attributable to climate change.

### 7.3 Food Supply in the Niger River Basin

A major reason for the good coverage of water demand along the river is the lack of water withdrawal by the agricultural sector. Based on the Land Use / Land Cover classification of



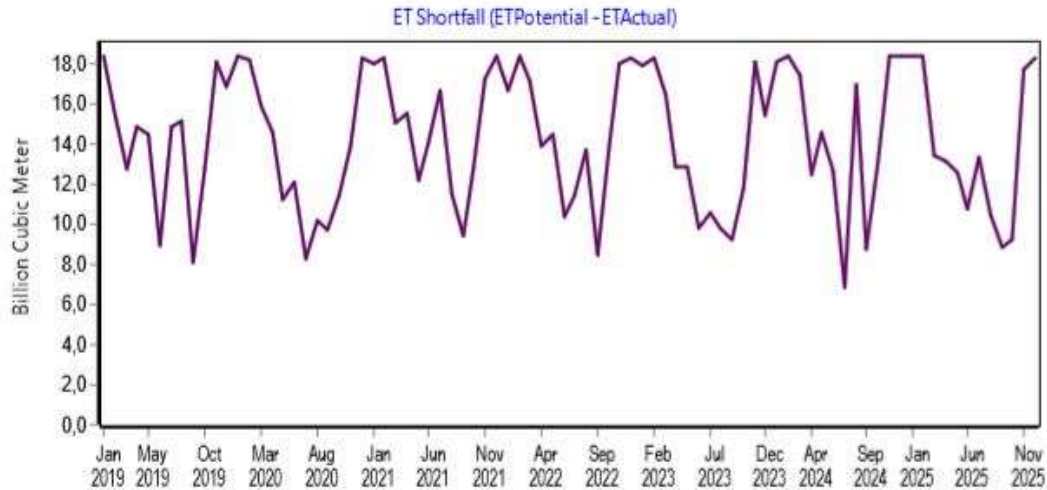
the Niger River Basin, around 33 % of the land are estimated to be used for agriculture (see Table 28).

**Table 28:** Percentage of Land Use / Land Cover classes in the Niger Basin

S/N	Land Cover Classification	Percent
1	Agriculture	33,10
2	Forest	12,52
3	Grassland	13,42
4	Wetland	0,18
5	Urban	0,12
6	Shrubland	7,25
7	Barren or Sparse Vegetation	29,99
8	Unknown	0,48
9	Open Water	3,15

In Nigeria, most farmers are cultivating Cassava, Rice and Maize to satisfy the food demand of their local community. They are mostly using extensive farming techniques and do not irrigate their fields. The success of their food production is therefore strongly dependent on external conditions like the number of sun hours, temperature and precipitation. According to Bewket (2009), in Sub-Saharan Africa, rainfall is the most important climatic factor influencing the growth characteristics of crops. Rainfall provides the water that serves as a medium through which nutrients are transported for crop development. In view of this significant role, clearly, inadequate water supply has adverse effects on efficient crop growth, resulting in low productivity. Von Braun (1991), has observed that a 10 % decrease in seasonal rainfall from the long-term average generally translates into a 4.4 % decrease in food production.





**Figure 42:** Shortfall in Evapotranspiration

This leads to food shortages and hunger problems in the Niger Basin. Wood (1977) and Pankhurst and Johnson (1988), have observed that food shortages and famines in Sub-Saharan Africa are mostly as a result of rainfall uncertainties and associated drought. Considering that the farmers in the Niger Delta Region rely solely on rain-fed agriculture, crop production is vulnerable to rainfall variability. Extreme variations to agro-climatic conditions, such as droughts and floods could directly affect the livelihood of the people in the region.

An increase in food production could be the solution to the current food shortages and decrease the vulnerability in the study region. The agricultural areas could be expanded or the use of the already existing fields could be intensified. One way to make the cultivation of agricultural areas more effective is by introducing irrigation. Figure 42 shows the shortfall in evapotranspiration and it indicated that until 2025 the potential evapotranspiration will always be higher than the actual evapotranspiration. This means that the soil water evaporates shortly after rainfall events and no water is left over. This water shortage is restricting the growth of crops strongly and could be resolved by irrigating the crops. Currently, there is almost no irrigation in the study area. This needs to change if food security is to be achieved, especially in consideration of extreme events through climate change.



## 7.4 Energy Generation through Hydro Power

The Lower Niger River has no existing dam from the Lokoja plain down to the Delta Region before finally discharging into the Atlantic Ocean. Yet, today much of the energy supply in the country is expected to come from Hydropower as a result of the current unstable gas supply due to militancy in the Niger Delta Region.

This study created the scenario “Hydropower in Onitsha” in which the impact of operating a dam after its construction end in 2025 was studied. The dam was assumed to have a similar dam capacity of the Bagre Dam in the Volta Basin in Burkina Faso. This was due to availability of data (which was applied for our study area).

The Bagre Dam is a key infrastructure to Burkina Faso with an immense contribution to the economy of the country. It has an installed capacity of about 8,36MW and a recorded annual production capacity of about 44,5 GWh in 2010 which represents a little over 60 % of its full operational capacity of about 73,26 GWh (Water Research Group, 2012).

The energy output of the modeled dam results in about 220 gigajoules per month. The maximum turbine flow of 40 m<sup>3</sup>/s for the studied dam was assumed to be the same as that of the Bagre Dam in Burkina Faso. With a minimum streamflow of 2300 m<sup>3</sup>/s in the “Reference” scenario and 1100 m<sup>3</sup>/s in the “Draught” scenario. The energy generation potential of the Lower Niger River could be exhausted much more by installing further and larger turbines than that at Bagre Dam.

## 7.5 Impact of Dams and Reservoirs on the Ecosystem

Dams fundamentally alter river courses. Construction of dams particularly large dams involve trade-off between economic, social and environmental benefits and costs. With respect to environmental issues, local conditions and the size and type of dam all influence the environmental impact. It has been suggested that while reservoir have few negative effects on human water supply, they have a substantial impact on aquatic biodiversity and ecosystems. Such impacts can occur both upstream and downstream of the dam and in reservoirs.

Essentially, impact occur consequent upon inundation storage, changes to flow and the flow regime, water quality impact, and changes to the morphology of the river system. Other environmental consideration may be those attributable to climate change.



World economic forum (2011), argues that in the backdrop of climate change and climate variability, how should our water best be stored and which storage should be used to minimize risk due to long term climate variability and change?

Such storage guarantees reliability of water supply which in turn means food security, electricity generation and industrial growth. Climate change also has an implication for existing dam infrastructure i.e. dams designed in the past without accounting for the increasing variability of climate change are now at risk (i.e. 100-year flood may be more severe meaning that the infrastructure is under designed). Studies carried out by various researchers does suggest that climate change will increase the intensity of extreme weather events (Ehiorobo et al., 2012, 2013) and has the potential to cause mass migration, create food and water insecurity and cause several other environmental and social impacts (Voigt, 2009; Khagram et al., 2000; Allonche et al., 2014).

Hence, the hydrological modelling of the water demand and supply of the lower Niger River Basin (using the WEAP model) revealed that although there is currently enough water supply (based on the amount of water available) for those that are able to withdraw water directly, however the infrastructure and management for the water supply is still insufficient to ensure a steady supply of water for those that are unable to withdraw water directly. This could lead to serious problems in the future along the Lower Niger River, especially with the threat of climate change. Therefore, this model can be utilized in the Niger Delta Basin for planning and management of water supply.

### **8.0 Problems Associated with Data Collection in the Niger Delta Basin**

The problems associated with data collection in the Niger Delta Basin include:

- Data Availability: Data in many of the stations are not up to data as there are gaps in some of the stations within the study area (data were not available for all stations within the study area).
- Shell Petroleum Development Company (one of the agencies from which data were to be collected) policy is non-sharing of their data with a third party. This has been a major problem for us in respect of data sharing.
- Over the years, the River Basins in Nigeria have been poorly gauged and poorly mapped. Discharge measurements were neglected and poorly carried out and as a result, data were poorly managed and stored.
- The Nigerian Meteorological Agency (NIMET) that harvest data on Rainfall, Temperature and Relative Humidity etc. have decided to commercialise their data for research as a result of poor funding by government. For instance, we were requested to



pay an equivalent of 3800 Euro for Met data covering 50years duration for 8 stations in the study area.

## 9.0 Conclusion

This study has assessed rainfall seasonality in Niger Delta Basin, frequency analysis of river discharge data for flood control in Niger Delta Basin, dams and reservoirs operations in the Niger Delta Basin (comprising of using WEAP to assess the water use impact on the Lower Niger River Basin in Nigeria, specifically hydrological modelling of water demand and supply of Lower Niger River Basin in Nigeria) . It was revealed that the mean monthly rainfall in the Niger Delta Basin was lowest in December and January and that the ITD, SSTA and local features are the main factors controlling rainfall in the Niger Delta Basin.

The flood frequency analysis indicated that the Generalized Logistic (GLO) and Generalized Extreme Value (GEV) distribution can be used to describe the discharge data for some areas within the Niger Delta Basin (Lokoja-GLO and Onitsha-GEV). Also, both the Generalized Pareto (GPA) and the Generalized Logistic (GLO) distribution can be used for analysis of annual maximum series data at River Okhuwan at Ugonoba in Benin Owena River Basin. Thus, these distributions can be used for future flood prediction within these areas.

The hydrological modelling of the water demand and supply of the lower Niger River Basin (using the WEAP model) revealed that although there is currently enough water supply (based on the amount of water available) for those that are able to withdraw water directly, however the infrastructure and management for the water supply is still insufficient to ensure a steady supply of water for those that are unable to withdraw water directly. This could lead to serious problems in the future along the Lower Niger River, especially with the threat of climate change. Therefore, this model can be utilized in the Niger Delta Basin for planning and management of water supply.

As Lokoja is an overlapping location between our CoE and the NWRI CoE, we will be sharing the data acquired from this location with them and other interested CoE. Lokoja station is strategic being at the confluence of the River Niger and the River Benue which take it source from neighbouring Cameroon and both rivers contribute to the flooding experienced in the lower Niger Basin as a result of reservoir and dam Operations outside the shores of Nigeria.



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## APPENDICES

### Appendix A Table of Monthly Rainfall Statistics in Some Southern Nigeria Cities (Millimetres)



**Table A.1:** Monthly Rainfall Statistics in Some Southern Nigeria Cities (Millimetres)

Year	Month	Ondo	Delta		Edo	Cross River			Rivers	Akwa Ibom
		Akure	Asaba	Warri	Benin	Calabar	Ikom	Ogoja	Port Harcourt	Uyo
1981	January	-		41.9	-	10.5	59.4	61.5	38.3	-
	February	22.4		56.4	6.8	-	6.2	-	36.3	-
	March	89.1		68.3	108.4	159.0	97.2	3.1	126.6	30.2
	April	253.3		83.3	119.8	163.5	274.5	194.2	173.0	175.7
	May	223.3		334.6	277.2	360.7	336.5	274.3	230.4	455.5
	June	258.6		296.2	180.6	355.8	219.5	218.7	448.5	279.1
	July	148.2		362.3	276.1	549.8	432.5	209.8	436.3	370.6
	August	152.7		348.0	230.0	400.4	504.9	189.7	353.5	325.4



	<b>September</b>	210.6		410.7	394.8	333.9	423.1	314.0	364.1	310.5
	<b>October</b>	55.9		269.3	178.1	325.4	312.5	240.1	269.5	249.6
	<b>November</b>	10.1		76.7	12.9	67.6	36.4	12.4	54.2	185.6
	<b>December</b>	-		2.2	1.1	10.3	-	-	-	-
1982	<b>January</b>	10.6		-	101.9	57.7	63.6	37.3	70.3	53.1
	<b>February</b>	68.1		203.5	111.4	57.4	185.2	21.4	49.3	50.8
	<b>March</b>	79.3		567.8	98.2	159.2	89.1	49.4	168.8	109.6
	<b>April</b>	221.8		347.3	211.4	190.1	146.1	93.8	86.4	168.9
	<b>May</b>	211.8		277.9	146.0	351.3	338.3	113.0	186.7	268.0
	<b>June</b>	169.8		388.3	174.1	396.0	367.8	389.7	378.7	279.2



	<b>July</b>	180.9		409.3	243.9	505.7	361.5	339.0	339.4	294.1
	<b>August</b>	25.2		376.3	66.8	381.7	247.8	157.0	234.0	291.8
	<b>September</b>	131.0		292.6	391.0	476.8	372.0	265.7	349.4	306.8
	<b>October</b>	269.6		110.7	381.9	131.8	278.0	285.3	227.9	247.4
	<b>November</b>	11.0		55.2	42.4	73.4	23.2	3.4	56.8	4.7
	<b>December</b>	-		28.0	-	27.9	-	8.5	26.0	30.9
<b>1983</b>	<b>January</b>	-		-	-	-	-	-	-	-
	<b>February</b>	26.2		49.1	49.4	13.5	18.9	-	-	-
	<b>March</b>	7.9		6.0	39.0	15.4	27.1	18.5	29.8	38.5
	<b>April</b>	161.9		128.1	76.8	141.5	156.8	13.1	220.8	177.2





	<b>May</b>	254.5		351.7	267.4	300.0	279.1	240.2	226.8	219.1
	<b>June</b>	194.8		406.5	277.2	504.6	301.6	186.6	229.4	205.7
	<b>July</b>	88.8		351.3	166.5	291.4	317.8	59.3	182.7	152.1
	<b>August</b>	56.4		103.0	142.8	360.4	376.9	327.3	129.5	146.6
	<b>September</b>	343.6		670.8	425.2	292.4	356.5	455.1	453.6	313.4
	<b>October</b>	142.0		177.0	150.3	246.4	61.2	58.3	262.4	-
	<b>November</b>	6.0		87.5	29.8	114.1	61.5	-	73.4	70.0
	<b>December</b>	62.9		190.6	22.8	67.0	3.3	-	8.0	44.1
<b>1984</b>	<b>January</b>	-		-	-	-	-	-	-	-
	<b>February</b>	-		12.6	45.8	24.8	-	-	35.9	-



<b>March</b>	174.9		171.5	87.3	187.8	42.4	43.4	107.6	115.7
<b>April</b>	189.6		221.8	59.3	143.2	255.6	132.3	76.4	101.6
<b>May</b>	203.0		243.0	120.4	312.0	228.5	157.2	408.6	208.0
<b>June</b>	218.3		271.2	134.1	437.3	351.4	179.0	348.5	290.8
<b>July</b>	151.3		516.1	223.8	274.5	271.4	321.1	494.8	242.6
<b>August</b>	206.6		439.5	181.8	121.2	470.9	443.7	159.8	139.2
<b>September</b>	197.1		479.4	235.2	414.5	317.5	324.6	387.6	260.8
<b>October</b>	166.1		238.8	154.8	310.4	187.2	219.8	135.6	248.4
<b>November</b>	0.5		100.4	4.4	273.4	36.0	1.2	172.8	126.7
<b>December</b>	-		3.2	2.5	-	-	-	34.9	-



1985	<b>January</b>	-		35.9	8.7	16.8	-	14.9	28.1	69.2
	<b>February</b>	-		60.8	16.0	-	-	-	0.3	-
	<b>March</b>	155.7		175.6	110.5	153.6	202.7	111.8	73.8	170.1
	<b>April</b>	146.5		147.4	33.2	250.0	147.1	50.0	280.3	171.6
	<b>May</b>	220.9		207.1	173.4	520.5	221.5	242.6	279.1	305.2
	<b>June</b>	186.7		594.0	202.5	456.6	212.6	170.6	227.8	274.0
	<b>July</b>	231.3		461.2	244.3	370.1	237.8	176.0	223.7	360.0
	<b>August</b>	326.7		649.6	305.2	326.3	270.0	248.3	494.6	453.0
	<b>September</b>	252.6		431.8	197.9	403.2	371.8	424.5	348.9	302.6
	<b>October</b>	99.5		139.1	147.5	313.3	224.7	256.6	161.3	258.0



	<b>November</b>	24.3		62.1	106.1	148.9	87.0	44.5	83.9	98.3
	<b>December</b>	-		12.2	-	4.5	56.9	1.8	4.8	9.4
1986	<b>January</b>	12.7		18.4	5.6	-	0.8	-	34.8	6.2
	<b>February</b>	150.2		50.0	45.1	72.1	22.2	18.9	87.7	24.8
	<b>March</b>	130.8		169.9	109.6	283.8	304.0	85.0	97.3	200.4
	<b>April</b>	41.8		246.8	52.3	118.5	76.7	77.3	121.4	102.0
	<b>May</b>	157.5		220.1	162.7	274.4	237.9	207.4	258.3	226.3
	<b>June</b>	142.2		281.8	65.1	153.0	236.9	210.3	168.7	144.4
	<b>July</b>	100.6		726.4	214.2	533.4	416.5	196.5	365.4	244.0
	<b>August</b>	77.5		318.6	117.7	264.1	375.4	112.6	340.8	111.9



	<b>September</b>	217.9		255.7	222.3	403.9	327.1	376.9	285.4	364.5
	<b>October</b>	82.0		543.4	166.5	414.6	263.6	230.2	263.2	273.1
	<b>November</b>	46.6		84.7	67.1	91.9	50.6	46.4	110.6	62.2
	<b>December</b>	-		-	-	-	-	-	-	-
1987	<b>January</b>	7.7		-	0.8	24.3	-	-	5.4	-
	<b>February</b>	49.1		83.7	74.5	37.4	54.7	32.5	167.6	58.9
	<b>March</b>	107.1		155.4	100.2	193.6	144.0	51.5	224.1	210.6
	<b>April</b>	94.3		88.9	112.5	110.9	120.6	46.2	90.5	90.0
	<b>May</b>	93.1		301.2	151.4	337.6	160.7	148.0	206.9	409.8
	<b>June</b>	116.7		206.0	217.0	377.0	330.5	124.8	285.7	222.6



	<b>July</b>	158.1		576.5	269.5	350.8	246.7	321.6	448.3	184.3
	<b>August</b>	384.4		623.8	722.5	493.8	485.9	312.7	511.1	334.2
	<b>September</b>	276.4		390.1	348.2	329.7	402.4	239.1	410.5	296.8
	<b>October</b>	113.7		312.1	299.8	399.2	331.5	169.7	297.4	286.4
	<b>November</b>	-		37.9	39.9	112.3	2.5	-	59.6	23.9
	<b>December</b>	0.8		-	-	94.8	-	-	16.8	47.6
<b>1988</b>	<b>January</b>	18.4		18.2	7.0	51.2	0.7	15.8	5.4	9.9
	<b>February</b>	74.7		108.4	71.1	31.1	5.6	15.3	4.5	3.5
	<b>March</b>	74.3		121.3	154.8	156.1	51.5	44.2	119.9	148.6
	<b>April</b>	182.0		185.8	136.5	378.6	154.0	163.8	165.8	182.5



	<b>May</b>	156.9		177.5	168.0	224.1	215.2	194.6	274.9	186.9
	<b>June</b>	203.5		349.5	227.0	497.9	173.0	169.8	467.4	311.6
	<b>July</b>	193.1		313.7	393.0	367.0	295.0	177.7	329.6	362.3
	<b>August</b>	82.6		255.8	191.2	147.3	344.3	148.9	307.1	249.0
	<b>September</b>	278.1		634.6	445.4	538.3	232.0	237.1	463.9	565.6
	<b>October</b>	229.9		295.5	273.2	233.1	237.9	341.7	226.6	174.7
	<b>November</b>	44.7		87.5	23.3	131.6	-	-	34.7	28.1
	<b>December</b>	17.6		161.0	58.6	56.3	7.4	72.3	21.1	16.1
1989	<b>January</b>	-		-	-	-	-	-	-	-
	<b>February</b>	-		6.3	25.8	-	-	-	-	-





<b>March</b>	117.2		109.1	66.1	121.5	76.0	38.8	128.3	36.7
<b>April</b>	59.1		171.0	152.0	341.8	133.1	126.9	175.8	251.4
<b>May</b>	183.7		256.0	140.4	255.6	185.2	216.1	138.6	218.4
<b>June</b>	226.8		374.1	343.4	540.5	280.4	379.4	184.0	261.0
<b>July</b>	199.6		452.9	279.2	626.5	272.2	162.7	193.1	519.6
<b>August</b>	357.4		385.8	427.8	286.9	372.9	495.7	267.7	342.5
<b>September</b>	175.5		371.8	157.3	279.0	406.2	379.2	280.1	478.1
<b>October</b>	111.5		272.7	365.1	218.3	295.9	393.6	409.5	332.4
<b>November</b>	19.1		156.3	14.2	95.9	-	11.2	61.3	45.8
<b>December</b>	-		15.5	-	-	-	-	26.5	16.1



1990	<b>January</b>	4.4		77.4	19.6	20.8	18.9	35.2	6.1	41.8
	<b>February</b>	15.5		7.5	18.8	-	-	-	28.5	0.3
	<b>March</b>	-		38.4	-	5.4	42.6	-	96.8	25.3
	<b>April</b>	158.5		222.1	256.8	53.6	156.3	209.0	100.5	175.7
	<b>May</b>	113.6		137.0	181.4	344.0	268.1	125.2	214.2	232.2
	<b>June</b>	90.7		467.7	204.1	473.6	300.0	481.2	201.0	130.2
	<b>July</b>	370.3		582.9	353.4	702.7	392.7	426.7	469.2	560.4
	<b>August</b>	245.8		733.6	614.5	225.7	375.1	218.8	676.5	453.7
	<b>September</b>	230.9		386.0	296.9	336.5	197.0	496.0	293.7	231.8
	<b>October</b>	213.3		318.2	288.9	310.0	369.2	360.3	190.6	272.5



	<b>November</b>	72.4		99.9	33.7	203.3	92.4	9.4	88.6	93.4
	<b>December</b>	62.5		28.1	168.6	56.5	50.2	52.6	117.0	36.9
1991	<b>January</b>	1.2		-	-	-	-	-	-	-
	<b>February</b>	98.6		-	58.1	11.0	34.8	0.1	80.9	31.1
	<b>March</b>	136.0		112.3	123.5	88.3	171.3	19.2	105.0	53.6
	<b>April</b>	223.2		459.3	386.3	259.3	192.4	129.0	107.5	345.3
	<b>May</b>	201.2		219.3	196.7	258.4	308.0	344.2	432.1	232.1
	<b>June</b>	162.9		230.5	207.2	479.0	364.6	365.1	256.5	325.1
	<b>July</b>	463.0		599.7	656.2	439.6	294.8	297.3	360.2	368.8
	<b>August</b>	203.6		497.3	382.6	505.6	624.1	310.5	310.1	371.3



	<b>September</b>	200.7		359.9	268.0	169.8	246.9	171.6	139.1	212.2
	<b>October</b>	152.6		353.1	267.9	359.0	199.8	309.1	171.6	360.3
	<b>November</b>	-		80.2	39.2	72.2	0.3	-	111.1	67.4
	<b>December</b>	10.4		9.1	11.9	19.7	-	-	20.3	16.7
1992	<b>January</b>	-		-	-	2.6	3.5	1.2	61.1	8.3
	<b>February</b>	-		40.5	0.2	0.5	-	1.8	-	-
	<b>March</b>	40.8		139.4	41.4	271.5	188.9	26.8	178.0	126.3
	<b>April</b>	107.8		93.6	222.7	206.3	199.2	141.8	89.9	112.3
	<b>May</b>	151.1		260.0	240.0	161.8	193.6	334.4	178.8	276.5
	<b>June</b>	237.9		519.8	335.8	387.7	329.0	295.8	170.2	280.0



	<b>July</b>	265.3		758.3	515.9	455.1	324.8	243.8	388.5	495.6
	<b>August</b>	101.7		297.5	76.4	400.2	236.1	163.4	271.1	391.9
	<b>September</b>	348.1		337.3	256.3	481.4	249.0	253.9	260.3	290.4
	<b>October</b>	194.6		453.6	292.2	408.5	262.7	127.4	271.5	129.1
	<b>November</b>	35.6		135.3	35.6	120.7	52.9	3.8	87.9	145.5
	<b>December</b>	-		25.0	-	0.1	-	-	13.7	-
1993	<b>January</b>	-		-	-	64.3	-	0.6	-	5.7
	<b>February</b>	57.0		40.5	9.6	39.9	-	18.7	43.0	22.2
	<b>March</b>	18.8		189.0	135.0	177.7	140.3	73.2	158.0	136.2
	<b>April</b>	84.6		286.1	95.4	161.2	72.8	59.1	247.5	133.1



	<b>May</b>	95.1		231.2	198.2	230.1	160.6	184.7	138.5	175.9
	<b>June</b>	104.1		128.7	208.8	281.0	307.3	184.2	326.8	248.5
	<b>July</b>	122.2		868.4	191.4	272.4	317.2	340.7	438.5	353.3
	<b>August</b>	274.1		492.7	433.9	479.1	338.1	182.8	426.0	402.8
	<b>September</b>	303.7		363.1	257.6	420.5	359.0	316.7	368.7	344.8
	<b>October</b>	95.9		201.3	174.2	242.6	307.0	149.3	266.8	229.6
	<b>November</b>	72.3		175.4	108.1	119.7	60.8	68.7	147.0	120.6
	<b>December</b>	21.4		34.2	48.6	22.8	9.3	17.2	20.9	2.6
1994	<b>January</b>	11.2		70.2	27.5	40.7	1.0	-	37.4	14.8
	<b>February</b>	39.4		17.6	14.6	-	-	-	66.8	2.3



<b>March</b>	44.4		70.2	111.4	167.1	141.7	7.2	80.9	47.1
<b>April</b>	97.8		126.9	149.8	328.2	94.5	127.8	128.9	277.4
<b>May</b>	169.9		182.9	327.9	255.3	306.3	234.8	372.6	326.7
<b>June</b>	225.8		362.0	351.3	294.2	355.4	140.7	256.3	285.5
<b>July</b>	147.6		453.7	444.4	609.3	259.4	305.4	462.3	546.3
<b>August</b>	162.8		398.5	461.4	424.5	304.0	393.5	314.3	322.3
<b>September</b>	181.3		616.9	391.7	290.0	408.4	354.9	342.0	433.2
<b>October</b>	157.3		455.3	204.5	265.2	389.7	264.0	218.8	288.6
<b>November</b>	28.0		52.8	47.0	229.7	45.1	-	93.9	124.1
<b>December</b>	-		-	-	-	-	-	-	-





1995	January	-		-		-		-		79.6	0.2		
	February	28.4		43.0		50.6		21.1		3.5	0.2	15.6	41.8
	March	128.0		298.1		165.4		366.1		191.9	84.3	118.3	188.2
	April	196.3		188.4		217.9		248.3		175.0	181.7	120.1	83.6
	May	146.4		264.8		226.9		208.6		298.9	202.4	362.5	328.8
	June	214.2		393.8		286.2		375.2		220.1	283.8	246.6	265.0
	July	268.6		398.7		383.3		632.4		333.2	274.9	393.6	457.2
	August	379.6		533.1		580.8		467.4		411.4	287.7	333.6	403.0
	September	262.3		607.6		383.3		704.2		343.4	454.4	319.6	276.8
	October	87.3		396.5		240.2		496.1		306.5	278.3	413.1	366.4



	<b>November</b>	14.2		171.6	124.7	168.0	54.0	-	72.9	127.8
	<b>December</b>	-		42.2	9.1	-	-	-	53.0	1.1
1996	<b>January</b>	-		11.2	7.0	2.4	-	-	-	8.7
	<b>February</b>	68.0		134.4	92.6	162.7	52.6	-	130.4	124.0
	<b>March</b>	67.8		244.5	188.2	161.5	79.7	57.3	113.9	123.8
	<b>April</b>	218.3		337.3	298.3	314.5	252.7	45.1	320.9	258.7
	<b>May</b>	220.0		278.9	322.2	299.5	248.6	273.4	363.8	347.3
	<b>June</b>	154.0		304.0	28.1	435.3	330.4	110.3	160.5	285.4
	<b>July</b>	106.2		167.3	182.3	401.1	202.8	212.7	241.3	372.6
	<b>August</b>	116.2		383.2	392.3	425.4	269.4	182.1	229.4	412.1



	<b>September</b>	286.8		520.7	476.0	615.2	471.6	417.5	478.0	433.2
	<b>October</b>	111.0		292.9	292.7	357.4	491.6	229.6	272.8	229.9
	<b>November</b>	17.6		31.3	5.6	40.5	-	-	22.8	86.1
	<b>December</b>	-		-	1.1	-	-	-	5.9	-
1997	<b>January</b>	33.3	35.9	28.9	75.3	61.0	4.8	-	23.3	20.6
	<b>February</b>	-	-	-	-	-	-	-	18.6	-
	<b>March</b>	90.9	168.0	131.2	104.0	139.4	110.9	80.6	96.4	119.2
	<b>April</b>	191.9	294.9	279.1	230.9	228.7	220.9	180.2	174.5	134.1
	<b>May</b>	187.0	387.7	300.8	305.3	328.2	212.0	351.0	380.1	229.7
	<b>June</b>	207.3	411.0	295.5	203.3	633.1	585.2	331.1	353.1	246.5



	<b>July</b>	218.3	159.8	666.2	285.0	796.6	424.5	359.1	360.0	339.0
	<b>August</b>	146.7	258.8	385.8	160.2	492.6	287.7	258.6	305.6	294.5
	<b>September</b>	170.1	267.8	331.5	222.9	211.2	486.2	295.4	207.4	106.2
	<b>October</b>	204.4	283.4	611.6	338.4	319.7	262.5	342.5	133.2	337.2
	<b>November</b>	53.2	49.6	180.7	176.6	214.3	91.9	26.9	247.7	96.3
	<b>December</b>	4.5	11.1	16.0	98.9	68.2	31.3	3.2	29.9	8.8
<b>1998</b>	<b>January</b>	-	-	19.3	44.1	25.4	-	-	22.6	-
	<b>February</b>	23.7	Tr	74.4	1.8	6.0	-	-	36.9	13.8
	<b>March</b>	10.9	278.0	69.7	104.6	174.0	59.1	3.7	87.6	76.2
	<b>April</b>	122.3	110.7	170.6	104.8	149.1	263.5	97.7	188.0	140.6



	<b>May</b>	231.1	294.1	227.2	214.6	217.6	226.4	258.2	279.1	143.0
	<b>June</b>	243.5	298.6	352.0	214.4	504.5	320.3	207.6	414.6	346.2
	<b>July</b>	155.3	221.9	562.1	506.1	255.2	303.7	140.4	369.8	350.6
	<b>August</b>	90.4	49.4	76.9	95.6	353.7	446.6	625.5	247.3	190.2
	<b>September</b>	256.3	198.7	575.7	387.9	365.0	394.4	526.0	489.1	303.0
	<b>October</b>	273.3	172.1	197.2	244.0	437.1	311.8	289.2	265.4	150.8
	<b>November</b>	46.8	Tr	118.5	58.8	170.0	43.2	-	136.7	235.0
	<b>December</b>	-	2.0	4.9	42.0	33.6	-	-	32.0	61.0
1999	<b>January</b>	20.3	32.9	51.3	86.3	86.0	52.9	78.3	40.9	59.2
	<b>February</b>	35.4	33.5	71.2	64.4	49.8	51.0	45.9	52.1	70.7



<b>March</b>	57.0	140.7	154.0	98.3	203.0	106.3	19.5	106.6	111.6
<b>April</b>	117.3	124.6	186.0	119.6	311.4	175.0	69.9	186.4	316.6
<b>May</b>	183.5	283.3	316.4	161.7	180.0	225.8	190.7	291.6	187.1
<b>June</b>	169.2	270.3	168.3	99.5	270.3	270.1	236.4	232.9	138.7
<b>July</b>	98.0	314.0	644.4	412.3	349.9	421.2	304.6	294.1	269.9
<b>August</b>	223.7	242.2	229.8	232.0	494.5	198.7	170.5	257.4	318.7
<b>September</b>	187.2	410.0	501.0	369.0	368.3	351.0	232.7	453.5	540.7
<b>October</b>	330.0	224.4	652.0	472.5	463.7	487.4	303.5	510.6	396.9
<b>November</b>	58.7	39.3	419.6	97.8	207.2	50.6	41.6	73.5	96.3
<b>December</b>	-	-	2.6	9.4	0.3	-	-	-	-



2000	<b>January</b>	44.7	9.2	18.3	4.0	66.0	12.0	-	11.6	9.5
	<b>February</b>	-	Tr	41.9	73.0	-	-	-	7.2	1.2
	<b>March</b>	34.9	99.3	132.1	60.8	95.9	9.4	-	59.2	118.2
	<b>April</b>	207.2	115.2	239.6	170.0	166.4	127.1	190.5	190.2	101.7
	<b>May</b>	118.9	135.0	312.9	191.8	217.0	349.1	138.2	202.3	327.3
	<b>June</b>	299.3	315.7	404.4	413.7	250.6	339.8	310.9	181.5	163.8
	<b>July</b>	215.3	382.2	261.0	294.7	617.9	373.7	304.2	420.4	330.5
	<b>August</b>	215.9	198.6	471.7	237.9	390.2	428.4	162.8	245.4	313.2
	<b>September</b>	232.6	466.5	388.5	345.0	627.6	330.7	285.1	454.9	267.1
	<b>October</b>	137.0	226.4	304.2	351.2	232.9	335.7	286.3	153.1	191.2





	<b>November</b>	19.6	1.6	108.5	49.0	153.6	14.4	-	51.6	132.1
	<b>December</b>	5.4	16.9	39.1	48.7	57.5	36.6	-	16.9	39.1
2001	<b>January</b>	-	-	4.2	18.8	-	-	-	31.3	-
	<b>February</b>	-	Tr	6.1	10.1	11.6	-	2.2	2.4	5.2
	<b>March</b>	70.7	31.2	129.0	119.3	151.7	91.2	15.8	156.2	201.0
	<b>April</b>	255.0	211.7	282.1	394.3	371.8	206.4	67.9	118.2	234.4
	<b>May</b>	106.6	251.6	334.2	155.7	491.4	240.5	152.9	314.7	329.6
	<b>June</b>	125.9	329.3	295.1	364.3	390.5	371.8	205.1	245.2	556.4
	<b>July</b>	155.1	114.1	340.2	216.0	268.5	152.9	109.5	336.9	203.4
	<b>August</b>	52.0	217.1	342.3	137.4	457.0	252.3	198.8	309.9	196.1



	<b>September</b>	185.4	183.0	354.2	357.1	455.7	440.2	324.2	365.3	248.1
	<b>October</b>	24.5	144.8	245.0	183.0	381.0	196.2	175.0	137.2	234.6
	<b>November</b>	1.2	-	42.9	82.6	217.1	30.1	-	108.1	94.6
	<b>December</b>	-	-	14.9	3.9	5.7	-	-	28.1	3.7
2002	<b>January</b>	-	-	-	-	-	-	-	-	-
	<b>February</b>	40.7	34.3	65.8	115.0	13.5	11.5	0.5	79.0	24.2
	<b>March</b>	121.3	44.7	83.0	163.5	154.6	37.1	65.0	75.8	125.1
	<b>April</b>	130.1	111.7	309.8	278.1	383.2	241.1	279.4	103.3	257.9
	<b>May</b>	80.6	236.8	232.9	199.4	301.3	140.7	137.3	117.5	302.1
	<b>June</b>	272.8	413.3	375.9	344.9	344.6	357.1	446.5	324.0	285.1



	<b>July</b>	255.6	258.3	628.0	411.3	274.1	479.6	334.5	285.4	174.8
	<b>August</b>	204.7	353.3	609.7	491.8	623.5	342.5	300.0	556.7	388.4
	<b>September</b>	236.9	235.3	517.0	294.8	284.3	336.8	408.4	265.4	266.7
	<b>October</b>	125.5	228.7	454.0	149.5	285.8	226.2	235.0	283.5	398.8
	<b>November</b>	78.8	11.9	36.1	101.0	126.0	53.0	10.5	67.0	86.3
	<b>December</b>	2.4	-	-	9.9	6.8	-	-	28.1	6.3
<b>2003</b>	<b>January</b>	1.1	30.5	53.8	33.9	26.7	8.1	20.2	52.9	23.4
	<b>February</b>	44.5	3.1	6.0	13.7	103.2	-	-	71.8	121.0
	<b>March</b>	30.5	11.9	153.3	172.0	226.6	64.9	2.5	158.2	111.2
	<b>April</b>	87.3	142.0	238.6	169.8	283.0	151.1	190.5	207.0	250.5



	<b>May</b>	115.3	193.0	168.3	226.5	315.3	148.3	156.5	134.5	207.7
	<b>June</b>	158.7	22.7	234.4	187.6	202.2	345.3	388.7	216.0	149.3
	<b>July</b>	89.7	234.6	243.2	177.1	227.4	417.1	398.2	363.3	475.0
	<b>August</b>	58.7	167.6	306.3	142.1	398.6	234.5	205.1	320.0	274.3
	<b>September</b>	320.8	455.1	436.1	393.3	399.2	316.2	192.2	580.4	388.8
	<b>October</b>	114.0	178.2	364.5	338.1	224.1	436.8	234.4	239.6	191.3
	<b>November</b>	60.0	40.2	115.0	57.3	148.5	49.5	27.5	98.6	101.3
	<b>December</b>	-	1.2	9.9	26.3	2.9	7.1	-	4.1	4.5
2004	<b>January</b>	70.4	2.4	25.4	28.8	9.9	-	-	1.8	4.3
	<b>February</b>	60.9	22.8	67.0	28.3	19.9	13.6	-	46.5	56.0



<b>March</b>	12.6	70.4	46.3	68.4	73.5	4.7	11.2	50.7	27.4
<b>April</b>	165.9	176.3	159.4	118.9	278.4	192.4	93.8	120.7	177.7
<b>May</b>	234.8	430.9	379.1	250.7	270.2	218.1	300.6	132.8	162.0
<b>June</b>	183.8	240.6	243.6	448.9	308.0	245.8	145.0	243.7	379.0
<b>July</b>	168.2	273.4	795.7	288.0	272.4	304.0	306.4	399.6	380.2
<b>August</b>	222.8	213.1	454.7	403.0	391.9	250.6	132.7	210.1	240.6
<b>September</b>	177.4	207.7	497.2	297.6	335.0	321.7	345.2	352.4	355.8
<b>October</b>	132.7	135.0	334.1	299.8	196.4	330.4	153.6	218.1	284.1
<b>November</b>	25.0	90.5	48.0	94.3	168.3	105.5	35.4	95.7	93.4
<b>December</b>	-	-	13.5	1.6	0.6	-	-	5.4	1.5



2005	<b>January</b>	-	59.4	37.3	-	33.8	25.9	27.5	17.1	30.7
	<b>February</b>	-	11.3	21.7	9.8	35.3	125.6	13.5	85.9	83.0
	<b>March</b>	186.4	25.5	191.2	182.2	295.9	129.0	16.6	170.8	170.4
	<b>April</b>	85.0	89.7	104.1	119.6	299.9	132.1	98.3	121.4	314.1
	<b>May</b>	211.4	194.5	315.1	95.5	263.9	231.4	207.3	247.3	229.6
	<b>June</b>	252.8	256.0	216.4	450.2	615.6	301.3	214.8	383.4	319.5
	<b>July</b>	189.6	374.2	592.4	458.8	827.2	261.9	240.8	253.9	552.0
	<b>August</b>	182.0	133.3	146.7	97.0	634.4	329.5	205.8	228.6	294.1
	<b>September</b>	236.0	390.5	432.5	207.6	230.4	301.3	255.5	284.2	279.6
	<b>October</b>	151.0	217.4	203.6	333.2	279.8	319.3	451.2	195.2	381.5



	<b>November</b>	31.1	4.6	68.6	40.0	279.8	63.1	50.1	28.7	164.4
	<b>December</b>	7.9	Tr	39.0	20.1	66.1	8.4	-	38.7	2.6
2006	<b>January</b>	31.2	54.8	111.0	33.1	84.7	44.3	-	99.5	5.4
	<b>February</b>	3.6	9.1	171.9	22.3	57.1	76.7	55.6	164.0	62.1
	<b>March</b>	120.9	198.3	177.6	146.0	323.0	131.0	39.9	152.9	192.7
	<b>April</b>	108.8	91.6	149.2	117.1	166.1	107.7	84.5	84.9	219.8
	<b>May</b>	213.7	251.4	453.9	394.0	431.8	307.6	322.7	252.1	292.9
	<b>June</b>	146.9	345.6	229.4	240.2	227.7	347.0	229.9	444.9	486.1
	<b>July</b>	192.6	114.7	368.4	462.4	486.9	313.1	221.9	410.3	269.0
	<b>August</b>	186.5	234.5	305.6	359.2	273.4	282.3	198.8	298.8	277.9





	<b>September</b>	243.5	386.5	528.2	334.4	536.3	322.0	418.0	795.0	414.8
	<b>October</b>	152.1	220.3	493.2	217.8	175.3	309.5	243.7	166.2	300.4
	<b>November</b>	7.2	-	25.0	32.0	134.4	5.0	1.3	-	37.6
	<b>December</b>	-	-	17.7	-	0.1	-	-	-	-
2007	<b>January</b>		-			-			2.0	
	<b>February</b>		-			51.1			78.0	
	<b>March</b>	59.6	-	23.5	91.6	181.0	18.8	28.5	93.2	119.1
	<b>April</b>	90.0	82.3	146.3	183.5	265.9	132.8	135.8	168.8	281.0
	<b>May</b>	208.3	283.8	287.1	350.2	384.2	192.2	241.6	290.1	343.5
	<b>June</b>	172.6	209.9	550.3	347.9	583.5	318.7	245.3	445.9	311.6



	<b>July</b>	181.9	218.5	364.2	354.3	492.2	314.7	184.9	500.9	255.8
	<b>August</b>	168.6	397.9	141.4	303.3	415.5	315.2	280.2	455.1	260.9
	<b>September</b>	276.6	279.8	512.8	462.5	561.7	360.3	605.8	366.7	395.4
	<b>October</b>	193.1	283.8	327.7	263.5	197.6	528.4	509.0	299.2	237.7
	<b>November</b>	52.2	46.4	65.3	152.0	262.1		109.3	145.1	277.6
	<b>December</b>	2.8	-	33.5	18.5	33.1		7.6	10.5	5.0
2008	<b>January</b>	-	-	1.7	10.3	75.1	42.0	27.7	-	37.3
	<b>February</b>	-	-	10.0	2.8	184.1	-	-	-	-
	<b>March</b>	176.4	44.9	182.6	146.1	178.7	96.8	41.7	142.4	134.9
	<b>April</b>	48.7	237.7	270.0	160.1	178.9	263.0	184.0	228.4	209.8



	<b>May</b>	83.8	238.8	357.7	215.6	386.8	-	494.6	196.3	374.6
	<b>June</b>	256.0	159.5	467.6	272.9	437.0	272.6	391.9	171.4	321.9
	<b>July</b>	258.9	236.7	451.9	413.6	597.8	276.5	179.6	284.7	112.6
	<b>August</b>	192.1	318.6	635.4	319.7	510.2	373.0	269.1	409.2	485.1
	<b>September</b>	218.4	354.6	422.3	199.3	190.1	359.3	300.7	375.5	134.5
	<b>October</b>	207.1	160.5	214.5	90.6	342.7	148.2	163.5	142.4	192.1
	<b>November</b>	22.5	13.8	75.3	95.4	94.4	-	-	64.1	58.9
	<b>December</b>	2.2	-	23.8	-	78.1	54.6	96.9	86.5	44.5
2009	<b>January</b>	26.1	8.2	13.0	14.6	89.7	43.6	61.3	61.3	46.9
	<b>February</b>	48.5	1.7	83.6	108.6	38.5	12.6	11.8	66.6	58.0



<b>March</b>	154.7	18.6	71.1	69.8	87.2	28.1	-	120.1	63.5
<b>April</b>	177.4	73.0	139.9	157.8	147.7	234.6	411.6	156.9	165.4
<b>May</b>	142.0	142.5	210.3	330.5	311.6	645.0	282.4	312.9	220.0
<b>June</b>	151.5	139.4	575.6	171.8	224.7	212.1	382.4	351.9	382.5
<b>July</b>	252.7	540.2	418.9	175.0	577.5	332.3	454.7	438.5	187.3
<b>August</b>	100.5	410.1	416.6	248.3	507.2	557.8	349.1	391.9	319.9
<b>September</b>	60.1	122.1	424.1	294.5	269.9	283.3	336.9	212.7	217.4
<b>October</b>	136.7	213.3	341.4	342.9	148.3	273.7	398.3	372.1	210.3
<b>November</b>	59.4	96.7	64.9	161.0	126.9	89.1	49.4	77.6	40.5
<b>December</b>	-	-	15.7	23.0	-	-	-	-	-



2010	<b>January</b>	63.0	-	5.4	15.5	31.8	-	-	-	-
	<b>February</b>	25.6	0.5	119.4	68.6	86.9	20.2	-	102.0	30.2
	<b>March</b>	56.7	27.6	89.5	55.3	63.2	66.1	25.5	40.8	32.7
	<b>April</b>	111.9	280.0	218.9	321.5	125.7	196.2	139.8	128.0	7.6
	<b>May</b>	147.9	111.3	380.0	79.6	306.5	258.0	421.8	231.6	289.7
	<b>June</b>	121.2	246.6	268.7	145.4	881.4	595.8	435.0	195.8	808.1
	<b>July</b>	169.5	246.7	191.8	91.6	287.0	141.4	270.4	167.9	311.4
	<b>August</b>	279.1	336.5	302.2	332.2	395.9	282.2	247.3	172.9	685.1
	<b>September</b>	220.5	200.1	546.6	615.1	451.3	311.1	282.5	402.1	487.7
	<b>October</b>	120.7	189.5	296.3	267.4	302.6	388.9	555.2	177.5	281.7



	<b>November</b>	71.8	113.9	157.7	306.5	271.6	60.7	26.6	82.8	271.6
	<b>December</b>	-	-	4.7	40.7	56.2	-	-	-	-
2011	<b>January</b>	-	-	-	-	-	-	-	-	-
	<b>February</b>	88.1	54.5	139.1	77.8	153.5	121.8	59.1	115.3	40.9
	<b>March</b>	96.1	98.4	68.3	87.0	123.1	40.2	21.7	93.5	174.3
	<b>April</b>	113.1	169.3	143.7	321.5	208.8	259.8	154.6	133.3	175.2
	<b>May</b>	144.9	465.2	366.9	353.5	340.9	316.0	436.5	234.5	458.8
	<b>June</b>	158.2	269.0	332.5	430.9	388.6	253.1	331.7	353.8	464.9
	<b>July</b>	176.3	454.5	672.6	550.8	648.6	229.1	167.1	305.5	929.5
	<b>August</b>	172.4	498.5	459.5	502.5	573.7	361.1	476.5	310.2	383.1



	<b>September</b>	326.0	458.7	254.8	409.3	251.8	384.9	626.1	413.0	501.4
	<b>October</b>	167.8	456.2	153.0	414.6	519.9	207.2	416.0		627.1
	<b>November</b>	25.8	0.0	114.1	63.6	325.2	63.2	1.7	45.3	195.0
	<b>December</b>	0.0	0.0	0.0	0.0	43.8	14.3	0.0	28.3	32.2
2012	<b>January</b>	35.6	0.1	18.8	47.7	32.9	16.4	25.4	23.4	163.3
	<b>February</b>	13.8	15.8	168.0	53.2	376.4	72.5	13.5	104.0	321.5
	<b>March</b>	74.1	20.6	47.1	74.8	36.0	11.3	0.0	92.7	29.5
	<b>April</b>	152.1	164.3	137.6	157.1	83.2	213.7	160.4	247.2	148.6
	<b>May</b>	96.8	68.2	333.4	383.7	438.4	343.6	565.1	208.0	336.0
	<b>June</b>	250.5	209.4	469.9	490.4	398.8	482.6	541.6	311.8	699.5





	<b>July</b>	242.3	294.5	677.5	395.3	630.1	309.5	371.4	359.0	911.9
	<b>August</b>	111.9	328.5	132.9	124.9	861.7	313.7	607.5	208.6	720.8
	<b>September</b>	204.1	144.7	333.0	255.5	619.7	273.3	530.7	409.4	526.7
	<b>October</b>	143.1	296.0	339.6	283.4	410.4	322.3	476.7	205.5	498.9
	<b>November</b>	42.0	104.8	112.2	186.7	126.7	93.1	118.9	79.0	260.5
	<b>December</b>	0.0	0.0	0.0	0.0	30.6	0.0	0.0	0.0	2.9
<b>2013</b>	<b>January</b>	2.5	7.7	107.1	11.9	141.0	0.0	33.0	40.6	28.6
	<b>February</b>	35.6	5.1	15.7	61.8	79.4	63.5	0.0	37.0	105.8
	<b>March</b>	215.1	60.0	151.6	126.2	231.4	80.0	89.6	122.1	169.5
	<b>April</b>	126.2	200.2	207.3	201.0	279.4	216.4	293.8	210.5	295.0



<b>May</b>	176.0	137.0	231.3	312.2	473.0	305.0	301.0	260.1	502.7
<b>June</b>	186.5	311.6	458.6	255.6	522.3	524.4	519.9	461.7	460.2
<b>July</b>	295.6	255.7	497.5	390.4	477.0	207.7	302.0	274.4	652.6
<b>August</b>	97.9	167.3	183.8	168.1	405.1	363.0	221.6	112.9	660.8
<b>September</b>	273.3	235.9	185.2	564.0	340.4	356.1	399.2	178.8	475.3
<b>October</b>	64.3	224.3	483.6	338.8	305.1	390.0	382.2	304.8	321.4
<b>November</b>	33.3	19.9	203.1	105.8	228.4	77.6	55.3	144.0	353.5
<b>December</b>	17.0	19.7	37.3	60.1	81.1	63.7	71.7	112.7	100.9
<b>January</b>	30.1	41.9	89.3	82.8	24.8	-	3.3	57.2	7.4
<b>February</b>	48.2	-	17.9	53.3	61.6	20.0	1.7	17.7	35.8



2014	<b>March</b>	66.6	53.5	144.4	130.4	371.2	79.3	98.7	143.2	213.5
	<b>April</b>	161.0	68.6	176.0	212.0	245.0	138.9	173.5	215.8	348.4
	<b>May</b>	100.6	292.3	355.7	252.0	319.6	409.0	255.5	294.5	408.0
	<b>June</b>	152.9	363.2	304.9	244.0	238.5	206.1	346.1	381.3	401.0
	<b>July</b>	184.0	332.7	194.2	274.0	716.2	188.6	149.8	265.0	706.5
	<b>August</b>	241.6	298.2	349.4	407.5	410.3	108.3	190.9	371.2	622.8
	<b>September</b>	167.4	217.7	411.4	368.0	501.5	322.5	370.8	342.1	387.3
	<b>October</b>	161.7	218.3	474.9	365.0	250.1	281.3	310.0	368.1	762.1
	<b>November</b>	93.1	70.5	250.7	160.6	136.8	161.4	108.0	118.6	180.9
	<b>December</b>	-	-	128.2	33.7	19.3	-	-	0.8	4.0



2015	<b>January</b>	11.5	-	-	26.5	-	-	-	4.0	53.9
	<b>February</b>	9.9	46.7	91.4	174.5	96.6	58.7	7.6	182.7	135.6
	<b>March</b>	168.0	174.9	138.4	182.0	143.1	49.9	109.2	111.7	148.8
	<b>April</b>	42.5	47.8	238.1	108.5	100.2	90.3	26.3	130.6	132.3
	<b>May</b>	179.9	250.6	334.9	208.3	390.7	278.8	151.7	148.8	284.4
	<b>June</b>	126.5	274.9	479.1	400.2	681.0	328.3	212.6	460.5	188.8
	<b>July</b>	85.9	334.0	188.8	387.6	420.1	343.0	569.0	274.4	182.6
	<b>August</b>	106.3	375.2	624.7	220.4	422.0	368.1	335.8	112.9	624.7
	<b>September</b>	346.1	727.5	333.2	340.5	476.8	298.6	211.7	178.8	333.2
	<b>October</b>	103.6	263.3	524.2	274.0	208.4	232.9	136.8	275.6	284.7



	<b>November</b>	37.6	53.3	227.4	18.8	391.9	141.6	53.3	46.7	121.6
	<b>December</b>	-	-	-	12.1	-	-	-	-	-
2016	<b>January</b>	-	-	1.2	-	-	-	-	-	-
	<b>February</b>	-	18.2	0.7	2.4	3.5	-	-	-	-
	<b>March</b>	70.4	141.3	228.9	184.6	192.9	131.5	50.7	309.7	234.7
	<b>April</b>	102.1	140.4	180.7	104.2	202.4	157.7	126.4	64.0	125.6
	<b>May</b>	153.6	206.2	296.3	232.9	420.3	383.7	224.5	236.4	304.9
	<b>June</b>	375.3	619.5	281.9	312.7	261.3	402.5	164.6	300.2	283.6
	<b>July</b>	124.0	490.8	537.3	325.9	454.6	538.7	311.7	280.1	384.3
	<b>August</b>	327.8	324.0	437.3	256.9	309.7	422.8	332.5	428.0	313.7



<b>September</b>	224.3	352.8	572.2	360.2	363.3	234.3	321.0	322.3	390.5
<b>October</b>	174.1	170.2	231.7	184.2	137.0	236.5	288.8	269.7	202.6
<b>November</b>	16.9	15.0	62.4	58.1	95.7	11.4	25.9	112.9	50.0
<b>December</b>	-	-	34.3	4.2	1.2	-	-	38.2	43.9



**Appendix B** Tables of Monthly Temperature ( $^{\circ}\text{C}$ ) Statistics in Some Southern Nigeria Cities





**Table B.1:** Summary of Monthly Mean Maximum Temperature (°C) Distribution Pattern Over Ondo (1961-2000)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1961	31.22	33.72	33.89	31.78	31.06	28.83	26.28	26.39	27.39	32.11	31.28	31.28
1962	32.11	34.06	32.00	31.33	30.50	28.33	27.00	26.56	27.28	29.28	29.83	30.78
1963	31.39	31.61	31.94	31.06	30.28	29.72	28.22	27.78	29.22	29.44	29.94	32.17
1964	31.56	33.72	32.83	30.89	29.78	28.83	26.94	26.33	27.39	28.5	30.44	30.83
1965	30.56	32.17	32.72	30.94	30.56	28.94	27.33	26.73	27.72	29.89	31.44	31.39
1966	32.17	33.61	33.11	31.28	30.11	29.44	28.22	27.44	28.22	29.83	31	31.17
1967	32.39	34.06	33	31.06	30.72	28.44	26.5	26.56	27.83	29.11	31.28	31.22
1968	30.83	33.28	31.39	30.83	30.39	28.83	27.94	27.83	28.39	29.74	31	31.06
1969	32.28	34.94	32.44	31.5	30.78	29.39	27.5	27.28	28.28	29.72	30.83	32.33
1970	30.28	34.11	32.22	31.94	30.61	28.33	28.2	27	28.1	30.3	32	32.2
1971	31.5	33.2	32	31.8	31.2	29	27.2	26.9	27.99	30.3	22.1	31.3
1972	32.7	32.6	32.9	31.4	31.4	29	28.9	27.8	28.5	30.4	32.6	32.2
1973	33.5	35.3	34.1	32.9	31	29.5	28.7	28.1	28.8	30.3	32.4	31.8
1974	31.5	33.6	33.3	30.9	30.2	29.4	27.4	27.8	28	29.3	31.6	32
1975	33.1	33.1	33.2	31.6	39.8	29.4	27.4	26.1	26.9	29.3	30.9	30.8
1976	30.9	31.5	32	31.4	29.7	28.3	26.8	26.1	27.7	28.4	29.9	31.2



1977	32	32.8	34.5	32.8	30.8	28.8	27.1	26.7	28.2	30	32.2	31.3
1978	32.7	34.2	33.1	30.6	30	28.9	27.6	27.7	29.3	30	31.1	32.2
1979	32.3	34.2	32.8	32.7	30.2	28.9	27.7	27.5	28.3	29.9	31.1	31
1980	32.4	34	32.5	31.4	30.4	29.2	26.9	26.9	28.5	29.4	30.8	30.8
1981	31.5	34.5	33	31.4	30.3	39	27.1	26.8	28.5	30.1	31.2	32
1982	32.4	33.9	32.9	32	30.3	26.7	27	26.7	28	29.6	32	31.9
1983	32	35	35.6	31.76	30.7	28.5	27.4	26.1	28.1	30	31.3	30.6
1984	32.6	35.1	33	31.2	30.39	30	27.26	26.91	28.41	29.86	31.39	31.4
1985	32.27	35.2	32.9	33.3	30	28.9	27.6	28.1	28.44	29.84	32.1	31.9
1986	32	33.1	31.3	31.9	31.5	29.4	26.2	26.8	27.7	29.3	31.1	32.2
1987	31.1	34.9	33.1	33	31.6	29.5	29.1	28.7	29.4	30.9	33.2	32.9
1988	32.6	34	32.5	32.3	31	29.2	27.4	26.8	29.2	30.8	32	31
1989	33.4	34.9	33.2	31.8	30.5	29.2	28.1	27.4	28.3	29.6	22.6	32.4
1990	32.3	24.1	36.6	32.5	30.8	29.5	27.2	27.3	29	29.8	31.3	30.8
1991	31.8	33.1	32.3	30.4	30.4	29.7	27.7	26.8	28.7	29.3	21.7	32.7
1992	33.5	36.2	34.1	32.3	30.9	28.6	27.3	26.7	27.7	30.2	31.1	32.8
1993	33.7	34.6	33.3	32.8	31.3	29.7	29.7	27.7	29.3	30.7	31.3	31.9
1994	31.9	33.4	33.6	31.4	31	29.6	28.07	27.34	29.2	30	32	33.7
1995	31.37	33.06	32.68	31.2	30.43	28.93	27.16	26.76	27.8	29.84	30.59	31.29



1996	31.56	33.03	32.52	31.1	30.24	29.06	27.54	26.97	27.97	29.39	30.53	31.27
1997	31.61	33.03	32.72	31.04	30.29	29.08	27.44	26.97	28.08	29.36	30.82	31.36
1998	31.5	33.37	32.61	31	30.31	28.9	27.39	26.98	27.91	29.41	31.03	31.13
1999	31.64	33.61	32.53	31.12	30.51	29.01	27.5	27.17	28.09	29.66	31.11	31.43
2000	31.59	34	32.63	31.32	30.52	28.89	27.67	27.22	28.16	29.74	31.22	31.6

**Table B.2:** Summary of Monthly Mean Minimum Temperature (°C) Distribution Pattern Over Ondo (1961-2000)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1961	21.5	21.17	22.78	22.33	22.33	21.33	21.17	21.06	20.44	21.06	22.28	20.83
1962	20.44	22.39	22.56	22.06	21.94	21.44	21.44	20.78	21.11	21.56	21.72	22
1963	22.33	22.94	22.44	22.44	22.67	21.83	21.78	21.83	22.06	21.5	21.89	22.83
1964	21.89	23.22	23	22.28	22.22	21.33	21	20.5	21	21	21.94	22.17
1965	22.39	22.67	22.78	22.22	21.89	21.61	21.44	21.22	21.11	21.83	23	21.5
1966	21.72	22.44	23.44	22.28	22.11	21.61	21.94	21.61	21.56	21.44	22.39	21.78
1967	19.39	23.28	22.83	22.72	22.33	21.56	21.17	20.89	21.17	21.44	22.5	22.72
1968	21.06	22.72	22.56	22.22	22	21.56	21.39	21.94	26.5	22.44	22.17	22.28
1969	21.06	23.56	23.06	23.06	22.94	22.33	21.67	21.44	21.67	20.89	22.06	23.5
1970	22.33	23.94	23.33	23.39	22.5	22.5	22	21.4	21.6	21.9	22.3	21.2



1971	21.2	22.6	22.8	22.5	22.6	21.7	21.1	21.1	21.95	21.6	22.4	20.2
1972	22.4	22.8	22.5	22.5	22.8	21.5	21.9	21.4	21.6	22.3	22.6	22.2
1973	23.3	24.5	23.7	22.9	22.3	21.9	21.6	22	21.8	22.3	22.3	22.8
1974	21.3	23	23.1	22.4	22.1	21.5	21.3	21.5	21.4	21.7	22.5	21.1
1975	19.5	22.4	23.5	22.8	21.8	21.6	21.2	20.9	20.9	21.2	21.9	20.3
1976	20.7	22.4	22.7	22.5	22	21.6	21	20.8	21.3	21.7	22.1	22
1977	22.8	22.9	23.5	23.6	21.8	21.6	21.3	22	22.4	22.1	21.3	20.6
1978	19.8	23.2	21.1	22.3	22.1	21.6	21.5	20.9	21.8	21.8	21.8	22.4
1979	22.6	23.5	21.9	23.6	22.1	22	21.8	21.9	21.7	21.6	22.6	19.5
1980	21.8	21.8	21.8	21.4	21.3	22.2	21	20.1	20.9	21.4	21.4	20.6
1981	22	23.5	23.2	23.1	23	21.8	21.5	21.2	22	22.1	21.5	23.3
1982	21.9	22.7	23.3	23.5	22.6	22.2	21.5	20.9	21.5	21.9	22.9	22.6
1983	18.6	22.4	24.6	21.87	23.3	22.1	21.4	21.2	21.7	22.5	23.5	22.5
1984	21.4	23	23.5	23	23.17	23.22	23.13	23.17	23.18	23.16	23.17	23.17
1985	22.44	22.8	23.5	23.1	23	22	21.1	21.6	21.57	21.42	23	20.2
1986	21.7	23	21.4	22.9	21.6	22	21.1	20.7	21.2	21.8	22.5	20.4
1987	22.6	23.6	23.4	23.9	23.1	22.3	22.1	22.3	22.1	22.4	23.7	21.7
1988	21.6	23.7	23.4	23.2	23	21.7	21.6	21.3	21.8	22	23.4	22
1989	18.5	21.8	23.1	23.1	22.6	21.9	21.7	21.5	21.6	22.4	23.8	22.3



1990	23.3	23	24.7	23.3	22.7	22.5	22	21.5	21.6	22.1	23.2	23.1
1991	22.5	23.7	23.8	22.4	22.9	22.1	21.9	21.6	21.7	21.4	23.2	21.6
1992	19.7	22.4	23.7	23.6	21.2	21.5	21.6	21.3	21.2	21.9	21.7	22
1993	20.7	23.3	22.5	23.7	22.1	22	21.7	21.5	21.6	22.1	22.3	21.7
1994	21.4	23.3	23.5	23.2	22.7	21.8	22.65	22.86	22.1	21.6	22.3	20.3
1995	21.71	22.48	22.71	22.27	22.21	21.51	21.37	21.08	21.14	21.39	22.17	21.87
1996	21.76	22.73	22.84	22.26	22.17	21.57	21.52	21.19	21.37	21.47	22.19	22.06
1997	21.54	22.91	22.9	22.39	22.24	21.59	21.47	21.21	21.38	21.44	22.34	22.2
1998	21.29	22.87	22.92	22.34	22.11	21.53	21.39	21.23	22.27	21.63	22.4	22.09
1999	21.12	22.93	22.93	22.5	22.26	21.73	21.52	21.42	22.4	21.61	22.42	22.36
2000	21.11	23.19	23.04	22.73	22.38	21.91	21.63	21.46	22.5	21.62	22.28	22.3



**Table B.3:** Summary of Monthly Mean Temperature (°C) Distribution Pattern Over Warri (1961-2000)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1961	26.39	26.44	27.33	27.06	27.11	25.11	24.56	24.67	24.61	25.22	26.67	25.94
1962	25.44	27.06	26.89	26.89	26.61	25.39	24.89	24.72	24.72	25.44	25.83	26.78
1963	26.5	27.17	27.28	27.17	26.83	26.17	25.5	25	25.06	25.61	26.39	26.94
1964	25.72	27.06	27.39	26.89	26.5	25.33	24.44	24.22	24.39	24.88	25.61	26.06
1965	25.94	26.67	27.11	26.67	26.39	25.28	24.33	24.28	25	25.72	27	25.89
1966	26.33	27.28	26.83	26.33	25.67	25.28	25.44	24.94	25.11	25.56	26.5	25.83
1967	24.83	27.33	27.22	27.17	26.72	25.22	24.33	24.64	24.81	25.4	26.33	26.24
1968	25.88	27	27.15	26.88	26.55	25.4	24.79	25.22	25.06	25.94	26.5	26.24
1969	26.33	28	27.5	27.67	27.06	25.83	24.56	25.22	26.67	26.72	27.61	26.28
1970	25.94	27.83	28.17	27.5	26.89	26.06	24.83	24.83	25.06	25.56	26.61	25.78
1971	26.11	26.72	27.17	27.33	26.72	25.49	24.68	24.5	25.16	25.68	26.6	26.05
1972	25.91	27.26	27.31	27.11	26.56	25.51	24.71	24.81	25.3	26	27.4	26.5
1973	27.5	28.2	28.3	27.7	26.8	25.9	25.4	24.9	25.4	26.1	26.9	26.3
1974	25.9	27.5	27.4	27.2	26.6	25.7	24.6	25	24.6	25.4	26.89	25.6
1975	25.1	27.5	27.5	27.2	26.6	25.4	24.5	24.4	24.6	25.5	25.8	25.1
1976	25.8	27.3	26.9	26.5	25.2	24.3	24.5	25.3	25.4	25.85	26.2	25.94



1977	27	27.47	28	27.7	27.3	27.5	25.8	25.3	25.07	26.1	27.9	25.9
1978	26.19	27.42	27.51	27.2	26.54	25.68	25	25.1	25.4	25.8	26.4	27.2
1979	27.2	27.3	27.8	27.5	26.9	25.8	25.2	24.6	25.6	26.3	26.8	25.9
1980	27.4	27.6	27.8	27.5	26.7	26.2	25.1	24.9	25.4	25.9	27	26.3
1981	26	27.6	27.9	27.7	26.6	26.4	24.8	24.9	25.6	26.1	27.5	28.4
1982	26.38	27.4	28.1	27.6	26.9	25.9	24.8	24.7	24.9	25.4	26.7	27.4
1983	25.2	28.1	29.2	28.8	27.6	25.9	24.9	24.8	25	26.3	26.9	26.4
1984	26.3	27.8	27.6	27.3	26.5	26.1	25.1	25.6	25.4	25.9	27.03	26.79
1985	26.38	27.6	27.99	27.66	27.1	25.5	24.99	24.94	25.33	25.96	26.9	26.91
1986	26.41	27.63	28.06	27.72	26.9	25.97	24.98	24.92	25.32	25.98	26.98	26.87
1987	26.3	27.68	28.09	27.75	26.9	26	24.95	24.97	25.28	25.93	27	27.01
1988	26.14	28	28.1	28.8	27.2	26.2	25.5	25.6	25.4	26.1	26.98	26.87
1989	26.31	27.5	27.4	27.9	26.7	26.4	25.4	25.1	25.7	26.4	27.9	27.6
1990	27.5	28	29	28.1	27.6	26.3	25.2	25.1	25.5	26.5	27.5	27.3
1991	27.4	28.2	28.3	27.96	27.7	26.03	25.09	25.08	25.31	26.05	27.1	27.02
1992	26.47	27.83	28.19	28	27.13	26.04	25.12	25.12	25.36	26.12	27.14	26.97
1993	26.61	27.8	28.08	27.91	27.08	26.06	25.15	25.16	25.4	26.11	27.17	27.04
1994	26.64	27.81	28.13	27.98	27.15	26.06	25.15	25.11	25.4	26.13	27.19	27.07
1995	26.76	27.88	28.17	28.09	27.22	26.16	25.23	25.18	25.44	26.2	27.28	27.12



1996	26.81	27.86	28.18	27.99	27.23	26.15	25.19	25.12	25.44	26.22	27.33	27.16
1997	26.88	27.91	28.29	28	27.3	26.11	25.16	25.13	25.41	26.19	27.24	27.1
1998	26.8	27.9	28.19	27.99	27.26	26.09	25.16	25.13	25.4	26.15	27.21	27.07
1999	26.71	27.86	28.18	28	27.2	26.1	25.17	25.14	25.41	26.16	27.22	27.08
2000	26.75	27.86	28.18	27.99	27.2	26.1	25.17	25.14	25.41	26.16	27.23	27.09

**Table B.4:** Summary of Monthly Mean Temperature (°C) Distribution Pattern Over Port-Harcourt (1961-2000)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1961	25.72	25.94	27	26.28	26.28	24.89	24.17	24.5	24.22	24.61	25.5	25.28
1962	24.78	26.78	26.17	26.33	26.17	24.72	24.44	24.44	24.28	24.83	25.17	24.56
1963	25.5	26.39	26.67	26.61	26	25.61	24.94	24.78	24.94	25.17	25.78	26.28
1964	25.5	27	26.83	26.5	26	24.78	24.33	24.33	24.17	24.87	24.94	25.28
1965	25.38	26.53	26.67	26.43	26.11	25	24.47	24.51	24.4	24.87	25.35	25.35
1966	25.29	26.67	26.58	26.47	26.07	25.03	24.55	24.52	24.45	24.94	25.31	25.36
1967	24.89	43.06	26.69	26.5	26.05	25.1	24.57	24.54	24.49	24.96	25.34	25.57
1968	25.26	30.81	26.69	26.48	26.06	24.98	24.48	24.48	24.38	24.91	25.24	25.39
1969	25.2	31.77	26.66	26.47	26.07	25.39	24.44	24.5	28.39	25.83	25.78	25.39
1970	31.78	27.33	27.11	27.22	26.5	25.5	24.44	24.44	24.67	24.83	25.78	25.39





1971	25.72	24.28	37.61	26.89	26.61	25.06	24.28	24.33	24.33	25	28.22	25.28
1972	29.17	26.5	26.5	26.6	26.1	25.3	24.9	24.5	25	25.5	26.7	24.56
1973	26.9	28	27.9	27.4	26.5	26	25.1	25	25	25.5	26.1	26.28
1974	23.6	26.9	27.1	26.9	26.1	25.3	24.5	24.9	24.4	25	25.8	25.28
1975	25.1	27.1	26.8	26.6	26.3	25.2	24.3	24.5	24.4	25	25.1	25.35
1976	25.6	26	26.6	26.2	26.4	24.9	24.1	24	25.1	25	24.8	25.36
1977	26.3	27.1	27.6	27	26.6	25.4	24.9	25	25	25.6	27	25.57
1978	26	27.5	28.3	28	28.1	25.3	24.8	24.7	24.7	25.3	25.6	25.39
1979	27	26.7	27	26.9	26.4	25.4	24.9	24.8	25.4	25.6	26.3	31.61
1980	27.1	27.7	27.4	27.3	26.5	25.8	24.9	24.6	25	25.2	25.9	25.39
1981	24.8	27	26.9	27.1	25.9	25.7	24.6	24.4	24.7	25.6	25.6	26.4
1982	26.5	27.1	27	26.9	25.5	25.3	24.3	24.2	24.7	25	25.5	26.6
1983	24.5	28.4	29.4	27.8	26.9	25.7	24.8	24.9	25.3	26.2	25.9	25.9
1984	26.3	27.5	27	27.1	26.3	25.8	24.6	25.3	24.6	25.5	26.1	25.4
1985	27	27.8	27.7	26.6	26.4	25.4	24.4	24.4	24.9	25.4	26.3	25.5
1986	26.8	27.2	26.9	27.5	26.8	25.9	24.5	25	25.3	26.1	26.1	25.7
1987	27.2	27.5	27.2	28	27.1	26.3	25.9	25.3	25.7	26.1	27.2	27
1988	27	28.5	27.7	27.3	26.9	25.9	24.9	25.3	25	25.5	26.6	25.7
1989	24.5	27.5	26.8	27.1	26.3	25.7	25	24.6	25.1	25.6	26.8	26.6



1990	26.9	27.7	29.2	27.9	26.8	26.2	24.5	24.7	25.1	25.8	26.5	26.3
1991	26.7	27.4	27.3	26.9	26.7	26.4	25.1	24.9	25.5	25.5	26.2	25.8
1992	25.5	27.7	27.6	27.7	26.8	25.5	24.3	24.5	25.3	25.7	26	26.5
1993	26.1	27.6	26.8	27.2	27	25.7	24.4	24.7	25.5	26	25	26.3
1994	26.4	27.9	27.7	27.3	26.4	25.5	24.6	24.7	25.1	25.6	26.7	26
1995	26.3	27.6	27.7	27.6	26.8	26.2	25.2	25.3	25.6	25.5	26.8	26.6
1996	27.4	26.5	27.2	26.9	26.8	26	25.4	24.8	24.8	25.5	27.2	27.3
1997	26.9	27.6	27.6	26.7	26.1	25.6	25.1	25	25.7	26.5	26.1	26.8
1998	26.3	29.1	28.9	28.4	27.9	26.4	25.3	25.5	25.2	26	26.5	26
1999	26.5	27.2	27.3	27	26.4	26.1	25.1	25.4	24.8	25	25.9	26.7
2000	26.78	27.6	28.1	27	26.9	25.7	25.2	25.18	25	25.75	26.7	25.9

**Table B.5:** Summary of Monthly Mean Temperature (°C) Distribution Pattern Over Benin City (1961-2000)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1961	27.1	27.61	28.39	27.47	27.22	25.53	24.5	24.53	25.19	26.11	27.36	26.5
1962	26.4	28.03	29.58	27.67	27.39	25.97	25.06	24.69	25.36	26.22	26.61	27.22
1963	27.2	28.06	27.78	27.64	27.19	26.81	25.75	25.61	26.75	26.53	27.14	27.39
1964	26.8	28.53	28.28	27.5	26.83	25.94	24.69	24.31	24.97	25.75	26.56	26.75



1965	26.9	27.5	27.81	27.03	26.69	26.06	24.72	24.72	25.17	26.58	27.64	26.69
1966	26.9	28.44	28.25	27.69	26.92	26.53	25.5	25.06	25.19	26.25	27.33	27.25
1967	25.9	28.83	27.92	27.39	27.06	26.08	25.22	25.22	25.33	26.53	27.36	27.67
1968	26	27.86	27.89	27.31	26.97	26.25	25.42	25.56	25.67	26.31	27.53	26.92
1969	27.5	29.36	28.19	28.22	27.78	26.22	24.94	25.17	25.98	26.83	27.52	27.57
1970	27.3	29.33	28.97	28.36	27.19	26.75	25.25	24.85	25.35	26.55	27.6	26.75
1971	26.4	28.15	27.9	27.8	27.75	26.3	24.8	24.65	25.1	26.65	28.05	26.25
1972	27.8	28.1	28.1	27.55	27.55	26.3	25.75	25	25.75	26.75	28.2	27.5
1973	28.7	30	29.2	28.55	27.7	26.45	26.05	25.45	26	27	27.65	27.3
1974	26.9	28.95	28.65	27.7	27.2	26.45	25.25	25.45	25.25	26	27.45	26.65
1975	26.6	28.2	28.9	28.25	27.2	26.05	25.1	24.55	25.15	26.25	27.1	26.25
1976	26.9	27.27	28.1	27.35	26.8	26	24.35	24.4	25.25	25.8	26.8	27.1
1977	27.4	28.8	29.05	29.1	28	26	24.8	24.9	26	26.95	28.3	26.7
1978	27.2	28.65	28.35	27.55	27.5	26.55	25.15	25.5	25.6	26.6	27.35	27.95
1979	28.5	28.65	28.8	28.65	27.35	26.6	25.85	25.25	26.35	27.05	28.05	27.05
1980	28.7	29.2	28.95	28.25	27.5	26.85	25.45	25.29	26	26.55	27.25	26.3
1981	27.2	29.45	29.05	28.35	27.1	27.15	25.15	25.7	26.15	26.85	27.5	28.25
1982	28.1	28.35	28.9	28.55	27.75	26.85	25.35	25.25	25.95	25.95	26.85	27.5
1983	26.1	29.75	30.35	29.85	28.55	26.55	23.9	25	26	27.2	27.8	27.1



1984	27	28.95	28.55	27.5	26.8	26.35	26.75	25.7	26.1	27	27.8	27.1
1985	28.7	28.95	29	28.2	27.5	26.4	25.25	25.35	25.9	26.9	28.15	27
1986	28.3	29.45	28.6	28.85	27.6	27.05	25.1	25.25	25.75	26.25	27.4	27.05
1987	29.2	30	28.28	28.56	28.4	27.15	26.5	26.15	26.3	27.45	28.9	28.2
1988	28	29.5	28.8	28.3	27.8	26.25	25.65	25.55	25.95	27.05	28.6	26.75
1989	26.3	28.9	28.55	28.75	27.5	26.7	25.65	25.3	26.05	26.9	28.5	27.95
1990	28.6	28.85	30.6	28.75	27.85	27	25.15	25.55	25.9	26.65	28.05	27.7
1991	27.9	28.9	28.85	27.65	27.8	27.15	25.55	25.25	26.15	26.15	28.15	27.35
1992	27.2	29.9	29.7	28.7	28	26.1	24.75	24.7	25.75	26.55	27.15	27.95
1993	27.4	29.4	28.4	28.3	27.9	26.6	25.25	25.5	26.35	27.2	28.05	27.25
1994	27.1	28.81	29.3	28.35	27.75	26.85	25.35	25.2	26.2	26.75	28.25	27.25
1995	28.5	29.45	28.8	28.8	28	26.85	25.8	25.95	26.7	26.75	27.9	28.35
1996	28.9	29.3	29.3	28.45	28.1	27.25	25.95	25.65	25.75	26.95	28.9	29.15
1997	28.6	29.15	28.7	27.8	27.55	26.9	25.55	25.55	26.8	27.25	28.25	28.25
1998	27.5	30.8	31.25	30.4	29.1	27.45	25.9	25.5	25.9	27	28.8	27.8
1999	27.3	29.05	28.95	28.3	27.9	27.05	25.7	25.8	25.85	26.05	27.85	28
2000	28.6	28.85	29.75	28.85	27.9	26.45	26	25.2	26	26.7	28.55	27.85



**Table B.6:** Summary of Monthly Mean Maximum Temperature (°C) Distribution Pattern Over Calabar (1980-2010)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	32.1	33	32.5	31.5	30.8	29.1	28.1	26.8	29	29.5	30.4	31.8
1981	31.3	33.6	32.7	32.3	31.2	30.5	28.3	27.4	28.9	30.3	31.5	32
1982	31.8	33.3	32.1	31.4	30.7	29	27.8	27.2	28.4	29.1	30.7	31.6
1983	31.6	35	34.8	33.2	30.9	28.5	28	26.9	29	29.5	30.6	30.9
1984	32.3	34.7	32.8	32.3	31.1	31.2	29.6	30.1	29.1	29.7	31.1	31.8
1985	32.3	33.6	33	31.4	31.2	29.6	29.2	28.5	29.3	29.7	30.7	30.7
1986	32.6	33.1	31.8	32.5	31.5	29.9	26.9	28.1	28.5	29.4	30.6	31.4
1987	32.9	33.3	32.4	32.6	31.5	30	29.3	28.7	29.1	29.7	31.3	31.7
1988	31.2	33.7	32.5	29.9	30.2	30.3	28.3	27.8	28.5	29.1	30.8	30.1
1989	31.6	33.4	32.4	31.5	30.8	29.7	28.2	27.9	28.5	29.7	30.9	31.7
1990	31.7	33.5	35.2	32.9	31.1	29.7	26.6	27.7	28.5	29.5	30.4	30.8
1991	32.2	33.3	32.6	31.3	30.9	30.5	28.3	28	29	29	30.5	30.8
1992	31.5	34.2	32.3	31.6	30.9	28.8	27.9	26.2	27.8	29.4	30.5	32.2
1993	31.4	33.3	31.7	31.6	31.2	29.7	28.4	28	29.4	30.1	30.1	30.9
1994	31.7	33.2	32.6	32.1	31.2	29.8	27.5	27.4	28.8	29.7	30.9	32.5
1995	32.7	34.1	32.6	32.4	31.5	30.9	29.4	29.3	30.3	30.1	30.5	31.5



1996	32.6	33.8	31.7	32.1	31.9	29.8	28.3	27.3	28.1	29.3	31.5	32.5
1997	31.9	33.6	32.7	30.8	31	29.4	28.7	28	29.9	30.7	31.4	32.3
1998	32.9	35	34.2	33.1	32.5	31.1	29.5	28	29.2	30.3	31.5	31.1
1999	31.9	32.3	32.3	31.1	30.8	30.1	29.3	29.2	28.7	29.3	30.4	32.3
2000	32.7	33.8	34.3	32.3	31.6	30.5	29	28.2	28.7	29.8	31.3	32
2001	32.4	34.3	32.5	32	31.6	30.1	28.5	27.1	28.2	30.2	31.3	32.2
2002	32.5	34.3	32	32	31.9	30.2	29.6	28.2	29.6	29.7	31.2	32.1
2003	33.1	34.2	33.3	32.1	31.4	30.2	30.2	28.7	29.8	31	31.5	31.6
2004	32.4	34	32	31	30	30	28	30	30.2	30	32	31.9
2005	32.6	34	32.4	32.5	31.2	29.1	28	26.7	29	29.5	31.3	30.8
2006	31.8	32.6	30.2	31.7	30.2	28.2	28.2	27.8	28.2	30.1	30.6	32
2007	31.2	32.5	32.1	31.5	31.2	29.9	27.3	27.2	28.3	29.4	31.1	31.9
2008	31.9	33.1	32.1	31.5	31.1	29.7	28	27.9	28.7	29.1	31	30.4
2009	31.8	32.6	31.3	31.4	31.1	29.4	28.2	27.3	28.7	29.4	31.7	31.9
2010	33.8	33.1	33	33.1	31.5	29.8	28.8	28.2	28.9	31.8	30.8	31.7



**Table B.7:** Summary of Monthly Mean Minimum Temperature (°C) Distribution Pattern Over Calabar (1980-2010)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	23.4	24	24.5	24.6	24.1	23.3	25	22.6	23	23.2	23	22.9
1981	22	24	24.2	24	23.4	23.4	21.9	22.6	22.8	23	23.1	23
1982	23.5	23.9	23.7	23	23	22.8	22.6	22.8	22.5	22.8	22.4	23.8
1983	20.7	24.8	25.9	25	24.1	23.6	22.9	22.6	22.6	23	22.8	23
1984	22.2	24.1	23.8	23.6	22.9	22.3	22.1	22.4	22	22.5	23	21.8
1985	23.8	23.6	24.7	23.5	22.8	22.3	22.3	22.6	22.3	22.7	23.3	22.9
1986	23.3	24.1	23.1	24	23.2	22.9	22.6	22.5	22.4	22.5	23.1	21.9
1987	23	23.9	24	24.4	23.9	23.1	23.2	23.2	23.1	23	23.8	23.6
1988	23.1	25	24	22.1	22.1	22.9	22.5	22.8	22.4	22.7	23.1	22.1
1989	20.4	22.6	23.5	23.2	22.5	22.6	22.1	22.2	22.2	22.4	23	22.4
1990	23.5	23.7	25.2	24.7	23.8	23.6	22.9	23.3	23.1	23.2	23.7	24.3
1991	23.5	25.3	24.8	23.9	24.1	24.2	23.3	23	23.1	22.7	23.6	22.9
1992	21.5	24.1	24.5	24.5	23.9	22.8	22.7	22.3	22.4	22.7	22.2	22.8
1993	22.2	24.1	23.5	23.9	24.2	23.5	22.9	23	22.8	22.9	23.2	23.3
1994	22.6	24.1	23.5	23	22.4	21.9	21.5	22.7	22.8	22.6	22.6	21.1
1995	21.9	23.1	22.6	23.1	22.6	22	21.6	21.7	21.6	21	22.5	21.9



1996	21.9	23.7	23.2	22.6	22.9	22	21.5	21.4	21.4	21.1	22.4	22.7
1997	22.5	21.6	22.9	22.1	22	21.7	21.1	22.6	23.2	22.8	22.8	22.6
1998	21.5	24.7	24.3	23.8	23.3	23.2	22.6	22.3	22.3	22.3	22.6	21.9
1999	22	22.5	22.2	22.3	22.2	21.9	21.1	21.4	22.6	22.7	22.9	22.6
2000	23.9	23.2	24.3	23.6	23.7	23.1	22.8	22.5	23	23	23.4	22.5
2001	22.4	23.4	23.7	23.7	23.7	23	22.8	22.6	22.8	23.2	23.7	24.1
2002	22.5	23.5	24.3	24	23.6	23.4	23.5	22.9	23.3	23.1	23.4	23.3
2003	23.4	24.4	24.4	23.6	23.6	23.3	23	23.1	22.9	23.4	23.6	23.3
2004	24	25	24	24	23	23	23	23	22.7	23	23	23.4
2005	21.7	25.2	24	24.6	23.8	23.7	23	22.9	23.3	23.1	23.8	23.3
2006	24.6	24.3	23.6	24.3	23.6	23.2	23.2	23.3	23.2	23.3	23.6	23.1
2007	23.4	24.1	24	23.7	23.4	22.4	22.5	22.4	22.3	22.4	23	22.5
2008	22.7	23.3	23.3	22.7	23.2	22.7	22.4	22.3	22.3	22.4	23	21.6
2009	22.8	23.3	23.2	23.1	23.6	22.9	22.8	22.5	22.5	22.7	23.5	23.1
2010	24.3	25	24.7	24.4	24.5	23.5	23.3	23	23	23.4	23.1	22.6





**Appendix C** Tables of Monthly Relative Humidity (%) Statistics in Some Southern Nigeria Cities



**Table C.1:** Summary of Monthly Relative Humidity (%) Distribution Pattern Over Port-Harcourt (1961-2000)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1961	85	78	82	86	87	89	91	86	91	90	88	80
1962	78	77	85	85	87	91	92	90	90	88	86	82
1963	82	78	84	86	87	90	92	83	91	89	87	81
1964	80	77	84	85	87	91	92	89	90	89	86	82
1965	85	83	83	85	86	90	93	92	89	89	87	85
1966	83	81	83	85	87	87	90	92	90	89	88	83
1967	72	81	83	85	87	90	92	90	90	89	87	82
1968	79	82	84	85	87	90	92	90	90	89	87	83
1969	81	82	84	85	87	89	91	90	90	89	86	86
1970	85	83	84	85	87	89	91	90	90	90	86	80
1971	80	82	83	82	83	85	90	90	91	88	86	82
1972	78	83	84	83	87	87	90	92	90	88	85	83
1973	84	82	79	82	85	88	89	90	90	88	83	87
1974	80	82	83	83	85	89	88	90	90	88	86	77
1975	72	80	84	85	86	88	90	88	91	88	88	82
1976	79	85	84	86	86	89	90	91	88	89	86	80



1977	84	79	78	85	86	89	90	89	91	88	84	78
1978	75	83	83	84	86	89	86	90	90	89	85	83
1979	81	85	86	86	87	91	91	92	91	90	89	78
1980	83	82	83	85	89	89	90	92	91	90	87	80
1981	81	81	84	84	89	90	91	92	92	90	84	83
1982	81	78	82	86	87	90	93	93	91	90	86	84
1983	57	74	74	83	87	90	92	92	92	91	87	85
1984	78	78	83	83	86	87	90	89	91	88	87	80
1985	84	73	81	86	87	89	91	93	89	88	87	77
1986	80	83	84	83	86	87	91	90	90	89	86	74
1987	78	81	84	83	85	86	89	91	89	89	85	80
1988	75	78	83	85	86	88	89	89	91	90	85	81
1989	63	64	83	84	86	88	90	91	89	88	85	79
1990	82	73	73	81	86	87	93	92	90	88	87	86
1988	75	78	83	85	86	88	89	89	91	90	85	81
1989	63	64	83	84	86	88	90	91	89	88	85	79
1990	82	73	73	81	86	87	93	92	90	88	87	86
1991	75	82	85	85	86	87	90	91	89	89	87	78
1992	69	71	81	83	85	88	92	91	89	87	82	78



1993	67	75	81	84	85	89	92	91	89	87	85	79
1994	75	76	82	83	87	89	92	91	91	88	87	44
1995	72	77	81	83	86	87	90	90	90	88	83	83
1996	81	82	84	85	85	87	87	90	91	88	80	81
1997	80	63	80	85	86	90	90	91	89	87	88	82
1998	72	76	75	83	84	87	90	88	91	87	85	82
1999	79	84	83	84	86	88	89	88	91	90	87	75
2000	74	76	76	84	84	88	90	90	91	88	86	76

**Table C.2:** Summary of Monthly Mean Relative Humidity (%) Distribution Pattern over Warri (1961-2000)

year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1961	87	83	85	86	86	90	90	85	90	89	85	54
1962	84	81	86	87	87	90	91	89	91	90	89	86
1963	83	83.33	84	85.67	85.67	88.67	91	90.44	89.22	88.5	85.67	84.5
1964	85	82	85.5	86.5	86.5	90	90.5	86	91	89	87	87
1965	88	84	83	85	85	89	93	91	89	89	85	85
1966	83	83	85	87	86	88	89	91	89	88	86	84



1967	78	83	84	85	86	89	91	89.33	89.67	88.5	86	84.35
1968	83	83.33	84	85.67	85.67	88.67	91	90	89	87	86	84.23
1969	83	81	86	85	90	92	94	89.38	92	88.63	87	83.89
1970	81	85	85	86	86.48	89.42	90	90	89.74	88.53	86.65	83.89
1971	82.44	82.87	84.75	85	85	88	90	91	91	87	85	83.41
1972	82.68	83.17	84.54	85	87	89.15	89	90	90	87	84	85
1973	86	85	81	84	86	89	90.25	91	90	87	83	88
1974	86	85	85	85	85	89	89	89	91	89	87	83
1975	81	82	84	87	90	91	91	89.33	91	89	88	85
1976	85	84	85	86	86	89	89	88	86	89	85	81
1977	84	80	79	84	84	87	89	87	89.91	88	83	82
1978	83.88	82	82.67	85.67	86.31	89.23	88	87	89	90	85	85
1979	86	86	84	86	88	89	91	91	90	88	89	81
1980	84	85	83	84	87	89	90	89.42	90	89	86	79
1981	84	83	85	88	87	91	91	91	91	87	77	83.81
1982	83.98	81	84	85	87	88	91	89	83	90	90	83
1983	60	81	81	83	88	89	89	89	91	97	86	87
1984	81	79	84	85	86	87	91	88	88	88	85.51	83.68
1985	80.41	80.33	83	84.33	86	90	90.19	89.36	89.51	88.77	87	83.64



1986	79.91	82	84	84.11	86.75	86	90	89.32	89.54	88.88	85.54	83.61
1987	79.04	82	84	84.48	86.56	86	90	89.32	89.39	88.89	85.45	83.59
1988	78.34	82	84	84	86	88	88	88	90	88	85.38	83.57
1989	77.53	72	82	83	86	87	89	90	87	86	83	81
1990	84	79	79	83	84	87	92	91	89	86	84	85
1991	78	83	83	85	86.45	88.37	89.89	89.1	89.08	88.86	85.4	83.17
1992	82.03	82.19	83.66	85.14	86.4	88.76	90.25	89.26	89.49	88.6	85.57	82.91
1993	76.6	80.05	82.71	84.8	83	85	90	89.11	86	88.85	83	76
1994	78.81	80.28	81	85.13	83	87	89	89.1	88.72	88.82	85.05	82.67
1995	79.79	80.07	82.42	84.65	85.18	87.14	89.77	89.36	88.58	88	84.61	82.24
1996	79.89	79.82	82.22	84.68	85	87.28	89.74	89.37	88.48	87.89	84.5	82.07
1997	80.08	79.55	82	84.63	84.88	87.19	89.96	89.54	88.29	87.88	84.39	81.88
1998	80.4	80.5	82	84.55	84.74	87.22	90.08	89.48	88.46	88.11	84.56	81.99
1999	79.95	80.68	82.38	84.58	84.83	87.24	89.84	89.29	88.39	88.38	84.64	81.62
2000	79.93	80.14	82.11	84.39	84.38	86.87	89.77	89.32	88.13	88.28	84.39	81.21



**Table C.3: Relative Humidity over Calabar @09 Hours (%) (1980-2010)**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	87	82	84	86	86	91	91	94	89	89	87	75
1981	78	80	83	84	86	88	90	92	89	86	83	81
1982	81	75	84	83	85	89	92	92	90	86	86	84
1983	50	75	77	82	88	88	90	92	89	87	85	86
1984	79	75	82	83	84	84	87	86	88	87	85	76
1985	84	76	81	84	84	87	87	89	88	87	87	76
1986	78	82	83	82	84	85	92	89	89	88	85	73
1987	80	83	81	82	85	83	88	91	88	89	84	83
1988	82	82	82	78	79	87	88	90	88	88	85	80
1989	65	66	82	84	84	88	90	91	89	86	85	80
1990	84	76	75	78	84	87	93	91	88	87	87	87
1991	77	80	83	85	84	87	91	92	87	88	86	79
1992	68	75	85	86	85	89	91	94	91	87	84	75
1993	71	78	83	84	85	88	89	92	88	87	88	81
1994	76	80	84	85	85	87	94	94	90	87	84	69
1995	72	78	84	85	85	88	90	90	88	87	82	86



1996	85	81	86	84	82	86	91	92	91	86	83	84
1997	84	71	80	84	84	89	90	91	86	85	86	82
1998	73	77	78	82	82	85	88	90	89	87	86	83
1999	81	86	83	87	84	85	88	89	89	89	88	80
2000	81	70	78	81	84	85	91	92	91	88	86	79
2001	82	70	83	85	84	87	90	93	89	87	86	85
2002	67	75	85	84	84	86	88	91	87	87	85	81
2003	81	82	82	84	86	86	87	92	90	85	86	82
2004	87	80	76	85	82	90	90	86	87	87	86	81
2005	78	79	86	82	85	90	89	90	89	87	85	84
2006	86	85	81	84	84	84	88	90	87	84	84	87
2007	87	82	80	85	86	87	89	84	90	87	86	86
2008	89	86	84	82	84	88	92	91	89	86	86	85
2009	86	85	82	85	84	87	89	91	88	89	86	85
2010	85	84	82	87	85	88	89	90	89	85	85	83





**Table C.4:** Relative Humidity over Calabar @ 15 Hours (%) (1980-2010)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	62	62	64	75	77	83	84	88	82	80	73	58
1981	56	55	67	80	75	80	84	86	82	75	68	59
1982	64	57	66	75	79	82	85	87	83	78	71	63
1983	42	51	57	67	80	83	85	88	82	79	72	67
1984	63	54	63	63	68	71	71	74	73	76	70	57
1985	63	47	63	70	72	78	78	81	77	77	72	61
1986	55	62	67	68	68	75	85	81	80	78	73	55
1987	51	60	66	67	71	75	77	82	77	77	71	61
1988	61	57	65	67	66	74	80	83	80	77	70	65
1989	45	43	64	69	72	78	80	83	81	74	70	57
1990	42	51	57	67	80	83	85	81	80	78	73	55
1991	55	61	67	70	75	75	82	86	77	77	72	60
1992	50	45	65	71	70	78	84	90	83	75	67	56
1993	55	56	65	68	72	78	81	83	78	72	75	65
1994	59	56	64	68	72	76	98	83	80	77	70	65
1995	49	62	67	68	68	75	85	81	80	78	73	55



1996	58	59	69	70	70	78	78	85	82	76	63	58
1997	59	43	62	71	74	79	81	84	77	73	72	55
1998	55	53	56	69	69	73	79	82	83	72	73	57
1999	59	56	65	72	71	75	77	76	79	76	76	56
2000	61	46	55	68	70	72	79	83	81	77	71	59
2001	52	45	68	70	71	75	80	90	84	74	63	60
2002	52	68	69	71	75	80	87	77	78	73	63	60
2003	60	64	71	74	76	78	83	79	77	73	62	56
2004	61	62	66	75	78	77	81	87	83	78	77	70
2005	61	57	72	71	75	82	88	88	85	76	69	66
2006	66	60	70	72	72	75	86	88	84	77	72	61
2007	60	59	70	71	71	75	82	84	80	77	71	66
2008	57	63	68	72	76	79	83	87	81	80	65	65
2009	64	59	64	71	75	77	83	82	83	77	63	70
2010	57	58	65	71	75	77	80	87	84	78	69	54



**Appendix D** Tables of Monthly River Discharge ( $\text{m}^3/\text{s}$ ) Statistics in Some Southern Nigeria Cities



**Table D.1:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Lokoja) (1960-1972)

Month	Julian Day	1972	1971	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	1960
Jan (1)	1	1801.8	2318.6	2958.8	10349.1	10811	10617.9	9752.8	11004.1	10424.8	12266.4	9073.1	11683.8	0
	2	1801.8	2318.6	2985.2	2503.4	2626.6	2580.4	0	2688.2	0	3002.8	2226.2	2857.6	0
	3	1765.2	2303.2	3002.8	2503.4	2595.8	2488	2395.6	2672.8	2549.6	2985.2	2195.4	2888.4	0
	4	1789.6	2195.4	2934.6	2488	2580.4	2457.2	2364.8	2642	2534.2	2950	2195.4	2888.4	0
	5	1801.8	2155.6	2934.6	2488	0	2441.8	2349.4	0	2503.4	2934.6	2180	2842.2	0
	6	1826.2	2155.6	3002.8	2457.2	0	2441.8	2349.4	2642	2488	2888.4	2155.6	2765.2	0
	7	1887.2	2180	3055.6	2457.2	0	2411	2318.6	2626.6	2488	2857.6	2143.4	2719	0
	8	1960.4	2195.4	0	2441.8	0	2395.6	2318.6	2626.6	2457.2	2842.2	2119	2719	0
	9	1997	2195.4	3055.6	2395.6	0	2395.6	2303.2	2595.8	2441.8	2811.4	2119	2642	0
	10	2033.6	2180	3038	2226.2	0	2380.2	0	0	2426.4	2780.6	2106.8	2626.6	0
	11	2070.2	2180	0	2094.6	0	2364.8	0	2595.8	2411	2765.2	14900	2626.6	0
	12	2082.4	2155.6	0	2082.4	0	0	2303.2	2580.4	2411	2749.8	2106.8	2595.8	0
	13	0	2143.4	3038	2106.8	2580.4	2364.8	2272.4	2549.6	2395.6	2719	2082.4	2580.4	0
	14	2082.4	2106.8	3002.8	2106.8	2549.6	2349.4	0	2549.6	2364.8	2688.2	2082.4	2534.2	0
	15	2106.8	0	2985.2	2119	2580.4	2349.4	2272.4	2534.2	2364.8	2672.8	2070.2	0	0



	16	2106.8	0	2934.6	0	2534.2	2318.6	2045.8	2534.2	2349.4	2642	2070.2	2534.2	0
	17	2119	0	2811.4	2119	0	2318.6	0	2503.4	2318.6	0	2045.8	2503.4	0
	18	2143.4	0	2719	2195.4	2534.2	2303.2	0	0	2303.2	2642	2045.8	2503.4	0
	19	2180	2106.8	2688.2	2349.4	2503.4	2303.2	2045.8	2503.4	2303.2	2626.6	2033.6	2488	0
	20	2195.4	2143.4	2749.8	2364.8	2488	2287.8	2131.2	2488	2287.8	2595.8	0	2472.6	0
	21	2226.2	2195.4	2811.4	2395.6	0	2272.4	2226.2	17790	2272.4	2580.4	0	2457.2	0
	22	0	2226.2	2842.2	2272.4	0	0	0	0	0	2580.4	0	2441.8	0
	23	2226.2	2226.2	2811.4	2155.6	0	0	0	2488	0	2549.6	0	2441.8	0
	24	2045.8	2045.8	2842.2	2082.4	0	2272.4	2226.2	2457.2	0	0	2033.6	2411	0
	25	2045.8	2303.2	2888.4	2070.2	0	2045.8	2195.4	0	2272.4	2549.6	2009.2	2395.6	0
	26	2226.2	2303.2	2903.8	2070.2	0	2226.2	0	2457.2	2045.8	2534.2	2009.2	0	0
	27	0	2318.6	2888.4	2045.8	0	0	2195.4	2441.8	0	2503.4	1997	0	0
	28	2226.2	2303.2	2888.4	1972.6	0	0	2180	0	0	0	0	0	0
	29	2272.4	2303.2	2842.2	1997	0	2226.2	0	2441.8	2045.8	2503.4	0	2395.6	0
	30	2287.8	2287.8	2826.8	1997	0	2210.8	0	2426.4	2131.2	2488	0	2380.2	0
	31	2303.2	2272.4	2811.4	2009.2	17790	2195.4	15580	2411	2226.2	17790	1997	2364.8	0
Feb (2)	32	2349.4	2045.8	2842.2	2082.4	2488	15750	2180	2395.6	2195.4	2488	1972.6	16940	0
	33	2349.4	2045.8	2857.6	2303.2	2457.2	0	2155.6	0	2195.4	2457.2	0	0	0
	34	2318.6	2226.2	2888.4	2441.8	0	2195.4	0	0	2180	2441.8	0	0	0



	35	2303.2	2195.4	2888.4	2488	0	2180	0	2395.6	0	2441.8	0	0	0
	75	2272.4	2226.2	2857.6	2364.8	0	0	0	2364.8	2180	2411	0	0	0
	37	0	2045.8	0	2226.2	0	0	2155.6	0	2155.6	0	0	0	0
	38	2272.4	2272.4	0	2082.4	0	0	2143.4	2364.8	2143.4	2411	1972.6	2364.8	0
	39	2226.2	2272.4	2857.6	2070.2	0	0	0	2349.4	0	2395.6	1960.4	2349.4	0
	40	2167.8	2241.6	2842.2	2106.8	0	0	0	0	0	2380.2	1948.2	2334	0
	41	2119	2226.2	2842.2	2155.6	0	2180	0	0	2143.4	2364.8	1936	2318.6	0
	42	2106.8	2045.8	0	2106.8	2457.2	2155.6	2143.4	2349.4	2119	2364.8	0	2318.6	0
	43	2119	0	2842.2	2033.6	2441.8	0	2119	2364.8	2106.8	2349.4	0	2303.2	0
	44	2143.4	0	2811.4	2070.2	0	2155.6	0	2395.6	2082.4	0	1936	2272.4	0
	45	0	2045.8	2796	2045.8	0	2195.4	0	2364.8	14745	0	1923.8	2045.8	0
	46	2143.4	2226.2	2765.2	2441.8	0	0	0	2349.4	0	2349.4	0	2226.2	0
	47	2119	2195.4	0	2503.4	2441.8	0	0	2349.4	0	2318.6	0	2226.2	0
	48	0	2195.4	0	2549.6	2411	2195.4	0	2318.6	0	0	0	2195.4	0
	49	0	2155.6	2765.2	2580.4	0	2180	2119	2318.6	0	2318.6	1923.8	0	0
	50	0	2131.2	2734.4	2534.2	0	0	2106.8	2334	0	2303.2	1911.6	15750	0
	51	2119	2106.8	2719	2503.4	0	2180	14900	2349.4	0	16430	1899.4	2195.4	0
	52	2106.8	2106.8	0	2457.2	0	2155.6	0	0	2082.4	0	0	2180	0
	53	2082.4	2082.4	0	2411	0	0	0	2349.4	2070.2	0	1899.4	0	0



	54	2033.6	0	2719	2395.6	0	0	0	2318.6	0	0	1887.2	0	0
	55	1997	2082.4	2749.8	2272.4	0	0	0	2318.6	0	0	0	2180	0
	56	1972.6	2070.2	2765.2	2155.6	0	2155.6	2106.8	2303.2	2070.2	0	0	2155.6	0
	57	1899.4	0	2796	2106.8	0	2143.4	2082.4	2303.2	2045.8	0	0	0	0
	58	1789.6	2070.2	0	2045.8	0	0	0	2318.6	0	0	1887.2	2155.6	0
	59	1692	2045.8	2796	2009.2	0	15240	14745	16600	2045.8	16430	1862.8	2143.4	0
Mar (3)	60	1692	1997	2796	1960.4	17280	15240	2082.4	16600	14280	16430	1862.8	2143.4	0
	61	1716.4	1923.8	2765.2	1789.6	0	2143.4	2070.2	16600	2033.6	2303.2	1850.6	2119	0
	62	1692	1887.2	2719	1753	0	2119	0	2318.6	2009.2	2318.6	0	0	0
	63	1655.4	1887.2	2642	1789.6	0	0	0	2303.2	0	2303.2	0	2119	0
	64	0	1899.4	2595.8	0	0	2119	2070.2	2303.2	0	0	1850.6	2106.8	0
	65	0	1923.8	2580.4	1789.6	0	2106.8	2045.8	2272.4	0	0	1826.2	2082.4	0
	66	1655.4	1899.4	2595.8	1728.6	0	0	2045.8	2272.4	2009.2	0	1801.8	2082.4	0
	67	1631	1850.6	2688.2	11536	0	0	2033.6	2143.4	1997	0	1789.6	2070.2	0
	68	1606.6	1801.8	2796	1728.6	0	2106.8	14280	2045.8	1997	0	1789.6	14590	0
	69	1551.2	1765.2	2749.8	1789.6	0	2082.4	2033.6	2226.2	1972.6	0	1765.2	2070.2	0
	70	1523	1728.6	2749.8	1801.8	0	0	2009.2	2226.2	0	0	1765.2	2045.8	0
	71	1494.8	1692	2765.2	1765.2	2411	2082.4	0	2195.4	1972.6	0	1753	2033.6	0
	72	1466.6	1692	2765.2	1765.2	2441.8	3002.8	2009.2	0	1960.4	0	0	0	0



	73	1419.6	1679.8	2749.8	1789.6	0	2070.2	1997	0	1960.4	0	0	2033.6	0
	74	1410.2	1618.8	2719	1850.6	0	2070.2	1997	0	1936	2303.2	0	2009.2	0
	75	1353.8	1606.6	2719	1850.6	0	2045.8	1972.6	0	0	2272.4	1753	0	0
	76	1353.8	1606.6	2688.2	1923.8	2441.8	0	1972.6	0	1936	2272.4	1765.2	2009.2	0
	77	1363.2	1570	0	2033.6	2426.4	0	1948.2	0	1923.8	2143.4	0	1997	0
	78	1382	1541.8	0	2143.4	2411	2045.8	1936	2195.4	0	2045.8	1765.2	1997	0
	79	1363.2	1513.6	0	2180	0	2033.6	0	2226.2	1923.8	2226.2	1753	1972.6	0
	80	1363.2	0	2688.2	2106.8	2411	2009.2	1936	0	1899.4	2195.4	1728.6	1972.6	0
	81	1353.8	1513.6	2672.8	1801.8	2441.8	1997	1923.8	0	0	2180	1716.4	1960.4	0
	82	1325.6	1494.8	2688.2	1692	0	1972.6	1899.4	0	1899.4	2155.6	1692	1936	0
	83	1325.6	1476	0	1728.6	2441.8	2009.2	1887.2	0	1887.2	2143.4	1692	1936	0
	84	1382	1466.6	2688.2	1801.8	2457.2	1997	1862.8	0	0	2119	1655.4	1923.8	0
	85	0	1476	2672.8	1826.2	0	1972.6	1862.8	0	0	2106.8	1643.2	0	0
	86	1382	1494.8	2672.8	1862.8	2457.2	1936	1850.6	2226.2	1887.2	2106.8	1606.6	1923.8	0
	87	1363.2	0	2657.4	1875	2441.8	1923.8	1826.2	2195.4	1875	2094.6	1560.6	1899.4	0
	88	1353.8	1494.8	2642	1887.2	2441.8	13350	1801.8	2180	1862.8	2082.4	1523	1887.2	0
	89	1363.2	1513.6	0	1765.2	2411	0	1765.2	2155.6	1850.6	2070.2	1513.6	1850.6	0
	90	1419.6	1494.8	2642	1643.2	2411	1923.8	1753	2143.4	1850.6	14590	1523	1850.6	0
Apr (4)	91	1419.6	1466.6	2642	1643.2	2395.6	1899.4	1716.4	2119	1826.2	2070.2	1523	1826.2	0





	92	1410.2	1494.8	2626.6	1618.8	2364.8	1850.6	1692	2082.4	0	2045.8	1513.6	0	0
	93	1382	1523	2595.8	1643.2	2364.8	1801.8	1655.4	2082.4	0	2045.8	1466.6	1826.2	0
	94	0	1541.8	2580.4	1679.8	2349.4	1765.2	1618.8	2045.8	0	2033.6	1438.4	1801.8	0
	95	1382	1513.6	2580.4	1655.4	2349.4	1716.4	1582.2	0	0	2045.8	1410.2	1789.6	0
	96	1419.6	1466.6	2595.8	1618.8	2318.6	1679.8	1570	2045.8	1826.2	2082.4	1382	1789.6	0
	97	1429	1419.6	2611.2	1582.2	2287.8	1618.8	1541.8	2033.6	1814	2058	1353.8	1765.2	0
	98	1447.8	1382	2626.6	1551.2	2272.4	1570	1513.6	2033.6	1801.8	2033.6	1325.6	1753	0
	99	0	1382	2595.8	1541.8	2272.4	1523	1494.8	2009.2	1765.2	2009.2	1306.8	1728.6	0
	100	1447.8	1325.6	0	1570	2226.2	1494.8	1466.6	1997	1728.6	1997	1297.4	1716.4	0
	101	1466.6	1278.6	2595.8	1643.2	2226.2	1447.8	1438.4	1972.6	1692	1997	1278.6	1692	0
	102	0	1269.2	2626.6	1655.4	2180	1410.2	1391.4	1936	1643.2	1960.4	1269.2	1692	0
	103	1466.6	1212.8	2626.6	1679.8	2180	1382	1382	1923.8	1618.8	1936	1241	1679.8	0
	104	1494.8	1175.2	2642	1692	2155.6	1335	1363.2	1899.4	1582.2	1923.8	0	1655.4	0
	105	1513.6	1165.8	2642	1716.4	2195.4	1306.8	1353.8	1887.2	1551.2	1899.4	0	1643.2	0
	106	1494.8	1175.2	2672.8	1692	2180	1297.4	1325.6	1899.4	1541.8	1923.8	1241	1618.8	0
	107	1466.6	1194	2642	0	0	1250.4	1297.4	1875	1523	1911.6	1222.2	1606.6	0
	108	1447.8	1222.2	2626.6	1692	2180	1212.8	1278.6	1850.6	1513.6	1899.4	1212.8	1606.6	0
	71.5	1410.2	0	2549.6	1655.4	2155.6	1175.2	1241	1826.2	1494.8	1899.4	1175.2	1570	0
	110	1419.6	1222.2	2395.6	1655.4	2106.8	1165.8	1212.8	1789.6	1476	1887.2	1175.2	1551.2	0



	111	1447.8	1241	2272.4	1716.4	2082.4	1137.6	1165.8	1789.6	1466.6	1862.8	1165.8	1541.8	0
	112	1438.4	1212.8	2195.4	1679.8	2082.4	1118.8	1137.6	1753	1447.8	1850.6	1147	1513.6	0
	113	1419.6	1175.2	2155.6	1716.4	2070.2	1118.8	1137.6	1728.6	1438.4	1862.8	1137.6	1466.6	0
	114	1419.6	1222.2	2106.8	1765.2	2033.6	1084.48	1109.4	1716.4	1410.2	0	1147	1438.4	0
	115	1410.2	1250.4	2033.6	1765.2	1972.6	1068.96	1092.24	0	1410.2	1862.8	0	1410.2	0
	71.5	1447.8	1269.2	1997	1716.4	1936	1037.92	1068.96	1716.4	1363.2	1850.6	7090	1382	0
	117	1457.2	1250.4	1960.4	1692	1972.6	1022.4	6254	1692	1344.4	1850.6	6975	1363.2	0
	118	1476	1241	1923.8	1679.8	2009.2	1014.64	1068.96	1679.8	1325.6	1862.8	7090	1353.8	0
	119	1466.6	1175.2	1887.2	1716.4	2033.6	991.36	1109.4	1679.8	1297.4	1887.2	1147	1325.6	0
	120	1447.8	1147	1801.8	1692	2033.6	952.56	6759	1655.4	1269.2	1862.8	1165.8	1297.4	0
May (5)	121	1466.6	1175.2	1765.2	1679.8	2155.6	975.84	1109.4	1643.2	1194	1826.2	7205	1269.2	0
	122	1466.6	1269.2	1765.2	1728.6	2195.4	968.08	1118.8	11140	1175.2	1801.8	1165.8	1222.2	0
	123	1476	1335	1753	1753	2195.4	991.36	1194	1643.2	1212.8	1765.2	1118.8	1212.8	0
	124	1494.8	0	1679.8	1716.4	2226.2	999.12	1241	1606.6	1165.8	1728.6	1137.6	1165.8	0
	125	1447.8	1335	1655.4	1728.6	2180	991.36	1297.4	1551.2	1118.8	1716.4	0	1147	0
	126	1438.4	1344.4	1631	1643.2	2131.2	1014.64	1344.4	1532.4	0	1692	0	1137.6	0
	127	1438.4	1353.8	1618.8	1570	2082.4	1045.68	1391.4	1513.6	1118.8	1679.8	1137.6	1137.6	0
	128	1419.6	1335	0	1476	2033.6	1084.48	1391.4	0	1092.24	1655.4	1118.8	1118.8	0
	129	1438.4	1353.8	1618.8	1606.6	1936	1092.24	1382	1513.6	1092.24	1606.6	1109.4	1084.48	0



	130	1438.4	1382	1655.4	1692	1862.8	1084.48	1382	1494.8	1109.4	1582.2	1109.4	1061.2	0
	131	1447.8	1382	1618.8	1716.4	1789.6	1061.2	1363.2	1466.6	1147	1570	1165.8	1037.92	0
	132	1476	1391.4	1606.6	1728.6	1692	1045.68	1297.4	1438.4	1137.6	1541.8	1175.2	1022.4	0
	133	1466.6	1391.4	1606.6	0	1655.4	1022.4	1222.2	1391.4	1118.8	1523	1147	1014.64	0
	134	1447.8	1438.4	1570	1728.6	1606.6	968.08	1175.2	1353.8	0	1523	1109.4	991.36	0
	135	1447.8	1419.6	1570	1765.2	1541.8	929.28	1147	1297.4	1118.8	1570	1109.4	991.36	0
	136	1466.6	1391.4	1582.2	1814	9952	906	1222.2	1269.2	1128.2	10744	1175.2	960.32	0
	137	1494.8	1363.2	1606.6	1862.8	10348	890.48	1297.4	1241	1147	1570	1241	929.28	0
	138	1541.8	1306.8	1570	1887.2	1541.8	859.44	1335	1222.2	1175.2	1582.2	1241	929.28	0
	139	1582.2	1278.6	1582.2	1899.4	1513.6	843.92	1353.8	1212.8	1194	1618.8	1212.8	906	0
	140	1679.8	1269.2	1655.4	2009.2	1494.8	843.92	1363.2	1194	1212.8	1923.8	1212.8	890.48	0
	141	1753	1297.4	1643.2	2167.8	1476	836.16	1382	1165.8	1241	2119	1175.2	0	0
	142	1801.8	1306.8	1606.6	2503.4	1513.6	843.92	1476	1165.8	0	2143.4	1147	890.48	0
	143	1850.6	1306.8	1679.8	2626.6	1541.8	843.92	0	1147	1241	2045.8	1147	882.72	0
	144	1887.2	1335	1692	2672.8	1523	859.44	1476	1137.6	1212.8	2180	1118.8	867.2	0
	145	1887.2	1363.2	1655.4	2688.2	10216	859.44	1541.8	1137.6	1175.2	2082.4	0	859.44	0
	146	1875	1391.4	1667.6	2642	10084	836.16	1679.8	1109.4	1194	1984.8	0	836.16	0
	147	1862.8	1419.6	1692	2595.8	10216	812.88	1826.2	1092.24	1222.2	1899.4	1118.8	812.88	0
	148	1850.6	1410.2	1716.4	2580.4	1523	820.64	1887.2	1137.6	0	1789.6	1137.6	812.88	0



	149	2045.8	1419.6	1850.6	2549.6	1570	836.16	1936	1118.8	0	1643.2	1147	789.6	0
	150	2045.8	1419.6	1960.4	2580.4	1765.2	843.92	1960.4	1092.24	1222.2	1643.2	1222.2	797.36	0
	151	2180	1447.8	2033.6	2503.4	1887.2	843.92	1960.4	1118.8	1241	1606.6	1278.6	812.88	0
June (6)	152	2272.4	1513.6	2119	2534.2	1997	867.2	1972.6	1165.8	7780	1618.8	1269.2	789.6	0
	153	2364.8	1541.8	2272.4	2549.6	2226.2	859.44	2411	1241	1241	1582.2	1269.2	774.08	0
	154	2488	1494.8	2395.6	2595.8	2303.2	867.2	3196.4	1278.6	1222.2	1551.2	1325.6	0	0
	155	2719	1523	2318.6	2595.8	2534.2	906	4153.2	1278.6	1222.2	1541.8	1391.4	774.08	0
	156	2780.6	1541.8	2303.2	2518.8	2611.2	913.76	4496.6	1316.2	1259.8	1513.6	1447.8	781.84	0
	157	2857.6	1570	2303.2	2457.2	2688.2	929.28	4860.2	1353.8	1297.4	1494.8	1513.6	797.36	0
	158	2950	1643.2	2045.8	2364.8	2549.6	906	4739	1353.8	1325.6	1476	1513.6	0	0
	159	2985.2	1679.8	2195.4	2318.6	2534.2	906	4516.8	1382	1335	1466.6	1551.2	0	0
	160	3161.2	1692	2180	2272.4	2534.2	975.84	4415.8	1410.2	1419.6	1438.4	1551.2	797.36	0
	161	3196.4	1716.4	2143.4	2195.4	2626.6	999.12	4617.8	1391.4	1523	1447.8	1618.8	812.88	0
	162	3249.2	1753	2070.2	2119	2765.2	1022.4	4557.2	1363.2	1606.6	1476	1692	0	0
	163	3337.2	1789.6	2033.6	2119	2934.6	1118.8	4456.2	1325.6	1716.4	1513.6	1692	0	0
	164	3407.6	1826.2	2082.4	2180	2888.4	1147	4415.8	1335	1716.4	1570	1753	0	0
	165	3548.4	1887.2	2119	2364.8	2934.6	1175.2	4516.8	1382	1728.6	1643.2	1826.2	812.88	0
	166	3530.8	1887.2	2131.2	2364.8	3108.4	1231.6	4597.6	1485.4	1740.8	1667.6	1875	859.44	0
	167	3513.2	1899.4	2155.6	2364.8	3302	1297.4	4678.4	1606.6	1765.2	1692	1923.8	906	0



	168	3495.6	2009.2	2180	2503.4	3654	1447.8	4739	1887.2	1936	1765.2	1960.4	968.08	0
	169	3618.8	2106.8	2155.6	2688.2	4032	1765.2	4819.8	2195.4	1960.4	1862.8	2106.8	1061.2	0
	170	3654	2106.8	2119	2857.6	4557.2	1850.6	4799.6	2488	2106.8	1887.2	2395.6	1068.96	0
	171	3618.8	2119	2155.6	2888.4	5102.6	1728.6	4819.8	2549.6	2119	1960.4	2580.4	1137.6	0
	172	3566	2045.8	2045.8	2934.6	5567.2	1643.2	4920.8	2580.4	2119	2045.8	2811.4	1175.2	0
	173	3513.2	2272.4	2364.8	2857.6	5910.6	1570	4981.4	2672.8	2143.4	2155.6	2950	1212.8	0
	174	3460.4	2303.2	2457.2	2765.2	5971.2	1618.8	5062.2	2765.2	2318.6	2272.4	3143.6	1250.4	0
	175	3513.2	2411	2441.8	2796	5971.2	1753	5062.2	2765.2	2488	2318.6	3495.6	1382	0
	176	3302	2395.6	2411	2842.2	6072.2	1716.4	5102.6	2811.4	2642	2334	3654	1532.4	0
	177	3108.4	2395.6	2441.8	2888.4	6173.2	1679.8	5143	2857.6	2796	2364.8	3812.4	1728.6	0
	178	2985.2	2411	2580.4	3214	6153	1728.6	5163.2	2934.6	2811.4	2272.4	3991.6	2009.2	0
	179	2950	2457.2	2765.2	3566	6112.6	1801.8	5203.6	3143.6	2888.4	2441.8	3931	2045.8	0
	180	2903.8	2549.6	2934.6	3759.6	5930.8	1887.2	5163.2	3302	2950	2488	3971.4	2009.2	0
	181	3002.8	2534.2	3002.8	4234	5688.4	2045.8	5345	3566	2888.4	2503.4	3931	1960.4	0
July (7)	182	3108.4	2488	3038	4456.2	5466.2	2534.2	5587.4	3812.4	2842.2	2534.2	3991.6	1887.2	0
	183	3055.6	2642	2985.2	4678.4	5284.4	2934.6	5688.4	3850.2	2765.2	2457.2	4153.2	1899.4	0
	184	3002.8	2749.8	2903.8	4617.8	5163.2	3354.8	5627.8	3850.2	2688.2	2488	4395.6	1899.4	0
	185	0	2842.2	2950	4941	5183.4	3513.2	0	3870.4	2642	2642	4638	2094.6	0
	186	3002.8	2950	3002.8	4941	5203.6	3671.6	0	3910.8	2595.8	2796	4880.4	2318.6	0



187	3038	2888.4	3196.4	4981.4	5567.2	3931	5627.8	4032	2749.8	2842.2	5062.2	2749.8	0
188	3038	2888.4	3249.2	5042	5971.2	3971.4	5688.4	4092.6	3002.8	2888.4	5143	3196.4	0
189	3161.2	2857.6	3249.2	5102.6	6395.4	3931	5567.2	4052.2	2985.2	2950	5062.2	3601.2	0
190	3354.8	3161.2	3161.2	5789.4	6819.6	3850.2	5466.2	4052.2	3090.8	3002.8	5102.6	4173.4	0
191	3566	3407.6	3090.8	6334.8	7136	3812.4	5446	3991.6	3055.6	2888.4	5264.2	4355.2	0
192	3671.6	3706.8	3196.4	6617.6	7205	3971.4	5466.2	3812.4	3143.6	2950	5567.2	4456.2	0
193	3671.6	3991.6	3460.4	6883	6759	4153.2	5526.8	3910.8	3390	3161.2	5526.8	4557.2	0
194	3777.2	4052.2	3724.4	6759	7067	4052.2	5526.8	4112.8	3601.2	3302	5385.4	4799.6	0
195	4092.6	4213.8	3991.6	6998	7090	4335	5930.8	4294.6	3654	3583.6	5385.4	5001.6	0
196	4415.8	4395.6	4294.6	7274	7136	4638	6355	4496.6	3724.4	3870.4	5385.4	5223.8	0
197	4415.8	4698.6	4335	7481	7136	4739	6577.2	4557.2	3759.6	3991.6	5587.4	5385.4	0
198	4395.6	5163.2	4395.6	7665	7021	4678.4	6759	4557.2	4032	4052.2	5506.6	5466.2	0
199	4395.6	5587.4	4516.8	7918	7182	4739	6883	4577.4	4112.8	4314.8	5405.6	5627.8	0
200	4617.8	5991.4	4860.2	8608	7136	4941	6799.4	4799.6	4294.6	4638	5345	5809.6	0
201	4759.2	6516.6	5062.2	9091	7182	5264.2	6617.6	4981.4	4395.6	4739	5324.8	6052	0
202	4880.4	6738.8	5163.2	9450.4	7205	5405.6	6698.4	5001.6	4557.2	5001.6	5264.2	6274.2	0
203	5143	6952	5223.8	9899.2	7527	5627.8	6759	5001.6	4698.6	5345	5102.6	6355	0
204	5385.4	7182	5143	9925.6	8217	5789.4	6698.4	4880.4	4880.4	5405.6	5042	6496.4	0
205	5708.6	7481	4981.4	10004.8	8838	5890.4	6678.2	4880.4	5122.8	5506.6	5143	6617.6	0



	206	6052	7803	4819.8	10110.4	9503.2	5991.4	6678.2	4880.4	5385.4	5627.8	5264.2	6738.8	0
	207	6153	7849	4759.2	10374.4	9899.2	5991.4	6577.2	5324.8	5648	5809.6	5324.8	6883	0
	208	6294.4	7665	4698.6	10453.6	9820	6031.8	6617.6	5688.4	6112.6	6031.8	5345	7274	0
	209	6294.4	7665	4739	10532.8	10427.2	6112.6	6637.8	5930.8	6617.6	6233.8	5526.8	7872	0
	210	6112.6	7803	4759.2	10691.2	10691.2	6112.6	6678.2	6153	7067	6435.8	5789.4	8401	0
	211	6395.4	7918	5001.6	11298.4	11034.4	6153	6698.4	6294.4	7320	6637.8	5688.4	9022	0
	212	6577.2	8125	5324.8	11924	11377.6	6395.4	6678.2	6274.2	7343	6883	5648	9503.2	0
August (8)	213	6738.8	7918	5708.6	12203	11694.4	6557	6557	6395.4	7734	7205	5789.4	9608.8	0
	214	6883	7987	5930.8	12482	11986	6759	6395.4	6759	8125	7803	5930.8	9661.6	0
	215	6819.6	8562	6112.6	12668	12389	6860	6395.4	7205	8378	8079	6193.4	9714.4	0
	216	6759	9137	6294.4	12885	12823	6998	6395.4	7665	8654	8355	6456	9767.2	0
	217	6738.8	9344.8	6516.6	13257	13009	7067	6395.4	8010	8792	8217	6860	9899.2	0
	218	6617.6	9450.4	6617.6	13474	13257	7182	6456	8585	8792	8286	7228	10004.8	0
	219	6395.4	9925.6	7021	13443	13474	7274	6819.6	8677	8608	8493	7596	10004.8	0
	220	6233.8	10295.2	7550	0	13815	7389	6929	8723	8585	8608	7872	9925.6	0
	221	6112.6	10453.6	7803	0	13970	7757	7067	9022	8470	8930	8263	9740.8	0
	222	6213.6	11034.4	8332	13443	14063	8401	7527	9371.2	8332	9424	8493	9450.4	0
	223	6334.8	11668	8930	13474	14156	8654	7918	9529.6	8148	10902.4	8470	9160	0
	224	6213.6	11747.2	9424	13474	14156	8884	8355	9767.2	8148	11377.6	8585	8723	0



	225	6415.6	12358	9635.2	13350	14094	9022	8677	10004.8	8194	11615.2	8861	8355	0
	226	6617.6	12978	9846.4	13257	14063	9160	8999	10268.8	8263	11893	9137	8010	0
	227	7136	13195	10057.6	13350	13722	9371.2	8999	10691.2	8286	12172	9292	7734	0
	228	7665	13536	10506.4	13474	13629	9582.4	8884	11219.2	8286	12575	9292	7458	0
	229	7987	13350	10691.2	13381	13443	9661.6	9160	11588.8	8263	13009	9344.8	7274	0
	230	8263	13164	11272	14063	13195	9661.6	9608.8	11986	8263	13381	9661.6	7136	0
	231	8355	13257	11615.2	14373	13102	9688	10216	12296	8125	13536	9899.2	6998	0
	232	8424	13257	12017	14968	13071	9767.2	10453.6	13009	7872	13629	10268.8	6819.6	0
	233	8815	13350	12265	15478	13474	10110.4	10585.6	13350	7918	14156	10744	6577.2	0
	234	9239.2	13629	12482	16056	13660	10427.2	10902.4	13443	8056	14063	11219.2	6617.6	0
	235	9318.4	13660	13009	16430	13877	10612	11351.2	13474	8102	14218	11747.2	6617.6	0
	236	9424	13722	13536	16804	14094	10823.2	11800	13536	8148	14373	12389	6617.6	0
	237	9767.2	13567	14063	17144	14342	10770.4	12265	13660	8286	14776	12978	6678.2	0
	238	10110.4	13722	14435	17382	14559	0	12730	13784	8355	14869	13536	6738.8	0
	239	10427.2	13815	15002	17790	14968	10770.4	13071	13908	8539	14968	14156	6799.4	0
	240	10849.6	14156	15512	18164	15002	10902.4	13257	14094	8884	15444	14652	6998	0
	241	11456.8	14342	16192	18334	15172	11430.4	13474	14280	9239.2	15852	14968	7527	0
	242	11893	14187	16498	18470	15478	11588.8	13722	14776	9529.6	16056	15104	8125	0
	243	12172	14156	16770	18674	15716	11747.2	14001	15070	9767.2	16260	15274	8470	0





September (9)	244	12358	14280	16940	19048	16294	11800	14280	15410	10295.2	16566	15410	8746	0
	245	12637	14745	17280	19422	16430	12079	14590	15784	10770.4	16872	15784	8976	0
	246	12916	15274	17654	19830	16566	12358	14900	16192	11272	17178	16158	9212.8	0
	247	13195	15580	17858	20340	16702	12637	15206	16464	11668	17586	16396	9371.2	0
	248	13443	15954	18130	20714	16770	12978	15512	16668	11986	18164	16702	0	0
	249	13660	16192	18334	21020	16940	13350	15954	16702	12079	18470	17144	9371.2	0
	250	14001	16294	18368	21224	17144	13784	16294	16770	12451	18946	17450	9344.8	0
	251	14187	16396	18538	21394	17246	14094	16600	16872	13195	19150	17790	9292	0
	252	14435	16566	18776	21632	17450	14621	17042	17144	13722	19252	18334	9371.2	0
	253	14435	16566	19048	22013.13	17790	15070	17654	17348	14156	19320	18776	9661.6	0
	254	14559	16872	19320	22263.64	18164	15614	17960	17552	14807	19320	19252	10004.8	0
	255	14838	16974	19660	22420.2	18368	15988	18130	17892	15376	19252	19626	10559.2	0
	256	15172	17076	20034	22608.08	18572	16396	18334	18266	15954	19218	20034	11113.6	0
	257	15308	17382	20306	22827.27	18776	16668	18538	18538	16498	19150	20408	11351.2	0
	258	15308	17654	20136	23109.09	18980	16872	18674	18674	17076	19252	21054	11800	0
	259	15274	17892	19932	23359.6	19150	17144	18946	18776	17382	19218	21598	12265	0
	260	15172	18368	19932	23704.04	19252	17280	19456	18878	17688	19320	21981.82	12668	0
	261	15104	18640	20068	24173.74	19354	17382	19966	18980	18062	19354	22357.58	13195	0



	262	15206	18776	20238	24549.5	19354	17688	20340	19218	18470	19456	22921.21	13629	0
	263	15308	18946	20442	25011.77	19558	17892	20714	19354	19048	19524	23265.66	13908	0
	264	15410	18980	20816	25294.12	19830	18028	21054	19558	19728	19660	23453.54	14249	0
	265	15512	18912	21054	25611.77	19932	17994	21292	19796	20204	19898	23672.73	14621	0
	266	15614	18844	21326	25929.41	20068	17960	21530	20034	20714	20136	23891.92	15002	0
	267	15580	18844	21530	26070.59	0	18028	21700	20408	21224	20306	23923.23	15376	0
	268	15308	18776	21700	26070.59	20068	18130	21825.25	20442	21793.94	20442	24017.17	15784	0
	269	15002	18946	21919.19	26141.18	20340	18266	22075.76	20442	22451.52	20544	24017.17	16192	0
	270	14528	19150	22169.7	26176.47	20442	18368	22169.7	20408	23171.72	20748	24079.8	16396	0
	271	13970	19116	21919.19	26423.53	20510	18538	22451.52	20442	23797.98	21054	24017.17	16702	0
	272	13381	18980	22608.08	26676	20748	18980	22514.14	20442	24236.36	21394	24017.17	16974	0
	273	12792	18946	22889.9	27018	20748	19320	22514.14	20408	24612.12	21496	23985.86	17348	0
October (10)	274	12482	18810	23109.09	26904	20680	19592	22482.83	20374	24643.43	21666	23954.55	17552	0
	275	12172	18674	23328.28	26790	20646	19864	22451.52	20340	24706.06	21825.25	23923.23	17790	0
	276	11986	18470	23453.54	26676	20544	20238	0	20204	24612.12	21919.19	0	18130	0
	277	11694.4	18232	23547.48	26529.41	20408	20442	0	19966	24549.5	21981.82	23923.23	18334	0
	278	11456.8	17960	23516.16	26070.59	20306	20850	0	19864	24549.5	22013.13	23829.29	18538	0
	279	11140	17586	23359.6	25717.65	20204	21224	22451.52	19728	24518.18	22075.76	23829.29	18674	0



	280	10849.6	17178	23171.72	25223.53	20068	21394	21919.19	19524	24424.24	21919.19	23891.92	18776	0
	281	10664.8	16770	22983.84	24800	19830	21496	22357.58	19320	24361.62	21887.88	23923.23	18776	0
	282	10453.6	16464	22795.96	24424.24	19558	21530	22357.58	19048	24173.74	21731.31	24079.8	18742	0
	283	10268.8	16260	22545.46	24017.17	19320	21598	22326.26	18742	23891.92	21530	24236.36	18538	0
	284	10242.4	15954	22232.32	23610.1	18912	21598	22232.32	18470	23578.79	21394	24424.24	18300	0
	285	10216	15682	21919.19	23234.34	18538	21598	22169.7	18232	23265.66	21292	24612.12	18062	0
	286	10295.2	15274	21496	22795.96	18164	21496	22075.76	17892	22827.27	21156	24800	17756	0
	287	10506.4	14968	20918	22357.58	17586	0	21919.19	17586	22263.64	21020	25011.77	17382	0
	288	10453.6	14621	20034	21981.82	17042	21496	21825.25	17348	21825.25	20714	25329.41	16974	0
	289	10348	14342	18946	21632	16362	21428	21700	17042	21054	20510	25611.77	16804	0
	290	10268.8	14001	17552	21326	15682	21428	21530	16600	20612	20306	25752.94	16294	0
	291	10453.6	13443	16124	20918	14968	21292	21292	16090	20136	20068	25929.41	15682	0
	292	10612	12668	14714	20544	14342	20952	20850	15478	19864	19762	25929.41	15070	0
	293	10612	12110	13784	20238	13722	20646	20340	14968	19014	19524	25823.53	14621	0
	294	10717.6	11668	12854	19898	12978	20272	19694	14311	18096	19320	25541.18	14249	0
	295	10823.2	11272	11924	19558	12265	19932	19048	13660	17178	19150	25294.12	13908	0
	296	10612	11034.4	11219.2	19116	11800	19150	18266	13102	16974	18946	24835.29	13567	0
	297	10268.8	10612	10770.4	18538	11456.8	18436	17586	12668	16872	18844	24455.56	13071	0
	298	9899.2	10004.8	10427.2	17960	10981.6	17790	16872	12482	16974	18674	23985.86	12482	0



	299	9344.8	9344.8	10057.6	17450	10532.8	16974	15988	12203	16940	18674	23171.72	11893	0
	300	8930	8792	9846.4	17042	10268.8	16260	15172	11831	16702	18640	21919.19	11219.2	0
	301	8493	8148	9661.6	16702	9767.2	15172	14280	11377.6	16362	18538	21731.31	10612	0
	302	8148	7596	9450.4	16396	9371.2	14156	13784	11060.8	16158	18436	21020	9978.4	0
	303	7803	6759	9450.4	15988	8884	13195	13102	10744	15784	18232	20306	9344.8	0
	304	7297	6516.6	9318.4	15614	8332	12420	12544	10427.2	15478	17994	19558	8884	0
November (11)	305	6819.6	6274.2	9212.8	15274	7803	11694.4	12017	10110.4	15206	17790	18844	8470	0
	306	6233.8	5930.8	9137	15274	7550	11219.2	11588.8	9503.2	14776	17450	17858	7987	0
	307	5749	5587.4	9022	15206	7412	10506.4	11192.8	8884	14373	17076	17042	7481	0
	308	5345	5223.8	8677	14968	7251	9925.6	10664.8	8355	14001	16192	16396	7067	0
	309	4981.4	4981.4	8148	14621	7136	9371.2	10136.8	7872	13660	15682	15376	6698.4	0
	310	4658.2	4739	7619	14528	6759	9091	9661.6	7527	13071	14900	14559	6435.8	0
	311	4375.4	4496.6	7067	14466	6819.6	8861	9212.8	6998	12482	13970	13722	6153	0
	312	4092.6	4234	6678.2	14342	6516.6	8654	8792	6617.6	12079	12792	13009	5870.2	0
	313	3812.4	4052.2	6355	14187	6274.2	8401	8355	6334.8	11298.4	11536	12265	5567.2	0
	314	3548.4	3870.4	6052	13877	6011.6	8010	7941	6052	10506.4	10876	11694.4	5304.6	0
	315	3284.4	3706.8	5749	13567	5749	7619	7550	5789.4	9740.8	10216	11192.8	5062.2	0
	316	3090.8	3618.8	5405.6	13257	5466.2	7182	7412	5526.8	9160	9529.6	10691.2	4860.2	0



	317	3002.8	3460.4	5163.2	12823	5223.8	6819.6	7320	5284.4	8792	8746	10268.8	4678.4	0
	318	2888.4	3284.4	4941	12265	5042	6496.4	6759	5102.6	8470	8217	9899.2	4496.6	0
	319	2749.8	3143.6	4759.2	11615.2	4860.2	6233.8	6819.6	4920.8	8217	7734	9424	4335	0
	320	2549.6	3038	4577.4	11113.6	4617.8	5930.8	6557	4759.2	7596	7343	9068	4173.4	0
	321	2349.4	2888.4	4415.8	10348	4294.6	5688.4	6233.8	4638	7320	6637.8	8792	4032	0
	322	2226.2	2796	4294.6	9661.6	4153.2	5446	5971.2	4496.6	6637.8	6637.8	8539	3910.8	0
	323	2143.4	2811.4	4112.8	9137	4173.4	5264.2	5688.4	4335	6678.2	6617.6	8355	3777.2	0
	324	2045.8	2734.4	3951.2	8631	4133	5021.8	5486.4	4213.8	6375.2	6153	8102	3671.6	0
	325	1960.4	2672.8	3812.4	8148	4092.6	4799.6	5284.4	4092.6	6092.4	5688.4	7849	3566	0
	326	1887.2	2580.4	3724.4	7757	4032	4678.4	5062.2	3971.4	5850	5446	7550	3495.6	0
	327	1765.2	2488	3618.8	7389	3870.4	4496.6	4941	3870.4	5648	5284.4	7274	3407.6	0
	328	1692	2441.8	3566	7021	3759.6	4355.2	4799.6	3759.6	5466.2	5062.2	6998	3337.2	0
	329	1692	2411	3566	6698.4	3724.4	4234	4698.6	3671.6	5223.8	4860.2	6738.8	3249.2	0
	330	1753	2364.8	3460.4	6456	3724.4	4112.8	4557.2	3601.2	4981.4	4698.6	6617.6	3161.2	0
	331	1826.2	2303.2	3390	6213.6	3654	4032	4415.8	3513.2	4880.4	4577.4	6456	3108.4	0
	332	1850.6	2226.2	3302	6031.8	3513.2	3870.4	4335	3460.4	4698.6	4456.2	6334.8	3055.6	0
	333	1801.8	2180	3249.2	5789.4	3249.2	3777.2	4213.8	3390	4557.2	4274.4	6153	2985.2	0
	334	1716.4	2155.6	3161.2	5567.2	3231.6	3706.8	4092.6	3337.2	4415.8	4133	6011.6	2934.6	0



December (12)	335	1643.2	2143.4	3090.8	5345	3214	3654	3971.4	3284.4	4294.6	3991.6	5870.2	2888.4	0
	336	1606.6	2106.8	3038	5223.8	3196.4	3566	3870.4	3214	4213.8	3910.8	5850	2842.2	0
	337	1582.2	2106.8	2950	5143	3038	3495.6	3759.6	3143.6	4092.6	3777.2	5809.6	2796	0
	338	1606.6	2082.4	2888.4	5042	2950	3407.6	3706.8	3090.8	3991.6	3706.8	5688.4	2765.2	0
	339	1655.4	2070.2	2842.2	4920.8	2950	3354.8	3618.8	3038	3870.4	3618.8	5446	2749.8	0
	340	1679.8	2033.6	2842.2	4799.6	2934.6	3302	3548.4	3038	3777.2	3548.4	5203.6	2688.2	0
	341	1692	2009.2	2888.4	4759.2	2985.2	3249.2	3513.2	2985.2	3706.8	3495.6	4941	2642	0
	342	1728.6	2009.2	2888.4	4638	2950	3214	3460.4	2934.6	3654	3442.8	4759.2	2626.6	0
	343	1765.2	1972.6	2842.2	4436	2873	3178.8	3407.6	2903.8	3583.6	3372.4	4658.2	2595.8	0
	344	1801.8	2009.2	2811.4	4234	2796	3143.6	3354.8	2888.4	3513.2	3302	4557.2	2580.4	0
	345	1887.2	1997	2811.4	4052.2	2719	3108.4	3249.2	2842.2	3460.4	3249.2	4415.8	2549.6	0
	346	1936	1960.4	2796	3931	2796	3090.8	3214	2811.4	3407.6	3196.4	4294.6	2503.4	0
	347	1936	1936	2749.8	3812.4	2903.8	3002.8	3161.2	2796	3354.8	3108.4	4173.4	2488	0
	348	1923.8	1923.8	2672.8	3706.8	2950	2985.2	3108.4	2796	3302	3090.8	4092.6	2488	0
	349	1997	1887.2	2595.8	3618.8	2934.6	2950	3055.6	2749.8	3249.2	3038	3971.4	2441.8	0
	350	2009.2	1850.6	2626.6	3566	2765.2	2903.8	3002.8	2719	3196.4	2985.2	3910.8	2411	0
	351	1997	1862.8	2642	3513.2	2549.6	2888.4	2985.2	2688.2	3143.6	2950	3812.4	2395.6	3214
	352	1997	1850.6	2503.4	3495.6	2549.6	2857.6	2950	2672.8	3090.8	2934.6	3724.4	2364.8	3161.2



	353	2009.2	1826.2	2411	3442.8	2595.8	2826.8	2903.8	2657.4	3038	2888.4	3654	2380.2	3126
	354	2033.6	1801.8	2318.6	3390	2642	2811.4	2857.6	2642	3002.8	2857.6	3601.2	2395.6	3090.8
	355	2033.6	0	2272.4	3354.8	2642	2811.4	2842.2	2626.6	2985.2	2811.4	3566	2364.8	3055.6
	356	2009.2	0	2226.2	3302	2626.6	2765.2	2811.4	2595.8	2950	2796	3513.2	2349.4	3002.8
	357	1997	0	2180	3249.2	2595.8	2749.8	2796	2580.4	2934.6	2765.2	3442.8	2349.4	2950
	358	1997	0	2155.6	3214	2580.4	2749.8	2765.2	2580.4	2903.8	2749.8	3407.6	2318.6	2934.6
	359	2009.2	0	2180	3161.2	2549.6	2719	2749.8	2549.6	2888.4	2719	3354.8	2303.2	2903.8
	360	2070.2	1801.8	2045.8	3108.4	0	2688.2	2719	2488	2842.2	2688.2	3337.2	2303.2	2888.4
	361	2143.4	1850.6	2318.6	3090.8	0	2688.2	2719	2488	2796	2672.8	3284.4	2272.4	2857.6
	362	2155.6	1850.6	2349.4	3055.6	0	2672.8	2688.2	2457.2	2796	2642	3214	2045.8	2842.2
	363	0	1826.2	2334	3020.4	0	2657.4	2657.4	2441.8	2765.2	2611.2	3178.8	2131.2	2826.8
	364	0	1801.8	2318.6	3002.8	0	2642	2642	2441.8	2749.8	2580.4	3143.6	2226.2	2811.4
	365	2155.6	1801.8	2318.6	2994	10424.8	10811	10718.3	9845.5	11104.5	10424.8	12551.97	9073.1	11591.1
	366	0	0	0	0	0	0	0	0	0	0	0	0	0



**Table D.2:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Lokoja) (1973-1985)

Month	Julian Day	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973
Jan (1)	1	1241	874.96	1476	1765.2	1457.2	2287.8	2318.6	1175.2	1344.4	2672.8	2534.2	1382	2180
	2	1212.8	874.96	1457.2	1740.8	1419.6	2155.6	2349.4	1175.2	0	2672.8	2534.2	1391.4	2155.6
	3	1194	843.92	1438.4	1753	1570	2045.8	2349.4	1212.8	1344.4	2657.4	2549.6	1410.2	2143.4
	4	1278.6	836.16	1410.2	1789.6	1679.8	1997	2303.2	1222.2	1288	2626.6	2549.6	1419.6	0
	5	1288	851.68	1372.6	1814	1704.2	1997	2241.6	1175.2	1194	2611.2	2534.2	1419.6	0
	6	1194	859.44	1344.4	1814	1667.6	2009.2	2119	1100	1231.6	2595.8	2488	1438.4	0
	7	1092.24	0	1269.2	1862.8	1643.2	2009.2	2106.8	1137.6	1391.4	2580.4	2457.2	1466.6	0
	8	1053.44	0	1194	1862.8	0	2058	2119	1212.8	1457.2	2565	2441.8	1476	2143.4
	9	1022.4	859.44	1194	1899.4	1643.2	2058	2131.2	1241	1513.6	2565	2364.8	1494.8	2119
	10	1053.44	851.68	1241	1862.8	1606.6	2143.4	2082.4	0	1419.6	2534.2	2380.2	1513.6	2058
	11	1092.24	828.4	1259.8	1814	1541.8	2180	2045.8	1241	1335	2503.4	2395.6	1541.8	1997
	12	1147	0	1278.6	1826.2	1541.8	2045.8	2021.4	1222.2	1316.2	2518.8	2318.6	1643.2	2009.2
	13	1194	828.4	1335	1838.4	1606.6	0	2143.4	1175.2	1269.2	2534.2	2195.4	1850.6	1801.8
	14	1269.2	805.12	1372.6	1838.4	1594.4	2045.8	2045.8	1184.6	1194	2518.8	2180	1850.6	1570





	15	1306.8	828.4	1382	1850.6	0	2082.4	2334	1212.8	1203.4	2503.4	2155.6	2033.6	1551.2
	16	1222.2	851.68	1391.4	1838.4	0	2119	2334	1222.2	1259.8	0	2143.4	1972.6	1551.2
	17	1175.2	820.64	1372.6	1753	1594.4	2155.6	2303.2	1194	1325.6	2503.4	2106.8	1936	1541.8
	18	1165.8	820.64	1400.8	1667.6	1504.2	2180	2195.4	1194	1372.6	2534.2	2045.8	1923.8	1523
	19	1165.8	805.12	1363.2	1655.4	1391.4	2226.2	2131.2	1203.4	1344.4	2580.4	2009.2	1899.4	1523
	20	1194	820.64	1259.8	1728.6	1316.2	2272.4	2070.2	1203.4	1231.6	2565	2021.4	1911.6	1532.4
	21	1250.4	828.4	1014.64	1801.8	1231.6	2303.2	2021.4	1212.8	1128.2	2580.4	2045.8	1923.8	1551.2
	22	1269.2	812.88	851.68	1862.8	1137.6	2226.2	1997	1212.8	1175.2	0	2580.4	0	1541.8
	23	1250.4	820.64	774.08	1911.6	1222.2	2155.6	1960.4	1222.2	1278.6	2580.4	2672.8	1923.8	1523
	24	1212.8	812.88	898.24	1875	1231.6	2143.4	1887.2	1212.8	1335	2565	2796	1887.2	1523
	25	1203.4	843.92	1037.92	1728.6	0	2131.2	1862.8	1222.2	1363.2	2565	2888.4	1753	1541.8
	26	1231.6	882.72	1084.48	1643.2	0	2119	1801.8	1288	1400.8	2626.6	2950	1679.8	1570
	27	1269.2	890.48	1092.24	1716.4	1231.6	2167.8	1801.8	1297.4	1410.2	2672.8	2985.2	1582.2	1570
	28	1363.2	1045.68	1053.44	1765.2	1222.2	2272.4	1862.8	1316.2	1410.2	0	2934.6	1541.8	1606.6
	29	1476	1084.48	1045.68	1777.4	1222.2	2395.6	1936	1241	1429	2672.8	2888.4	1513.6	1692
	30	1560.6	991.36	1053.44	1814	1212.8	2441.8	1911.6	1212.8	1476	2642	2873	1476	1814
	31	1582.2	913.76	1076.72	1875	1212.8	2426.4	1899.4	1194	1532.4	2611.2	2857.6	1438.4	1936
Feb (2)	32	1606.6	898.24	1068.96	1911.6	1222.2	2411	1923.8	1175.2	1541.8	2595.8	2749.8	1382	1936
	33	1570	952.56	1037.92	1887.2	1203.4	2411	1948.2	1175.2	1532.4	2580.4	2580.4	1438.4	1936



	34	1485.4	1053.44	1037.92	1875	1250.4	2395.6	1948.2	1194	1504.2	2549.6	2441.8	1513.6	1887.2
	35	1353.8	1030.16	1045.68	1862.8	1382	2411	1936	1203.4	1551.2	2518.8	2303.2	1541.8	1716.4
	75	1269.2	937.04	1037.92	1862.8	1551.2	2457.2	1923.8	1203.4	1679.8	2488	2180	1466.6	1570
	37	1250.4	921.52	1006.88	1899.4	1631	2503.4	1887.2	1175.2	1765.2	2472.6	2226.2	1353.8	1513.6
	38	1212.8	1053.44	1022.4	1850.6	1667.6	2534.2	1875	1156.4	1826.2	2472.6	2349.4	1194	1476
	39	1128.2	1137.6	1061.2	1740.8	1655.4	2518.8	1850.6	1156.4	1850.6	2488	2457.2	1092.24	1438.4
	40	1109.4	1061.2	1084.48	1679.8	1594.4	2518.8	1801.8	1100	1801.8	2503.4	2534.2	1109.4	1457.2
	41	1109.4	944.8	1092.24	1740.8	1560.6	2503.4	1850.6	1053.44	1765.2	2534.2	2626.6	1137.6	1476
	42	1184.6	890.48	1068.96	1936	1494.8	2518.8	1936	1076.72	1643.2	2580.4	2672.8	1241	1618.8
	43	1278.6	921.52	1061.2	1984.8	1391.4	2503.4	2009.2	1118.8	1667.6	2580.4	2503.4	1269.2	1765.2
	44	1269.2	960.32	1109.4	1997	1551.2	2426.4	2082.4	1137.6	1704.2	2565	2349.4	1269.2	1862.8
	45	1194	944.8	1147	1960.4	1391.4	0	2131.2	1147	1753	2580.4	2045.8	1250.4	1887.2
	46	1137.6	898.24	1109.4	1899.4	1410.2	2426.4	2167.8	1147	1789.6	2611.2	2195.4	1278.6	1862.8
	47	1068.96	867.2	1053.44	1862.8	1429	2411	2131.2	1128.2	1814	2642	2226.2	0	1826.2
	48	991.36	859.44	1030.16	1838.4	1429	2395.6	2106.8	1100	1826.2	2672.8	2318.6	0	1728.6
	49	944.8	851.68	1053.44	1850.6	1447.8	0	2070.2	1100	1911.6	0	2364.8	1278.6	1618.8
	50	937.04	906	1084.48	1838.4	1476	2395.6	2045.8	1100	2045.8	0	2334	1269.2	1541.8
	51	921.52	1022.4	1128.2	1814	1485.4	2426.4	2033.6	1109.4	2195.4	0	2303.2	1269.2	1476
	52	898.24	1147	1137.6	1740.8	1494.8	2441.8	1923.8	1100	2318.6	2672.8	2318.6	1241	1466.6



	53	921.52	1128.2	1092.24	1679.8	1523	2426.4	1789.6	1109.4	2380.2	2626.6	2303.2	1194	1438.4
	54	999.12	1022.4	1068.96	1655.4	1551.2	2380.2	1826.2	1109.4	2395.6	2549.6	2226.2	1175.2	1410.2
	55	1068.96	960.32	1061.2	1618.8	1541.8	2349.4	1997	1084.48	2441.8	2472.6	2155.6	1194	1382
	56	1147	913.76	1037.92	1457.2	1457.2	2303.2	2070.2	1147	2518.8	2380.2	1997	1194	1353.8
	57	1269.2	867.2	1045.68	1344.4	1353.8	2272.4	2009.2	1165.8	2549.6	2318.6	1789.6	1175.2	1306.8
	58	1400.8	859.44	1053.44	1278.6	1259.8	2226.2	1911.6	1137.6	2565	2272.4	1716.4	1194	1241
	59	1335	843.92	1084.48	1269.2	1288	2167.8	1850.6	1137.6	2534.2	2272.4	1789.6	1194	1241
Mar (3)	60	1372.6	797.36	1194	1288	1297.4	1899.4	1826.2	1137.6	2503.4	2272.4	1826.2	1147	1269.2
	61	1400.8	805.12	1353.8	1241	1353.8	1789.6	1765.2	1128.2	2441.8	2334	1862.8	1109.4	1278.6
	62	1391.4	843.92	1391.4	1175.2	1400.8	1838.4	1777.4	1092.24	2395.6	2318.6	1850.6	1045.68	1250.4
	63	1335	882.72	1400.8	665.2	1363.2	1850.6	1789.6	1045.68	2411	2287.8	1801.8	1022.4	1241
	64	1259.8	890.48	1410.2	478	1250.4	1789.6	0	1037.92	2426.4	2272.4	1728.6	1022.4	1222.2
	65	1194	882.72	1410.2	353.2	1061.2	1740.8	0	1076.72	2441.8	2045.8	1618.8	1014.64	1212.8
	66	1165.8	898.24	1400.8	286.5	1175.2	1667.6	1789.6	1109.4	2441.8	2226.2	1494.8	999.12	0
	67	1156.4	913.76	1382	243.9	1250.4	1504.2	1740.8	1076.72	2426.4	2167.8	1438.4	0	1212.8
	68	1184.6	890.48	1391.4	222.6	1231.6	1476	1692	1053.44	0	2119	1382	999.12	1222.2
	69	1222.2	867.2	0	517	1222.2	1466.6	1667.6	1037.92	0	2106.8	1353.8	991.36	1222.2
	70	1269.2	851.68	1391.4	975.84	1297.4	1457.2	1655.4	1022.4	2426.4	2106.8	1335	968.08	1194
	71	1250.4	843.92	1184.6	1203.4	1344.4	1429	1551.2	1045.68	2441.8	2094.6	1325.6	944.8	1175.2



	72	1175.2	812.88	1184.6	1306.8	1391.4	1410.2	1429	1076.72	2441.8	2070.2	1306.8	929.28	1118.8
	73	1109.4	812.88	1194	1382	1429	1438.4	1353.8	1109.4	2380.2	2045.8	0	906	975.84
	74	1053.44	805.12	1372.6	1429	1447.8	1372.6	1278.6	1137.6	2303.2	1948.2	1306.8	890.48	882.72
	75	1053.44	789.6	1476	1410.2	1419.6	1306.8	1231.6	1100	2272.4	1911.6	1297.4	906	859.44
	76	1137.6	805.12	1513.6	1382	1391.4	1241	1297.4	1068.96	2241.6	1826.2	1297.4	906	890.48
	77	1137.6	812.88	1523	1419.6	1410.2	1316.2	1306.8	1068.96	0	1667.6	1278.6	882.72	898.24
	78	1100	812.88	1560.6	1419.6	1429	1410.2	1325.6	1076.72	0	1523	1269.2	867.2	906
	79	1045.68	828.4	1523	1494.8	1419.6	1382	1382	1100	0	1541.8	1212.8	836.16	890.48
	80	983.6	867.2	1429	1466.6	1429	1335	1429	0	2241.6	1551.2	1222.2	812.88	882.72
	81	983.6	952.56	1363.2	1447.8	1447.8	1316.2	1316.2	1100	2195.4	1504.2	1250.4	843.92	859.44
	82	991.36	1037.92	1353.8	1513.6	1382	1288	1269.2	1084.48	2143.4	1466.6	1269.2	867.2	836.16
	83	929.28	1022.4	1335	1551.2	1335	1269.2	1353.8	1084.48	2131.2	1457.2	1269.2	859.44	836.16
	84	874.96	944.8	1306.8	1532.4	1353.8	1241	1382	1100	2106.8	1429	1297.4	812.88	843.92
	85	867.2	921.52	1269.2	1457.2	1335	1222.2	1410.2	1100	2094.6	1391.4	1241	774.08	867.2
	86	890.48	937.04	1306.8	1438.4	1325.6	1184.6	1382	1084.48	2033.6	1344.4	1165.8	766.32	859.44
	87	898.24	929.28	1353.8	1466.6	1353.8	1137.6	1316.2	1068.96	1972.6	1344.4	1184.6	750.8	828.4
	88	952.56	921.52	1372.6	1485.4	1353.8	1137.6	1250.4	1084.48	1923.8	1353.8	1212.8	743.04	797.36
	89	1068.96	913.76	1391.4	1513.6	1297.4	1222.2	1175.2	1109.4	1862.8	1382	1297.4	766.32	774.08
	90	1147	937.04	1410.2	0	1269.2	1316.2	1147	1092.24	1777.4	1382	1306.8	774.08	797.36



Apr (4)	91	1203.4	1061.2	1410.2	1513.6	1259.8	1391.4	1194	1068.96	1679.8	1353.8	1316.2	789.6	820.64
	92	1203.4	1165.8	1372.6	1551.2	1194	1316.2	1231.6	1076.72	1728.6	1344.4	0	774.08	843.92
	93	1128.2	1184.6	0	1551.2	1165.8	1259.8	1231.6	1109.4	1777.4	1353.8	1316.2	774.08	0
	94	1053.44	1118.8	1212.8	1513.6	1212.8	1259.8	1391.4	1137.6	1789.6	1372.6	1297.4	789.6	843.92
	95	1061.2	1030.16	1231.6	1485.4	1325.6	1288	1419.6	1156.4	1777.4	0	1297.4	789.6	820.64
	96	1100	983.6	1335	1494.8	1391.4	1325.6	1438.4	1203.4	1728.6	1372.6	1316.2	766.32	789.6
	97	1128.2	975.84	1372.6	1541.8	1419.6	1316.2	1419.6	1212.8	1655.4	1325.6	1306.8	750.8	836.16
	98	1092.24	983.6	1316.2	1551.2	1429	1306.8	1400.8	1231.6	1594.4	1288	1297.4	743.04	882.72
	99	1076.72	991.36	1278.6	1541.8	1429	1297.4	1241	1184.6	1643.2	1278.6	0	719.76	929.28
	100	1118.8	991.36	1306.8	1485.4	1410.2	1325.6	1156.4	1061.2	1704.2	1259.8	0	743.04	929.28
	101	1147	1006.88	1316.2	1485.4	1391.4	1335	1109.4	1006.88	1716.4	1269.2	1297.4	766.32	944.8
	102	1147	1022.4	1325.6	1532.4	1429	1363.2	1100	991.36	1655.4	1344.4	1288	750.8	913.76
	103	1184.6	1014.64	1316.2	1631	1400.8	1344.4	1137.6	1006.88	1560.6	1335	1297.4	750.8	859.44
	104	1222.2	1037.92	1288	1570	1325.6	1438.4	1175.2	1022.4	1513.6	1288	1316.2	789.6	843.92
	105	1128.2	1037.92	1241	1513.6	1269.2	1523	1194	1037.92	1504.2	1203.4	0	789.6	867.2
	106	1084.48	1022.4	1203.4	1466.6	1212.8	1513.6	1184.6	1068.96	1513.6	1250.4	1316.2	836.16	906
	107	1076.72	999.12	1128.2	1532.4	1156.4	1485.4	1250.4	1084.48	1606.6	1297.4	1297.4	828.4	890.48
	108	1061.2	968.08	1109.4	1667.6	1241	1476	1316.2	1100	1728.6	1353.8	1288	820.64	882.72
	71.5	1045.68	968.08	1231.6	1704.2	1372.6	1476	1278.6	1118.8	1777.4	1410.2	1306.8	766.32	820.64



	110	1037.92	929.28	1325.6	1679.8	1429	1466.6	1175.2	1118.8	1789.6	1391.4	1344.4	743.04	789.6
	111	1037.92	929.28	1353.8	1541.8	1466.6	1438.4	1100	1092.24	1728.6	1372.6	1382	797.36	766.32
	112	1084.48	952.56	1344.4	1457.2	1485.4	1419.6	1076.72	1118.8	1667.6	1372.6	1382	906	774.08
	113	1156.4	960.32	1382	1391.4	1457.2	1400.8	1045.68	1184.6	1704.2	1353.8	1344.4	944.8	797.36
	114	1128.2	983.6	1419.6	1391.4	1400.8	1400.8	1118.8	1222.2	1716.4	1400.8	1353.8	968.08	820.64
	115	1045.68	983.6	1447.8	1504.2	1325.6	1429	1165.8	1353.8	1753	1391.4	1391.4	929.28	797.36
	71.5	1030.16	960.32	0	1618.8	1325.6	1476	1203.4	1438.4	1740.8	1410.2	1382	913.76	766.32
	117	1068.96	944.8	1447.8	1704.2	1372.6	0	1212.8	1419.6	1692	1429	0	952.56	758.56
	118	1100	944.8	1457.2	1801.8	1382	1476	1231.6	1400.8	1643.2	1447.8	0	999.12	750.8
	119	1137.6	968.08	1429	1850.6	1372.6	1466.6	1297.4	1335	1541.8	1391.4	0	1068.96	836.16
	120	1100	999.12	1410.2	1740.8	0	1447.8	1212.8	1344.4	1643.2	1400.8	1382	1076.72	913.76
May (5)	121	1076.72	1006.88	0	1504.2	1372.6	1447.8	1118.8	1297.4	1728.6	1466.6	1382	1076.72	975.84
	122	1084.48	983.6	1410.2	1382	1344.4	1466.6	1037.92	1344.4	1801.8	1485.4	1382	1068.96	999.12
	123	1184.6	975.84	1391.4	1382	1344.4	1523	1184.6	1457.2	1814	1504.2	1400.8	1045.68	999.12
	124	1288	0	1410.2	1400.8	1541.8	1667.6	1288	1504.2	1801.8	1494.8	1400.8	1092.24	975.84
	125	1250.4	975.84	1400.8	1391.4	1631	1740.8	1391.4	1476	1716.4	1457.2	1429	1118.8	1014.64
	126	1147	952.56	1372.6	1438.4	1667.6	1753	1372.6	1438.4	1716.4	1457.2	1438.4	1147	1037.92
	127	1222.2	968.08	1353.8	1523	1485.4	1679.8	1353.8	1400.8	1728.6	1466.6	1457.2	1175.2	1068.96
	128	1335	983.6	1344.4	1560.6	1466.6	1606.6	1400.8	1419.6	1801.8	1541.8	1466.6	1222.2	1068.96



	129	1297.4	1045.68	1382	1541.8	1438.4	1541.8	1419.6	1429	1875	1541.8	1485.4	1363.2	1061.2
	130	1344.4	1022.4	1400.8	1582.2	1485.4	1466.6	1419.6	1429	1838.4	1606.6	1523	1335	1022.4
	131	1382	1006.88	1400.8	1753	1570	1363.2	1447.8	1438.4	1655.4	1643.2	1532.4	1391.4	991.36
	132	1372.6	1022.4	1419.6	1875	1740.8	1382	1485.4	1400.8	1419.6	1679.8	1523	1438.4	929.28
	133	1297.4	1037.92	1438.4	1911.6	1801.8	1325.6	1570	1419.6	1353.8	1679.8	1513.6	1476	929.28
	134	1203.4	1109.4	1494.8	1875	1789.6	1259.8	1570	1438.4	1325.6	1728.6	1513.6	1476	968.08
	135	1137.6	1269.2	1570	1838.4	1850.6	1269.2	1618.8	1419.6	1410.2	1728.6	1504.2	1523	975.84
	136	1109.4	1476	1570	1850.6	2033.6	1231.6	1655.4	1438.4	1447.8	1716.4	1485.4	1551.2	991.36
	137	1250.4	1513.6	1582.2	1911.6	2143.4	1278.6	1692	1457.2	1485.4	1716.4	1466.6	1582.2	1014.64
	138	1372.6	1513.6	1606.6	1936	2210.8	1391.4	1777.4	1494.8	1447.8	1692	1494.8	1570	952.56
	139	1288	1504.2	1594.4	1936	2210.8	1466.6	1814	1551.2	1400.8	1618.8	1532.4	1582.2	968.08
	140	1165.8	1476	1429	1838.4	2131.2	1532.4	1740.8	1570	1400.8	1570	1541.8	1570	1045.68
	141	1037.92	1447.8	1288	1777.4	2045.8	1551.2	1801.8	1667.6	1457.2	1551.2	1532.4	1606.6	1092.24
	142	1014.64	1372.6	1325.6	1838.4	1984.8	1532.4	1887.2	1667.6	1513.6	1655.4	1532.4	1570	1109.4
	143	1006.88	1250.4	1438.4	2021.4	2009.2	1504.2	1887.2	1728.6	1541.8	1862.8	1560.6	1523	1109.4
	144	999.12	1175.2	1551.2	2119	2021.4	1485.4	1850.6	1838.4	1494.8	1960.4	1594.4	1523	1147
	145	991.36	1156.4	1606.6	2082.4	1960.4	1551.2	1789.6	1887.2	1466.6	1948.2	1631	1466.6	1068.96
	146	991.36	1194	1643.2	1984.8	1875	1643.2	1753	1899.4	1457.2	2021.4	1606.6	1438.4	1100
	147	1037.92	1250.4	1655.4	1911.6	1838.4	1667.6	1728.6	1923.8	1447.8	2094.6	1594.4	1419.6	1147



	148	1076.72	1306.8	1704.2	1862.8	1911.6	1631	1716.4	2033.6	1419.6	2195.4	1692	1363.2	1175.2
	149	1100	1363.2	1692	1838.4	1911.6	0	1716.4	2094.6	1419.6	2441.8	1667.6	1353.8	1194
	150	1165.8	1447.8	1655.4	1777.4	1997	1631	1765.2	2094.6	1466.6	2580.4	1667.6	1325.6	1147
	151	1250.4	1476	1541.8	1704.2	2021.4	1655.4	1765.2	2131.2	1476	2595.8	1679.8	1222.2	1137.6
June (6)	152	1288	1485.4	1504.2	1704.2	1984.8	1740.8	1716.4	2119	1504.2	2441.8	1679.8	1194	1084.48
	153	1335	1532.4	1476	1801.8	2009.2	1826.2	1740.8	2106.8	1504.2	2395.6	1692	1241	1092.24
	154	1372.6	1560.6	1560.6	1850.6	1960.4	1875	1777.4	2180	1551.2	2503.4	1704.2	1297.4	1147
	155	1391.4	1582.2	1618.8	1862.8	1887.2	1899.4	1789.6	2045.8	1643.2	2472.6	1704.2	1306.8	1212.8
	156	1335	1618.8	1655.4	1899.4	1862.8	1972.6	1801.8	2167.8	1753	2441.8	1716.4	1316.2	1241
	157	1278.6	1631	1618.8	1814	1984.8	2094.6	1826.2	2318.6	1862.8	2426.4	1740.8	1325.6	1278.6
	158	1231.6	1728.6	1667.6	1679.8	2106.8	2143.4	1850.6	2364.8	1936	2457.2	1826.2	1306.8	1269.2
	159	1212.8	1679.8	1692	1541.8	2094.6	2287.8	1960.4	2411	1960.4	0	1801.8	1391.4	1212.8
	160	1194	1631	1679.8	1551.2	2094.6	2180	2143.4	2549.6	1948.2	2457.2	1777.4	1438.4	1212.8
	161	1222.2	1551.2	1618.8	1631	2082.4	2167.8	2155.6	2719	1984.8	2441.8	1765.2	1523	1269.2
	162	1203.4	1447.8	1570	1740.8	2021.4	2131.2	2395.6	2903.8	2045.8	2426.4	1777.4	1541.8	1325.6
	163	1278.6	1429	1523	1862.8	1984.8	2143.4	2657.4	3460.4	2167.8	2549.6	1765.2	1513.6	1391.4
	164	1400.8	1429	1476	2021.4	2009.2	2143.4	2796	3724.4	2210.8	2688.2	1801.8	1541.8	1438.4
	165	1504.2	1476	1513.6	2106.8	1984.8	2195.4	2842.2	3777.2	2155.6	2734.4	1850.6	1541.8	1447.8
	166	1667.6	1570	1606.6	2082.4	1948.2	2287.8	3055.6	3794.8	2131.2	2919.2	1887.2	1594.4	1457.2





	167	1789.6	1594.4	1777.4	2009.2	1936	2364.8	3302	3830	2106.8	3143.6	1923.8	1655.4	1466.6
	168	1887.2	1631	1826.2	1875	1972.6	2426.4	3654	4072.4	2094.6	3161.2	1936	1728.6	1513.6
	169	1887.2	1740.8	1838.4	1765.2	2082.4	2426.4	3671.6	4234	1960.4	3090.8	1948.2	1728.6	1541.8
	170	1899.4	1814	1899.4	1740.8	2226.2	2411	3742	4193.6	1899.4	3126	2009.2	1789.6	1513.6
	171	1936	1972.6	2033.6	1887.2	2334	2349.4	3910.8	4072.4	1887.2	3231.6	2082.4	1826.2	1494.8
	172	1997	0	2195.4	1960.4	2364.8	2395.6	4052.2	3910.8	1936	3337.2	2180	1887.2	1466.6
	173	2119	0	2334	2058	2334	2457.2	4234	3742	1948.2	3319.6	2226.2	1936	1391.4
	174	2257	1972.6	2457.2	2021.4	2411	2565	4274.4	3759.6	1984.8	3266.8	2303.2	2045.8	1391.4
	175	2395.6	1960.4	2534.2	1997	2549.6	2688.199	4314.8	3777.2	1960.4	3231.6	2318.6	2395.6	1447.8
	176	2457.2	2009.2	2411	2082.4	2734.399	2734.399	4355.2	3812.4	2021.4	3337.2	2272.4	2734.4	1457.2
	177	2580.399	2143.4	2334	2257	3090.799	2765.199	4415.8	3850.2	2094.6	3442.8	2241.6	3108.4	1476
	178	2734.399	2210.8	2241.6	2411	3442.799	2765.199	4597.6	3910.8	2180	3636.4	2272.4	3284.4	1476
	179	2688.199	2303.2	2226.2	2611.199	3636.399	2749.799	4779.4	4153.2	2272.4	4032	2411	3002.8	1466.6
	180	2672.799	2287.8	2349.4	2826.799	3671.599	2749.799	4779.4	4335	2426.4	4254.2	2457.2	2749.8	1410.2
	181	2688.199	2272.4	2457.2	2919.199	3724.399	2734.399	4840	4476.4	2672.8	4314.8	2411	2534.2	1391.4
July (7)	182	2703.599	2210.8	2318.6	3143.599	3759.599	2672.799	4880.4	4638	2765.2	4395.6	2364.8	2534.2	1541.8
	183	2765.199	2082.4	2210.8	3442.799	3777.199	2688.199	4941	4658.2	2811.4	4335	2411	2580.4	1728.6
	184	2888.399	2033.6	2131.2	3636.399	3741.999	2749.799	5001.6	4759.2	2873	4274.4	2441.8	2642	1862.8
	185	2842.199	2045.8	2155.6	3759.599	3829.999	2688.199	4840	4739	2826.8	4355.2	2503.4	2749.8	1936



	186	2903.799	2070.2	2287.8	3689.199	3890.599	2580.399	4698.6	4718.8	2780.6	4456.2	2565	2857.6	2009.2
	187	2967.599	2045.8	2380.2	3794.799	4011.799	2457.2	4557.2	4617.8	3002.8	4577.4	2611.2	2985.2	2033.6
	188	3090.799	2119	2703.599	3971.399	4112.799	2364.8	4537	4415.8	3055.6	4678.4	2796	3407.6	2106.8
	189	3213.999	2303.2	2903.799	4011.799	4254.199	2272.4	4577.4	4375.4	3126	4617.8	3020.4	3830	2226.2
	190	3284.399	2441.8	3178.799	4092.599	4537	2195.4	4860.2	4779.4	3214	4577.4	3161.2	4335	2457.2
	191	3354.799	2549.6	3389.999	4213.799	4961.2	2257	5082.4	4840	3266.8	4617.8	3890.6	4415.8	2503.4
	192	3513.199	2672.799	3389.999	4132.999	5466.2	2287.8	5143	4840	3372.4	4638	4436	4415.8	2364.8
	193	3759.599	2718.999	3636.399	4153.199	5910.6	2411	5264.2	4961.2	3478	4718.8	4557.2	4294.6	2226.2
	194	4011.799	2811.399	3971.399	4375.4	6577.2	2611.199	5405.6	5001.6	3566	4779.4	4759.2	4274.4	2106.8
	195	4213.799	2985.199	4092.599	4718.8	6819.6	3213.999	5324.8	5183.4	3636.4	4819.8	4779.4	4537	2143.4
	196	4294.599	3178.799	4072.399	4981.4	6759	3583.599	5264.2	5365.2	3706.8	4880.4	4819.8	4819.8	2180
	197	4557.2	3372.399	4052.199	5102.6	6658	3513.199	5405.6	5547	3671.6	4941	4638	4860.2	2195.4
	198	4638	3548.399	4031.999	5405.6	6658	3513.199	5587.4	5870.2	3706.8	5223.8	4537	5062.2	2195.4
	199	4799.6	3706.799	3951.199	5809.6	6678.2	3653.999	5910.6	6476.2	3724.4	5466.2	4597.6	5264.2	2272.4
	200	5102.6	3930.999	3890.599	5749	6839.8	3930.999	6153	6952	3830	5688.4	4718.8	5223.8	2272.4
	201	5264.2	4516.8	4072.399	5627.8	7044	4274.399	6213.6	7251	3931	5870.2	5082.4	5284.4	2119
	202	5425.8	4961.2	4294.599	5506.6	7067	4900.6	6314.6	7251	3971.4	6072.2	5102.6	5506.6	2119
	203	5688.4	5223.8	4274.399	5506.6	7251	5223.8	6718.6	7159	4395.6	6132.8	5223.8	5850	2180
	204	5789.4	5466.2	4173.399	5668.2	7481	5688.4	7458	7251	4476.4	6193.4	5607.6	6031.8	2045.8



	205	5648	5526.8	4072.399	5769.2	7619	6031.8	7688	7343	4617.8	6476.2	6092.4	6011.6	2241.6
	206	5486.4	5607.6	3910.799	5890.4	7780	6233.8	7941	7458	4779.4	6779.2	6597.4	5991.4	2488
	207	5526.8	5708.6	3636.399	5850	7688	6476.2	8470	7228	5183.4	7251	6759	6274.2	2534.2
	208	5668.2	5708.6	3460.399	6031.8	7964	6860	8884	7159	5648	7573	7481	6213.6	2672.8
	209	5789.4	5547	3372.399	6274.2	8355	7343	9292	7711	5910.6	7872	7688	6173.2	2903.8
	210	5890.4	5627.8	3354.799	6516.6	8608	7642	9397.6	8102	5991.4	7849	7872	6355	3214
	211	6092.4	5627.8	3477.999	6395.4	8562	7757	9045	8309	5991.4	7941	8079	6435.8	3513.2
	212	6294.4	5708.6	3530.799	6193.4	8056	7941	9137	8585	6031.8	8171	8125	6759	3706.8
August (8)	213	6516.6	6072.2	3583.599	6375.2	8056	8171	9239.2	8424	6294.4	8263	8217	7067	3870.4
	214	6718.6	6193.4	4011.799	6314.6	8079	8332	9424	8171	6375.2	8148	8493	7136	3870.4
	215	6860	6132.8	4415.8	6456	8194	8263	9556	8033	6132.8	8102	8746	7205	4254.2
	216	6906	6052	4759.2	6496.4	8378	8171	9714.4	7918	5910.6	8056	8999	7274	4638
	217	6929	6092.4	4516.8	6213.6	8815	8217	9925.6	7964	5587.4	8010	9091	7320	4880.4
	218	6883	6294.4	4961.2	6112.6	9503.2	8240	10163.2	8033	5365.2	7619	9265.6	0	5385.4
	219	6839.8	6597.4	5324.8	6314.6	10216	8240	10295.2	8355	5203.6	7389	9503.2	7320	5850
	220	6883	6738.8	5648	6355	10453.6	8309	10268.8	8516	5042	7527	9661.6	7481	6052
	221	7113	6678.2	6072.2	0	10532.8	8861	10004.8	8861	4941	7435	9740.8	7688	5971.2
	222	7274	6617.6	6456	6355	10638.4	9160	9740.8	9091	4900.6	7366	9899.2	7987	6031.8
	223	7435	6577.2	6597.4	6516.6	10585.6	9265.6	9476.8	9397.6	4900.6	7573	10136.8	8217	6355



	224	7619	6698.4	6617.6	6929	10268.8	9344.8	9371.2	9872.8	4739	7596	10427.2	8539	6952
	225	7918	0	6658	7481	9952	9397.6	9265.6	10110.4	4961.2	7711	10981.6	8700	7297
	226	8171	6698.4	6738.8	7849	9608.8	9450.4	9160	10374.4	5203.6	7826	11562.4	8884	7665
	227	8654	6658	6597.4	8056	9318.4	9529.6	9424	10717.6	5648	8148	12079	8861	7803
	228	8907	6557	6536.8	8010	9212.8	9820	9925.6	10981.6	5870.2	8539	12420	8792	7803
	229	9212.8	6557	6718.6	8079	9114	10110.4	10216	10955.2	6637.8	8654	12575	8792	7918
	230	9424	6456	6698.4	8240	9476.8	10480	10532.8	10612	7435	8838	12637	8861	8217
	231	9714.4	6294.4	6395.4	8286	9820	10717.6	11008	10268.8	6132.8	8953	12699	9137	8470
	232	9925.6	6254	5870.2	8332	10242.4	10770.4	11298.4	10004.8	6637.8	8999	12854	9292	8677
	233	10400.8	6153	5446	8355	10876	10876	11404	10031.2	8516	9424	13040	9424	8930
	234	10955.2	6052	5244	8355	11456.8	11140	11955	10216	8424	9872.8	12885	9450.4	9371.2
	235	11456.8	6153	5385.4	8286	11986	11831	12234	10664.8	8378	10321.6	12513	9397.6	9635.2
	236	11773.6	6274.2	5446	7987	12482	11955	12544	11140	8355	10770.4	12172	9371.2	9925.6
	237	11955	6395.4	5627.8	7872	12823	12203	13071	11404	8654	11166.4	11831	9503.2	10453.6
	238	12141	6496.4	5870.2	7803	13164	12482	13257	11615.2	9045	11404	11668	9820	10691.2
	239	12079	6536.8	6193.4	8286	13536	12792	13412	11955	9045	11562.4	11404	9925.6	10823.2
	240	12141	6557	6536.8	8999	13753	12947	13567	12203	9022	11641.6	11219.2	10295.2	11034.4
	241	0	6738.8	6435.8	9556	14001	13040	13939	12544	9212.8	11694.4	10928.8	10770.4	11034.4
	242	12141	7113	6415.6	9846.4	14435	13319	14435	12916	9503.2	11773.6	10559.2	11192.8	11113.6



	243	12110	7159	6698.4	10084	15138	13536	14934	13350	9740.8	11747.2	10268.8	11694.4	11113.6
September														
(9)	244	12079	7297	7021	10374.4	15478	13908	15410	13567	9820	11641.6	10110.4	12358	11034.4
	245	12017	7251	7067	10480	15954	14218	15988	13753	9899.2	11483.2	10242.4	12761	10823.2
	246	11986	7619	7297	10691.2	16328	14838	16600	13939	10004.8	11351.2	10374.4	13164	10612
	247	11862	8171	7596	10981.6	16770	15172	17008	14249	10374.4	11377.6	10506.4	13288	10506.4
	248	11773.6	8838	7826	11245.6	17110	15478	17314	14559	10823.2	11404	10717.6	13350	0
	249	11747.2	9318.4	7964	11456.8	17348	15546	17620	14838	11087.2	11456.8	11008	13629	10506.4
	250	12141	9661.6	8240	11588.8	17654	15784	18062	15172	11509.6	11298.4	11404	14001	10664.8
	251	12730	9846.4	8424	11668	17926	15852	18300	15478	11800	11219.2	11800	14156	10849.6
	252	13350	9978.4	8424	11562.4	18062	16192	18606	15648	12203	11192.8	12234	14280	10955.2
	253	13784	9925.6	8631	11483.2	18130	16362	18844	15818	12668	11140	12792	14435	10849.6
	254	14280	9767.2	8792	11588.8	18198	16498	19150	15886	13009	11219.2	13288	14714	10823.2
	255	14652	9556	8953	11668	18334	16770	19218	16158	13226	11113.6	13753	15104	10849.6
	256	15070	9344.8	9091	11668	18470	17144	19286	16464	13474	11034.4	14249	15512	10902.4
	257	15546	9160	9239.2	11536	18640	17110	19320	16532	13784	10823.2	14745	16090	10955.2
	258	16260	9022	9292	11588.8	18674	17212	19354	16702	14218	10585.6	15104	16396	11034.4
	259	16872	8953	9292	11800	18742	17314	19320	17008	14590	10348	15444	16498	11377.6
	260	17348	8723	9265.6	12048	18810	17552	19252	17382	15002	10163.2	15784	16566	12079



	261	17722	8378	9318.4	12172	18912	17586	19048	17688	15376	10057.6	16022	16668	12792
	262	18096	8102	9344.8	12203	19082	17620	18844	17926	15648	9952	16532	16770	13350
	263	18334	8056	9424	12141	19252	17722	18572	18232	15852	9872.8	16838	17076	13381
	264	18436	8079	9635.2	11955	19354	17654	18334	18470	15920	9740.8	17212	17280	14280
	265	18572	7941	9952	11800	19422	17620	17892	18742	15988	9714.4	17518	17450	14435
	266	18640	8056	10136.8	11747.2	19490	17620	17450	19014	16090	9714.4	17858	17654	14621
	267	18674	7826	10216	11720.8	19524	17484	17144	19150	16158	9503.2	18096	17688	14528
	268	18742	7665	10295.2	11720.8	0	17416	16804	19252	16294	9371.2	18402	17960	14714
	269	18776	7688	10348	11588.8	19524	17654	16532	19286	16464	9344.8	18844	18266	14528
	270	18810	7596	10532.8	11668	19456	17552	16294	19388	16600	9608.8	19286	18538	14342
	271	18708	7550	10876	11588.8	19354	17484	16090	19490	16668	9793.6	19524	18674	14187
	272	18538	7619	11140	11483.2	19218	17348	15784	19694	16464	10004.8	19864	18946	14094
	273	18198	7734	11166.4	11430.4	19014	17314	15478	19830	16464	10163.2	20102	19252	14063
October														
(10)	274	17926	7964	11034.4	11509.6	18776	17314	15274	19762	16464	10268.8	20374	19456	14094
	275	17620	8217	10770.4	11720.8	18504	17382	15070	19694	16498	10374.4	20646	19660	14156
	276	17314	8585	10453.6	11800	18198	17314	14934	19490	16770	10585.6	20850	19762	14156
	277	17076	8470	10057.6	11831	17892	17178	14652	19286	16974	10823.2	21020	19762	14063
	278	16838	8332	9476.8	12141	17654	17008	14621	19014	17212	11008	21122	19728	14063



	279	16600	8355	8953	12296	17348	16702	14528	18810	17484	11113.6	21428	19660	13381
	280	16124	8562	8424	12327	16940	16498	14404	18708	17756	11272	21762.63	0	13722
	281	15614	8700	7987	12358	16600	16362	14311	18504	17960	11404	21950.51	19660	13567
	282	15138	8792	7320	12296	16158	16260	14249	18130	18096	11430.4	22044.44	19762	13474
	283	14652	8723	6779.2	12203	15750	16124	14125	17722	18164	11377.6	22138.38	19728	13102
	284	14032	8585	6274.2	11955	15342	15886	14125	17212	18130	11245.6	22107.07	19592	12544
	285	13381	8217	5910.6	11955	14900	15614	14156	16702	18096	11140	22107.07	19456	12017
	286	12730	7803	5688.4	12079	14497	15240	14187	16294	17926	11008	22075.76	19252	11377.6
	287	12110	7481	5324.8	12234	14032	14807	14001	15886	17756	11034.4	22013.13	19048	10770.4
	288	11615.2	7389	4961.2	12420	13474	14342	13815	15376	17620	11192.8	21950.51	18776	10295.2
	289	11166.4	7297	4739	12606	12947	13815	13691	15036	17518	11404	21731.31	18470	9740.8
	290	10796.8	7090	4415.8	12699	12389	13133	13567	14528	17314	11509.6	21326	18130	8999
	291	10664.8	6952	4092.599	12513	11955	12420	13195	13939	16974	11562.4	20918	17586	8332
	292	10717.6	6779.2	3794.799	12048	11588.8	11720.8	12606	13691	16532	12172	20510	17144	7757
	293	10928.8	6698.4	3530.799	11456.8	11192.8	10823.2	11831	13815	15886	12172	19932	16600	7412
	294	11113.6	6658	3319.599	10796.8	10744	10242.4	11192.8	14032	15410	12668	19354	16090	6975
	295	11087.2	6819.6	3196.399	10242.4	10268.8	9793.6	10585.6	14249	14968	13195	18810	15580	6577.2
	296	10453.6	7021	3090.799	9714.4	9688	9424	9899.2	14001	14528	13226	18334	15172	6355
	297	9661.6	7090	2985.199	9344.8	9068	9292	9397.6	13753	13970	13257	17790	14528	6213.6



	298	9022	6906	2872.999	8953	8585	9239.2	8953	13381	13381	13381	17110	14001	5910.6
	299	8631	6476.2	2703.599	8608	8148	9318.4	8585	12823	12637	13567	16260	13350	5708.6
	300	8240	6153	2441.8	8401	7780	9371.2	8217	12482	11831	13908	15308	12637	5648
	301	7918	5910.6	2257	8355	7527	9318.4	7964	12017	11008	14156	14342	12203	5749
	302	7642	5708.6	2180	8424	7205	9045	7780	11747.2	10136.8	14435	13474	11800	5930.8
	303	7274	5526.8	2094.6	8217	6929	8769	7803	11562.4	8976	14559	12637	11298.4	6052
	304	6759	5244	1923.8	7895	6759	8539	7711	11694.4	8286	14683	11800	10638.4	5870.2
November														
(11)	305	6173.2	4981.4	1777.4	7688	6617.6	8447	7642	11831	7619	14807	11113.6	9978.4	5708.6
	306	5506.6	4718.8	1679.8	7527	6395.4	8332	7389	11800	6929	14838	10532.8	9529.6	5446
	307	5163.2	4516.8	1606.6	7228	6233.8	8125	7182	11615.2	6395.4	14968	9978.4	9344.8	5163.2
	308	4981.4	4294.599	1594.4	6929	6112.6	7803	6998	11298.4	5991.4	15070	9397.6	9091	4920.8
	309	5223.8	3910.799	1541.8	6678.2	5991.4	7412	6779.2	10955.2	5627.8	15002	8723	8815	4678.4
	310	5143	3513.199	1485.4	6294.4	5789.4	6998	6516.6	10717.6	5365.2	15104	8171	8493	4395.6
	311	4900.6	3213.999	1466.6	5910.6	5547	6557	6395.4	10480	5062.2	14934	7596	8125	4092.6
	312	4698.6	2985.199	1582.2	5567.2	5345	6395.4	6254	10031.2	4819.8	14652	7159	7734	3759.6
	313	4415.8	2780.599	1606.6	5223.8	5021.8	6072.2	6153	9556	4496.6	14156	6799.4	7343	3548.4
	314	4132.999	2703.599	1594.4	4900.6	4860.2	5789.4	6031.8	8930	4213.8	13381	6496.4	6952	3372.4
	315	3829.999	2595.799	1513.6	4496.6	4233.999	5547	5910.6	8355	3931	12637	6193.4	6617.6	3196.4





	316	3513.199	2349.4	1335	4132.999	3971.399	5304.6	5001.6	7780	3706.8	11773.6	5971.2	6334.8	3038
	317	3301.999	2082.4	1278.6	3812.399	3759.599	5102.6	4456.2	7205	3530.8	11008	5708.6	6173.2	2903.8
	318	3266.799	1997	1382	3618.799	3671.599	4840	4011.8	6718.6	3372.4	10295.2	5466.2	6092.4	2719
	319	3354.799	1923.8	1363.2	3460.399	3583.599	4557.2	3654	6274.2	3214	9371.2	5244	5910.6	2503.4
	320	3477.999	1838.4	1231.6	3284.399	3389.999	4294.599	3354.8	5910.6	3020.4	8700	5021.8	5648	2045.8
	321	3565.999	1887.2	1212.8	3108.399	3143.599	4112.799	3161.2	5547	2873	7941	4840	5526.8	2180
	322	3425.199	1997	1306.8	2967.599	2967.599	4011.799	3337.2	5365.2	2765.2	7251	4678.4	5284.4	2155.6
	323	3090.799	2045.8	1363.2	2857.599	2967.599	3951.199	3513.2	5122.8	2719	6698.4	4496.6	4941	2082.4
	324	2967.599	1984.8	1382	2842.199	2857.599	3890.599	3478	4880.4	2672.8	6314.6	4355.2	4658.2	2033.6
	325	2795.999	1801.8	1353.8	2780.599	2811.399	3759.599	3460.4	4638	2626.6	5930.8	4234	4395.6	1997
	326	2657.399	1692	1222.2	2703.599	2795.999	3636.399	3618.8	4395.6	2518.8	5567.2	4153.2	4173.4	1862.8
	327	2426.4	1814	1030.16	2549.6	2672.799	3513.199	3759.6	4193.6	2380.2	5223.8	4092.6	3991.6	1716.4
	328	2155.6	1862.8	975.84	2426.4	2488	3477.999	3794.8	4011.8	2180	4941	3991.6	3850.2	1728.6
	329	1984.8	1875	1061.2	2318.6	2334	3319.599	3759.6	3850.2	2033.6	4678.4	3870.4	3706.8	1899.4
	330	1838.4	1862.8	1076.72	2241.6	2303.2	3249.199	3706.8	3706.8	1923.8	4436	3794.8	3601.2	2070.2
	331	1753	1814	1084.48	2155.6	2070.2	3161.199	3742	3530.8	1850.6	4234	3742	3495.6	2045.8
	332	1667.6	1765.2	1100	2094.6	1875	3073.199	3777.2	3407.6	1875	4092.6	3654	3390	2195.4
	333	1667.6	1716.4	983.6	2058	1960.4	3002.799	3706.8	3337.2	1899.4	3850.2	3583.6	3302	2106.8
	334	1862.8	1667.6	882.72	2033.6	2082.4	2919.199	3566	3266.8	1887.2	3636.4	3548.4	3249.2	2082.4



December (12)	335	2082.4	1631	906	1984.8	2094.6	2826.799	3442.8	3196.4	1875	3425.2	3513.2	3196.4	2070.2
	336	2257	1551.2	999.12	1911.6	0	2765.199	3319.6	3090.8	1838.4	3196.4	3495.6	3161.2	0
	337	2226.2	1466.6	991.36	1862.8	2094.6	2672.799	3196.4	3020.4	1850.6	3020.4	3460.4	3196.4	2070.2
	338	2241.6	1382	937.04	1850.6	2106.8	2580.399	3090.8	2934.6	1814	2934.6	3478	3161.2	1972.6
	339	2272.4	1353.8	906	1838.4	2119	2518.8	3020.4	2919.2	1753	2811.4	3495.6	3108.4	1899.4
	340	2303.2	1363.2	836.16	1838.4	2058	2457.2	2873	2826.8	1704.2	2688.2	3478	3090.8	1936
	341	2226.2	0	797.36	1814	2021.4	2257	2734.4	2688.2	1643.2	2549.6	3425.2	3038	2033.6
	342	2094.6	1363.2	781.84	1777.4	1972.6	1850.6	2749.8	2642	1570	2472.6	3354.8	2950	2082.4
	343	1960.4	1391.4	743.04	1679.8	1923.8	1532.4	2826.8	2657.4	1541.8	2426.4	3302	2934.6	0
	344	1777.4	1504.2	805.12	1560.6	1875	1704.2	2919.2	2672.8	1570	2380.2	3249.2	2934.6	2082.4
	345	1560.6	1618.8	859.44	1532.4	1838.4	2045.8	0	2503.4	1551.2	2441.8	3196.4	2903.8	2045.8
	346	1466.6	1560.6	851.68	1560.6	1838.4	2195.4	2919.2	2287.8	1541.8	2441.8	3143.6	2857.6	1899.4
	347	1740.8	1485.4	851.68	1594.4	1826.2	2226.2	2857.6	2210.8	1541.8	2349.4	3108.4	2796	1541.8
	348	2106.8	1400.8	789.6	1551.2	1814	2167.8	2796	2131.2	1551.2	2272.4	3038	2765.2	1335
	349	2457.2	1306.8	766.32	1438.4	1789.6	2070.2	2719	2021.4	1532.4	2167.8	2985.2	2688.2	1297.4
	350	2488	1241	766.32	1335	1692	1984.8	2580.4	2058	1494.8	1997	2950	2642	1297.4
	351	2518.8	1165.8	820.64	1391.4	1523	1960.4	2045.8	2058	1476	1838.4	2919.2	2642	1363.2
	352	2534.2	1137.6	867.2	1410.2	0	1936	2210.8	1984.8	1476	1814	2903.8	2672.8	1753



	353	2549.6	1100	890.48	1457.2	1523	1923.8	2303.2	1899.4	1466.6	1826.2	2888.4	0	1948.2
	354	2565	1100	0	1485.4	1391.4	1838.4	2395.6	1814	1466.6	1838.4	2873	0	2155.6
	355	2534.2	1118.8	0	1532.4	1241	1777.4	2364.8	1765.2	1410.2	1850.6	2842.2	0	2155.6
	356	2503.4	1222.2	0	1570	1184.6	1728.6	2318.6	1655.4	1391.4	1789.6	2811.4	2672.8	1960.4
	357	2503.4	1297.4	890.48	1560.6	1203.4	1753	2287.8	1643.2	0	1643.2	2765.2	2642	1643.2
	358	2457.2	1335	882.72	1523	1156.4	1753	2272.4	1667.6	0	1594.4	2719	2626.6	1466.6
	359	2257	1316.2	898.24	1532.4	1175.2	1716.4	2045.8	1728.6	1391.4	1594.4	2672.8	2580.4	1391.4
	360	2082.4	1222.2	913.76	1541.8	1250.4	1667.6	2303.2	1923.8	1363.2	1631	2657.4	2549.6	1363.2
	361	1972.6	1175.2	890.48	1551.2	1419.6	1692	2334	2119	1353.8	1551.2	2642	2549.6	1363.2
	362	2021.4	1156.4	836.16	1560.6	1582.2	1740.8	2349.4	2349.4	1353.8	1485.4	2672.8	2534.2	1353.8
	363	2106.8	1194	836.16	1594.4	1667.6	1740.8	2334	2318.6	1278.6	1419.6	2657.4	0	1344.4
	364	2143.4	1212.8	874.96	1541.8	1777.4	1704.2	2318.6	2303.2	1212.8	1353.8	2672.8	0	1335
	365	2082.4	1203.4	882.72	1485.4	1887.2	1582.2	2334	2303.2	1175.2	1325.6	2672.8	2534.2	1335
	366	0	0	0	0	0	0	0	0	0	0	0	0	0



**Table D.3:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Lokoja) (1986-1997)

Month	Julian Day	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986
Jan (1)	1	0	0	2967.599	1936	2005.133	2180	1560.6	2334	2713.866	1109.4	1306.8	2045.8
	2	0	0	2985.199	1929.9	2112.9	2094.6	1765.2	0	2790.866	1128.2	1410.2	1997
	3	0	0	3073.199	1887.2	2287.8	2123.067	1826.2	2131.2	2857.599	1137.6	1466.6	1923.8
	4	0	0	3178.799	1736.733	2434.1	2143.4	1972.6	0	2826.799	1165.8	1457.2	1862.8
	5	0	0	3037.999	1624.9	2318.6	2106.8	2045.8	1936	2718.999	1194	1372.6	1814
	6	0	0	2872.999	0	2045.8	2094.6	2119	2082.4	2641.999	1288	1363.2	1814
	7	0	0	3161.199	1740.8	2033.6	0	2106.8	2426.4	2703.599	1382	1400.8	1911.6
	8	0	0	3178.799	1777.4	2167.8	2094.6	1911.6	2595.799	2765.199	1532.4	1457.2	2033.6
	9	0	0	3143.599	1862.8	0	2155.6	1753	2657.399	2826.799	1716.4	1532.4	2106.8
	10	0	0	3231.599	1978.7	0	2241.6	1740.8	2518.8	2872.999	1789.6	1594.4	2272.4
	11	0	0	3301.999	2082.4	0	2272.4	1936	0	2826.799	1875	1594.4	2472.6
	12	0	0	0	2070.2	0	2143.4	1936	0	2611.199	1923.8	1513.6	2657.399
	13	0	0	3290.266	2045.8	1661.5	2094.6	1838.4	2218.5	2472.6	1984.8	1457.2	2780.599
	14	0	0	0	0	1618.8	2021.4	1765.2	2125.1	2457.2	1984.8	1466.6	2749.799
	15	0	0	3548.399	2272.4	1785.533	2021.4	1740.8	1997	2488	1997	1466.6	2641.999



	16	0	0	3618.799	2257	2039.7	1997	1765.2	1765.2	2472.6	0	1523	2549.6
	17	0	0	3689.199	2405.867	2195.4	1972.6	1826.2	1740.8	2334	1997	1631	2472.6
	18	0	0	3680.399	2387.9	2272.4	1972.6	2119	1838.4	2257	1728.6	1716.4	2488
	19	0	0	3583.599	2395.6	2303.2	1984.8	2257	1862.8	2082.4	1485.4	1716.4	2472.6
	20	0	0	3513.199	2192.5	2344.267	2025.467	2180	1814	2131.2	1297.4	1618.8	2334
	21	0	0	3513.199	2045.8	2287.8	2045.8	2094.6	1997	2131.2	1118.8	1513.6	2131.2
	22	0	0	3530.799	0	2231.333	2021.4	1887.2	1997	2106.8	1156.4	1466.6	1667.6
	23	0	0	3565.999	2426.4	2139.333	1972.6	1667.6	2303.2	2094.6	1194	1485.4	1363.2
	24	0	0	0	2480.3	2009.2	1956.333	1667.6	2241.6	2045.8	1128.2	1466.6	1250.4
	25	0	0	0	2441.8	1984.8	2033.6	0	2180	1862.8	1068.96	1438.4	1297.4
	26	0	0	0	2277.533	1997	2127.133	1297.4	2187.7	1814	1156.4	1457.2	1344.4
	27	0	0	0	2094.6	1927.867	2143.4	1363.2	2033.6	1801.8	1250.4	1594.4	1410.2
	28	0	0	0	2082.4	1891.267	2094.6	1466.6	1960.4	1960.4	1288	1716.4	1523
	29	0	0	0	0	1984.8	2021.4	1541.8	1887.2	2082.4	1335	1814	1692
	30	0	0	0	2344.267	1997	1984.8	1494.8	0	2180	1400.8	1911.6	1789.6
	31	0	0	0	2426.4	2114.933	1997	1457.2	0	2272.4	1466.6	1936	1667.6
Feb (2)	32	0	0	3354.799	0	0	2062.067	1523	1899.4	2349.4	1631	1801.8	1504.2
	33	0	0	3319.599	0	2395.6	2082.4	1887.2	1936	2318.6	1631	1582.2	1297.4
	34	0	0	3348.932	2488	2426.4	2180	2045.8	1984.8	2167.8	1643.2	1382	1203.4



	35	0	0	3401.732	2426.4	2441.8	2457.2	2106.8	2058	2167.8	1570	1222.2	1466.6
	75	0	0	0	2472.6	2488	2334	2195.4	2106.8	2155.6	1504.2	1128.2	1728.6
	37	0	0	3460.399	2511.1	2657.399	2233.9	2272.4	2119	2058	1476	1156.4	1753
	38	0	0	0	2495.7	2503.4	2106.8	2272.4	2241.6	1936	1447.8	1194	1570
	39	0	0	0	2534.2	2395.6	1984.8	2241.6	2303.2	1936	1551.2	1222.2	1570
	40	0	0	0	2653.549	2364.8	0	2441.8	2364.8	2131.2	1692	1250.4	1560.6
	41	0	0	0	2680.499	2364.8	1952.267	2595.799	2241.6	1899.4	1594.4	1297.4	1504.2
	42	0	0	3460.399	2667.666	2203.1	2112.9	2611.199	2257	0	1523	1353.8	1419.6
	43	0	0	3477.999	2657.399	2131.2	2131.2	2595.799	2119	0	1457.2	1372.6	1400.8
	44	0	0	3477.999	2580.399	2241.6	2058	2518.8	1936	1194	1391.4	1344.4	1353.8
	45	0	0	3495.599	2426.4	2334	1948.2	2195.4	1740.8	1128.2	1269.2	1325.6	1250.4
	46	0	0	3495.599	2272.4	2411	1948.2	2058	1618.8	1030.16	1137.6	0	1156.4
	47	0	0	3530.799	2155.6	2354.533	1972.6	2106.8	1643.2	952.56	1118.8	1325.6	0
	48	0	0	0	2257	2236.467	2021.4	2287.8	1594.4	999.12	1100	1353.8	975.84
	49	0	0	3565.999	2359.667	2241.6	0	2364.8	1618.8	1137.6	1076.72	1382	937.04
	50	0	0	3565.999	2310.9	2303.2	1936	2395.6	1643.2	1100	1053.44	1391.4	937.04
	51	0	0	0	2287.8	2364.8	1862.8	2272.4	1667.6	1053.44	1014.64	1429	1118.8
	52	0	0	0	0	2472.6	1838.4	2226.2	1716.4	1175.2	975.84	1513.6	1288
	53	0	0	0	2416.133	2552.68	0	2058	1667.6	1165.8	1014.64	1532.4	1353.8



	54	0	0	0	2334	2611.199	0	1850.6	1643.2	1100	1061.2	1485.4	1372.6
	55	0	0	3389.999	2167.8	2431.533	1807.9	1753	1814	1147	0	1485.4	1316.2
	56	0	0	3513.199	2272.4	2287.8	1753	1765.2	1862.8	960.32	0	1504.2	1241
	57	0	0	3560.132	0	2277.533	1710.3	1753	1936	890.48	0	1476	1165.8
	58	0	0	3530.799	2411	2349.4	0	1789.6	1887.2	913.76	0	1504.2	1092.24
	59	0	0	3565.999	2457.2	2508.533	1850.6	1765.2	1911.6	944.8	0	1532.4	1128.2
Mar (3)	60	0	0	3601.199	2611.199	0	1850.6	1838.4	1899.4	1259.8	1061.2	1631	1231.6
	61	0	0	0	2534.2	2544.467	0	1850.6	1887.2	1241	1030.16	1838.4	1212.8
	62	0	0	3706.799	0	2344.267	1911.6	1862.8	1911.6	1259.8	999.12	1814	1147
	63	0	0	0	2503.4	0	1862.8	1862.8	1887.2	1241	983.6	1643.2	1084.48
	64	0	0	3090.799	2626.599	2131.2	1807.9	1826.2	1862.8	1259.8	975.84	1513.6	1053.44
	65	0	0	2911.499	2811.399	2180	0	1789.6	1911.6	1316.2	1014.64	1513.6	1100
	66	0	0	2911.499	0	2143.4	0	1862.8	1875	1288	1068.96	1594.4	1147
	67	0	0	3002.799	3037.999	2131.2	0	1960.4	1838.4	1109.4	1068.96	1814	1147
	68	0	0	3026.266	0	2131.2	0	2009.2	1789.6	975.84	1076.72	2009.2	1128.2
	69	0	0	3037.999	2903.799	2058	0	1960.4	1704.2	906	1084.48	2082.4	1175.2
	70	0	0	0	2795.999	2045.8	1795.7	1850.6	1753	1037.92	1092.24	2094.6	1184.6
	71	0	0	0	0	1987.85	1826.2	1814	1838.4	1165.8	1118.8	2058	1084.48
	72	0	0	2967.599	0	1838.4	2033.6	1899.4	1765.2	1165.8	1128.2	0	1076.72



	73	0	0	2880.699	2554.733	1832.3	2106.8	1838.4	1716.4	1118.8	1184.6	2058	1231.6
	74	0	0	2742.099	2411	2082.4	1997	1789.6	1667.6	1037.92	1222.2	2045.8	1269.2
	75	0	0	2703.599	2198.6	2385.333	1850.6	1679.8	1692	1100	1137.6	2058	1288
	76	0	0	2795.999	2033.6	2518.8	1917.7	1606.6	1716.4	1344.4	1068.96	2070.2	1335
	77	0	0	2795.999	2082.4	2457.2	1997	0	1911.6	1447.8	1045.68	2009.2	1382
	78	0	0	2826.799	2334	2210.8	1911.6	0	2033.6	1438.4	1030.16	1826.2	1400.8
	79	0	0	2765.199	2549.6	2147.467	1923.8	1606.6	2009.2	1297.4	1045.68	1594.4	1344.4
	80	0	0	0	2657.399	2405.867	0	1594.4	1838.4	805.12	1061.2	1504.2	1306.8
	81	0	0	2094.6	2826.799	2482.867	0	1643.2	1777.4	493.6	1068.96	1429	1288
	82	0	0	0	2888.399	2699.749	1923.8	1643.2	1765.2	517	1076.72	1316.2	1288
	83	0	0	0	0	2724.132	1899.4	1618.8	1740.8	975.84	1092.24	1212.8	1250.4
	84	0	0	0	2718.999	2498.267	1875	1667.6	1692	1092.24	1100	1203.4	1109.4
	85	0	0	0	2518.8	2380.2	1936	1765.2	1667.6	999.12	1068.96	1278.6	1045.68
	86	0	0	0	2457.2	2369.933	2058	1801.8	1643.2	1006.88	1045.68	1316.2	1147
	87	0	0	0	2426.4	2585.532	2233.9	1728.6	1631	1076.72	1045.68	1353.8	1212.8
	88	0	0	0	2287.8	2837.066	0	1753	1606.6	1147	1037.92	1400.8	1269.2
	89	0	0	0	2257	2919.199	2143.4	1801.8	1667.6	1175.2	1076.72	1466.6	1288
	90	0	0	0	2180	2934.599	2009.2	1850.6	1814	1194	1118.8	1513.6	1288
Apr (4)	91	0	6092.4	0	2106.8	2967.599	1984.8	1911.6	0	1194	1118.8	1504.2	1259.8





	92	0	0	0	2094.6	2949.999	2070.2	1972.6	2210.8	1212.8	1147	1476	1259.8
	93	0	0	0	2143.4	0	2021.4	2070.2	2426.4	1231.6	1175.2	1457.2	1269.2
	94	0	0	0	2119	0	2045.8	2033.6	2334	1241	1109.4	1410.2	1259.8
	95	0	0	0	0	0	2180	1887.2	2021.4	1250.4	1061.2	1344.4	1222.2
	96	0	0	0	1980.733	2795.999	0	1850.6	0	1250.4	1076.72	1278.6	1175.2
	97	0	6092.4	0	1801.8	2775.466	2221.067	1984.8	0	1259.8	1092.24	1194	1118.8
	98	0	0	0	1716.4	2718.999	0	2210.8	0	1241	1156.4	1128.2	1100
	99	0	0	0	1777.4	2616.332	2241.6	2318.6	1826.2	1241	1231.6	1118.8	1118.8
	100	0	0	0	2341.7	2580.399	2226.2	2180	0	1278.6	1400.8	1165.8	1194
	101	0	0	0	2518.8	2657.399	2195.4	1984.8	0	1353.8	1551.2	1278.6	1288
	102	0	0	0	2711.299	2770.332	2257	1826.2	0	1438.4	2143.4	1466.6	1316.2
	103	0	0	0	2790.866	2811.399	2441.8	1777.4	0	1410.2	2641.999	1643.2	1325.6
	104	0	0	0	2872.999	2795.999	2503.4	1911.6	1740.8	1382	2488	1960.4	1344.4
	105	0	0	0	2934.599	2703.599	0	2094.6	0	1447.8	2180	2334	1429
	106	0	0	0	2919.199	2626.599	2334	2272.4	0	1382	2426.4	2349.4	1476
	107	0	6132.8	0	2919.199	2734.399	2334	2303.2	0	1325.6	2718.999	2364.8	1419.6
	108	0	0	0	2934.599	2734.399	2618.899	2167.8	0	1306.8	2985.199	2426.4	1306.8
	71.5	0	0	0	2880.699	2734.399	2672.799	2021.4	1740.8	1382	3301.999	2503.4	1363.2
	110	0	0	0	2634.299	2672.799	2457.2	2045.8	0	1438.4	3407.599	2565	1476



	111	0	0	0	2376.35	2511.1	2457.2	1997	0	1419.6	3513.199	2534.2	1606.6
	112	0	0	0	2267.267	2367.88	2349.4	1826.2	1643.2	1438.4	3548.399	2534.2	1716.4
	113	0	0	0	2657.399	2264.7	2280.1	1814	1560.6	1476	3565.999	2426.4	1438.4
	114	0	0	0	0	2203.1	2272.4	1692	0	1513.6	3530.799	2334	1297.4
	115	0	0	0	2672.799	2233.9	2226.2	1740.8	0	1984.8	3513.199	2364.8	1325.6
	71.5	0	0	0	2692.049	2395.6	2349.4	1984.8	1740.8	2167.8	2967.599	2534.2	1241
	117	0	0	0	2503.4	2449.5	2611.199	2070.2	0	2210.8	2488	2672.799	1109.4
	118	0	0	0	2411	2310.9	2672.799	2033.6	2155.6	2155.6	2131.2	2734.399	1006.88
	119	0	0	0	2341.7	2131.2	2549.6	1814	2151.1	0	1875	2718.999	968.08
	120	0	0	0	2260.85	2094.6	2441.8	1450.867	0	2155.6	1972.6	2703.599	1022.4
May (5)	121	0	0	0	0	0	2603.499	1335	2395.6	2058	2082.4	2765.199	1076.72
	122	0	6132.8	0	0	0	2626.599	1369.467	2411	1814	2318.6	2872.999	1184.6
	123	0	0	0	1997	0	2457.2	1410.2	2652.266	1814	2472.6	2903.799	1241
	124	0	0	0	2015.3	0	2411	1457.2	2523.933	2082.4	2303.2	2826.799	1269.2
	125	0	0	0	2088.5	0	2349.4	1510.467	2207.9	2143.4	2155.6	2734.399	1175.2
	126	0	0	0	2249.3	0	2318.6	1594.4	0	2488	2106.8	2672.799	1045.68
	127	0	0	0	2395.6	0	2287.8	0	2318.6	2641.999	1325.6	2688.199	1147
	128	0	0	0	2143.4	0	2195.4	1728.6	2565	2888.399	1457.2	2672.799	1278.6
	129	0	0	0	1960.4	0	2094.6	1838.4	2565	3125.999	1618.8	2611.199	1325.6



	130	0	0	0	1905.5	0	2143.4	1990.9	2426.4	3266.799	1560.6	2534.2	1372.6
	131	0	0	0	1826.2	0	2195.4	2045.8	2441.8	3301.999	1594.4	2503.4	1410.2
	132	0	0	0	1923.8	0	2318.6	2121.55	0	2985.199	1948.2	2534.2	1410.2
	133	0	0	0	1866.867	0	2518.8	2029.25	2626.599	2919.199	2119	2441.8	1400.8
	134	0	0	0	1704.2	0	2495.7	1960.4	2811.399	3407.599	2180	2303.2	1391.4
	135	0	0	0	0	0	2436.667	1966.5	2949.999	3636.399	2226.2	2195.4	1410.2
	136	0	0	0	0	0	2334	0	2880.699	3724.399	2364.8	2082.4	1447.8
	137	0	0	0	0	0	2303.2	1997	2872.999	3971.399	2349.4	1972.6	1410.2
	138	0	0	0	1826.2	0	2257	2015.3	2811.399	3777.199	2287.8	1826.2	1372.6
	139	0	0	0	1832.3	0	2195.4	2100.7	2734.399	3372.399	2167.8	1618.8	1382
	140	0	0	0	1814	0	2167.8	2277.533	0	3460.399	0	1485.4	1410.2
	141	0	0	0	1942.1	0	2180	2441.8	2985.199	3777.199	0	1438.4	1457.2
	142	0	0	0	2167.8	0	2257	2215.933	2940.466	3794.799	0	1466.6	1476
	143	0	0	0	2272.4	0	2426.4	2349.4	2749.799	3689.199	0	1476	1513.6
	144	0	0	0	2218.5	0	2349.4	2480.3	2618.899	3653.999	0	1466.6	1631
	145	0	0	0	2025.467	0	2334	2672.799	2626.599	3389.999	0	1476	1753
	146	0	0	0	0	0	2464.9	2801.132	2688.199	0	2143.4	1485.4	1850.6
	147	0	0	0	1728.6	0	2580.399	3117.199	2795.999	0	2303.2	1523	1838.4
	148	0	0	0	0	0	2626.599	3769.799	2718.999	0	2380.2	1541.8	1838.4



	149	0	0	0	2411	0	2718.999	4238.039	2857.599	3319.599	2364.8	1504.2	1875
	150	0	0	0	2441.8	0	2985.199	4592.55	2790.866	3689.199	2334	1504.2	1911.6
	151	0	0	0	0	0	2880.699	4900.6	2557.3	3548.399	2303.2	1485.4	1923.8
June (6)	152	0	0	0	2641.999	0	2857.599	5163.2	2518.8	3231.599	2241.6	1504.2	1862.8
	153	0	0	0	2649.699	0	2934.599	5486.4	0	2549.6	2287.8	1485.4	1814
	154	0	0	0	2565	0	2993.999	5674.933	2641.999	2131.2	2503.4	1476	1862.8
	155	0	0	0	2580.399	0	3131.866	5782.667	2641.999	2818.1	2364.8	1513.6	1948.2
	156	0	0	0	0	0	3026.266	5910.6	2703.599	2180	2395.6	1570	1960.4
	157	0	0	0	2595.799	0	2780.599	5850	2672.799	2082.4	2180	1631	2033.6
	158	5021.8	0	0	2565	0	2734.399	5698.5	2426.4	2021.4	1606.6	1753	2070.2
	159	5223.8	0	0	2549.6	0	2919.199	5365.2	2349.4	2033.6	2241.1	1997	2106.8
	160	5324.8	6132.8	0	2626.599	0	3161.199	5143	2441.8	2867.5	1606.6	2334	2045.8
	161	5183.4	6112.6	0	0	0	3108.399	4961.2	2718.999	2058	1643.2	2857.599	1984.8
	162	5425.8	6132.8	0	0	0	3222.799	4991.5	2842.199	2082.4	1667.6	3073.199	1936
	163	0	0	0	0	0	3407.599	0	2949.999	2472.6	2181.1	3125.999	1826.2
	164	0	0	0	0	0	3301.999	0	2934.599	2518.8	1704.2	3055.599	1777.4
	165	6415.6	0	0	0	0	3301.999	4941	0	2918.1	1899.4	2919.199	1789.6
	166	0	0	0	0	0	0	4860.2	2565	2257	2819.1	2703.599	1850.6
	167	0	0	0	0	0	3521.999	4900.6	2518.8	2143.4	2595.799	2580.399	1936



	168	0	0	0	0	0	3477.999	5375.3	0	2210.8	2241.6	2457.2	2070.2
	169	0	0	0	0	0	3425.199	5688.4	2503.4	2334	2009.2	2349.4	2241.6
	170	0	0	0	0	0	3354.799	5749	2580.399	3042.4	1801.8	2303.2	2395.6
	171	0	0	0	0	0	3442.799	5850	2611.199	2595.799	1753	2257	2441.8
	172	7872	6122.7	0	0	0	3398.799	5977.933	2688.199	2641.999	2425.3	2167.8	2441.8
	173	0	6132.8	0	0	0	3121.599	5984.667	2811.399	3347.599	1765.2	2155.6	2411
	174	7987	0	0	0	0	3037.999	5951	2949.999	2672.799	1728.6	2303.2	2287.8
	175	0	0	0	0	0	3002.799	6314.6	3090.799	2734.399	1692	2611.199	2195.4
	176	0	0	0	0	0	3037.999	6678.2	3196.399	2811.399	1679.8	2734.399	2226.2
	177	0	0	0	0	0	3366.532	6779.2	3213.999	3250.299	1692	2795.999	2272.4
	178	0	0	0	0	0	3389.999	6711.867	3020.399	2718.999	2229.9	2857.599	2334
	179	0	0	0	0	0	3231.599	6658	2826.799	2919.199	1826.2	2934.599	2349.4
	180	0	0	0	0	0	3354.799	6617.6	2626.599	3073.199	1862.8	2903.799	2364.8
	181	10216	0	0	0	0	3870.399	6557	2549.6	3284.399	1875	2765.199	2272.4
July (7)	182	9952	0	0	0	0	4233.999	6415.6	0	3991.599	2272.4	2657.399	2287.8
	183	0	0	0	0	0	4456.2	6546.9	3090.799	0	0	2626.599	2334
	184	9529.6	0	0	0	0	4436	6940.5	0	0	0	2657.399	2334
	185	0	0	0	0	0	4304.699	7274	2911.499	4597.6	0	2672.799	2318.6
	186	0	6132.8	0	0	0	4052.199	7222.25	2826.799	0	0	2626.599	2349.4



	187	0	0	0	0	0	4018.532	7228	3178.799	0	0	2534.2	2472.6
	188	9091	0	0	0	0	4132.999	7281.667	0	0	2070.2	2441.8	2641.999
	189	0	0	0	0	0	4294.599	7297	3601.199	0	0	2349.4	2734.399
	190	0	6112.6	0	0	0	4355.2	7665	0	0	0	2318.6	2949.999
	191	0	0	0	0	0	4335	7688	3601.199	4739	0	2318.6	3037.999
	192	7274	0	0	0	0	4328.266	7734	3495.599	5365.2	0	2395.6	3161.199
	193	0	0	0	0	0	4567.3	7757	3513.199	0	2257	2472.6	3284.399
	194	0	0	0	0	0	4658.2	7642	3706.799	0	2595.799	2534.2	3284.399
	195	0	0	0	0	0	4860.2	7573	3653.999	5668.2	2626.599	2611.199	3337.199
	196	5850	0	0	0	0	5042	7918	3724.399	0	2657.399	2734.399	3565.999
	197	0	0	0	0	0	0	7964	3759.599	0	2765.199	2888.399	3741.999
	198	5910.6	0	0	0	0	5378.667	7941	3910.799	6435.8	2919.199	3108.399	3794.799
	199	0	0	0	0	0	5526.8	8217	0	0	3073.199	3125.999	3812.399
	200	0	0	0	0	0	5728.8	0	0	0	3231.599	3143.599	3777.199
	201	6536.8	0	0	0	0	6031.8	0	5163.2	6738.8	3319.599	3143.599	3829.999
	202	6355	0	0	0	0	6153	9212.8	5304.6	0	3196.399	3213.999	3930.999
	203	0	0	0	0	0	6112.6	9476.8	5749	0	3108.399	3477.999	4072.399
	204	0	0	0	0	0	6052	10031.2	6213.6	6883	3073.199	3689.199	4335
	205	4840	0	0	0	0	6031.8	10163.2	6314.6	0	3319.599	3910.799	4516.8



	206	3951.199	0	0	0	0	6233.8	10216	6183.3	0	3425.199	4092.599	4436
	207	0	0	0	0	0	6516.6	10354.6	5971.2	6415.6	3618.799	4052.199	4516.8
	208	0	0	0	0	0	6759	10546	6193.4	6375.2	3425.199	3890.599	4577.4
	209	0	0	0	0	0	6567.1	10691.2	6627.7	6294.4	3301.999	3689.199	4496.6
	210	0	0	0	0	0	6698.4	11041	7078.5	6233.8	3161.199	3653.999	4395.6
	211	0	0	0	0	0	6718.6	11404	7412	6173.2	3653.999	3706.799	4799.6
	212	0	0	0	0	0	0	11734	7688	6112.6	3724.399	3671.599	4941
August (8)	213	0	0	0	0	0	0	0	0	5890.4	3618.799	3583.599	0
	214	0	0	0	0	0	7189.667	12110	0	0	3636.399	3671.599	0
	215	0	0	0	0	0	7419.667	12203	8631	5890.4	3653.999	3794.799	0
	216	0	0	0	0	0	7327.667	12347.67	8516	5920.7	3671.599	3850.199	5526.8
	217	0	0	0	0	0	7228	12451	8539	6011.6	3794.799	3870.399	5688.4
	218	0	0	0	0	0	7182	12590.5	8838	0	3910.799	3971.399	5850
	219	0	0	0	0	0	7105.333	12513	8872.5	6233.8	4031.999	4193.599	6233.8
	220	0	0	0	0	0	7473.333	12451	8799.667	0	4153.199	4294.599	6334.8
	221	0	0	0	0	0	0	12420	8838	0	4415.8	4355.2	6658
	222	1231.6	0	0	0	0	8383.75	12606	8941.5	6892.533	4395.6	4476.4	6883
	223	0	0	0	0	0	8807.333	12792	9056.5	7343	4294.599	4658.2	7044
	224	1061.2	0	0	0	0	8899.333	13019.33	8948.4	7619	4213.799	4739	7251



	225	0	0	0	0	0	8746	13226	8861	7619	4294.599	4819.8	7320
	226	0	0	0	0	0	8661.667	13288	9129.32	7895	4537	4920.8	7711
	227	0	0	0	0	0	8684.667	13412	9600	8182.5	4739	5062.2	7550
	228	0	0	0	0	0	8815	0	9999.52	8872.5	5264.2	5163.2	7366
	229	0	0	0	0	0	8884	13908	10075.2	9450.4	5304.6	5163.2	7297
	230	0	0	0	0	0	9029.667	14218	10216	9978.4	5324.8	4941	7228
	231	0	0	0	0	0	9204	14466	10471.2	10453.6	5627.8	4819.8	7205
	232	0	0	0	0	0	9582.4	14683	10704.4	0	6132.8	4799.6	7159
	233	0	0	0	0	0	9635.2	15376	10744	11351.2	6637.8	4920.8	7228
	234	0	0	0	0	0	9476.8	15495	10618.6	12203	6617.6	5324.8	7251
	235	0	0	0	0	0	9503.2	15614	10427.2	0	6718.6	5769.2	7412
	236	0	0	0	0	0	9529.6	15761.33	10202.8	12869.5	7021	6274.2	7642
	237	0	0	0	0	0	9635.2	15818	10084	12978	7458	6799.4	7780
	238	0	0	0	0	0	9635.2	16226	10147.36	13334.5	8194	6998	7642
	239	0	0	0	0	0	9811.2	16413	10405.2	13629	8907	7113	7435
	240	0	0	0	0	0	10004.8	16668	10625.2	13985.5	9265.6	7320	7251
	241	0	0	0	0	0	9978.4	0	10786.24	14249	9661.6	7757	7320
	242	0	0	0	0	0	0	17869.33	10884.8	14388.5	9661.6	8263	7619
	243	0	0	0	0	0	10031.2	18495.5	11054.2	14435	9714.4	8861	8010





September (9)	244	0	0	0	0	0	10084	19082	11608.6	14579.67	9714.4	9582.4	8378
	245	0	0	0	0	0	10242.4	19252	11877.5	14714	9872.8	10189.6	8677
	246	0	0	0	0	0	10295.2	19320	12420	0	10057.6	10691.2	9186.4
	247	446.8	0	0	0	0	0	19535.33	12936.67	14951	10348	10902.4	9635.2
	248	0	0	0	0	0	11087.2	19524	13071	15087	10638.4	11192.8	9925.6
	249	0	0	0	0	0	11562.4	19490	13257	15240	11324.8	11509.6	10136.8
	250	758.56	0	0	0	0	11785.47	19490	13691	15512	11924	11694.4	10374.4
	251	0	0	0	0	0	11996.33	19422	14187	0	12637	11800	10532.8
	252	0	0	0	0	0	0	19354	14424.67	16566	13133	11986	10664.8
	253	0	0	0	0	0	12621.5	19252	14769.8	0	13505	12110	11140
	254	0	0	0	0	0	12967.67	19150	14959.5	16634	13939	12203	11351.2
	255	0	0	0	0	0	13432.67	0	15070	16838	14218	0	11588.8
	256	0	0	0	0	0	14148.25	0	15138	16889	14621	12203	11694.4
	257	0	0	0	0	0	14419.5	19252	15002	17110	14745	12110	11694.4
	258	0	0	0	0	0	14559	19167	15172	16770	14838	12203	11615.2
	259	0	0	0	0	0	14838	0	15274	0	15104	11986	11456.8
	260	0	0	0	0	0	0	18934.67	15398.67	16396	15342	11800	11351.2
	261	0	0	0	0	0	16135.33	18844	15489.33	0	15478	11588.8	11298.4



	262	0	0	0	0	0	16566	18674	0	16158	15580	11694.4	11324.8
	263	0	0	0	0	0	16821	18504	15670.67	16158	15682	11588.8	11483.2
	264	0	0	0	0	0	17291.33	18334	15648	16192	15920	11588.8	11668
	265	0	0	0	0	0	17552	17926	15580	16413	16090	11694.4	12048
	266	0	0	0	0	0	17858	17815.5	0	0	16260	11694.4	12296
	267	0	0	0	0	0	17858	17484	15750	16770	16362	11800	12420
	268	0	0	0	0	0	17892	17161	15852	0	16498	11893	12420
	269	0	0	0	0	0	18062	16838	15897.33	16906	16600	12203	12327
	270	0	0	0	0	0	18164	16311	15852	0	16634	12513	12575
	271	0	0	0	0	0	18277.33	16090	0	17076	17892	12699	13040
	272	0	0	0	0	0	18453	15682	0	17314	17824	12792	13536
	273	0	0	0	0	0	18617.33	15500.67	0	17280	17858	12885	14001
October (10)	274	0	0	0	0	0	18640	0	15750	0	16702	13102	14280
	275	0	0	0	0	0	18572	14497	15716	17195	16838	13288	14497
	276	0	0	0	0	0	18470	14047.5	15410	17382	17008	13195	14590
	277	0	0	0	0	0	18470	13644.5	14968	17756	17144	13009	14683
	278	0	0	0	0	0	18436	13288	0	18028	17484	12792	14621
	279	0	0	0	0	0	18402	13195	0	18572	17518	12606	14590



	280	0	0	0	0	0	18402	13257	13257	17960	17484	12513	14528
	281	0	0	0	0	0	18300	13339.67	12637	17450	17450	0	14590
	282	0	0	0	0	0	18096	13536	12327	16770	17416	12513	14745
	283	10744	0	0	0	0	17892	13629	0	16294	17348	12606	14745
	284	10717.6	0	0	0	0	17722	13691	11298.4	16044.67	17314	12699	14590
	285	10532.8	0	0	0	0	17280	0	10981.6	15852	17246	13009	14311
	286	10321.6	0	0	0	0	16940	13236.33	0	15750	17110	13288	13939
	287	10136.8	0	0	0	0	16532	12895.33	10532.8	0	16838	13505	13257
	288	9952	0	0	0	0	16090	12730	10242.4	15240	16532	13288	12544
	289	9688	0	0	0	0	15546	12141	10057.6	15019	16090	13009	11694.4
	290	9556	0	0	0	0	15036	11862	10308.4	15432.67	15580	12513	11034.4
	291	9424	0	0	0	0	14838	11527.2	10678	0	15172	12110	10506.4
	292	9265.6	0	0	0	0	14528	11104.8	0	15903	14683	11588.8	9978.4
	293	8976	0	0	0	0	14187	10572.4	0	15999.33	14373	11008	9397.6
	294	8654	0	0	0	0	13970	10427.2	11008	16124	14218	10189.6	8815
	295	8355	0	0	0	0	13629	10145.6	11192.8	16124	14621	9371.2	8309
	296	8102	0	0	0	0	13350	9802.4	10955.2	16056	0	8631	7849
	297	7987	0	0	0	0	13040	9626.4	10268.8	15784	14373	7964	7366
	298	7987	0	0	0	0	12451	9318.4	9476.8	15461	13505	7320	6860



	299	7964	0	0	0	0	12017	9068	9045	15036	12606	6678.2	6678.2
	300	7964	0	0	0	0	11588.8	0	0	14435	0	6173.2	6536.8
	301	8125	0	0	0	0	11324.8	0	0	12947	10981.6	5789.4	6375.2
	302	8171	0	0	0	0	10928.8	8447	7757	0	10189.6	5466.2	6153
	303	8263	0	0	0	0	10480	8332	7343	10585.6	9265.6	5102.6	5971.2
	304	8378	0	0	0	0	9740.8	0	7090	9388.8	8861	4759.2	5789.4
November (11)	305	8562	0	0	0	0	0	7987	6678.2	8159.5	7964	4395.6	5930.8
	306	8723	0	0	0	0	8746	8056	6557	7550	7389	4153.199	6132.8
	307	8746	0	0	0	0	8424	0	6415.6	6998	6952	3971.399	6355
	308	8700	0	0	0	0	8094.333	8125	6334.8	0	6698.4	3829.999	6536.8
	309	8493	0	0	0	0	0	7665	6193.4	5890.4	6395.4	3671.599	6274.2
	310	8125	0	0	0	0	7228	7274	5890.4	5567.2	5809.6	3495.599	5910.6
	311	7849	0	0	0	0	6839.8	6839.8	5775.933	5264.2	5183.4	3337.199	5688.4
	312	7366	0	0	0	4954.467	6708.5	6506.5	5385.4	4853.467	4718.8	3143.599	5688.4
	313	6975	0	0	0	4907.333	6698.4	0	5213.7	4537	4436	2967.599	5668.2
	314	6839.8	0	0	0	4691.867	6785.933	5917.333	5136.267	4355.2	4153.199	2811.399	5567.2
	315	6637.8	0	0	0	4436	7026.75	5856.733	4981.4	0	3870.399	2703.599	5223.8
	316	6334.8	0	0	0	4228.949	0	5668.2	4712.067	4031.999	3741.999	2565	4900.6



	317	6052	0	0	0	4031.999	6738.8	5163.2	4415.8	3991.599	3671.599	2426.4	4617.8
	318	5951	0	0	0	4011.799	6072.2	4870.3	4031.999	3812.399	3530.799	2334	4294.599
	319	6355	0	0	0	4011.799	5425.8	4577.4	3760.899	3671.599	3389.999	2334	4031.999
	320	6496.4	0	0	0	3859.839	5223.8	4294.599	3530.799	3565.999	3319.599	2395.6	3794.799
	321	6557	0	0	0	3580.079	5021.8	3981.499	3460.399	3612.932	3196.399	2303.2	3548.399
	322	6193.4	0	0	0	3366.532	4799.6	4092.599	3689.199	0	3196.399	2226.2	3301.999
	323	10612	0	0	0	3210.479	4526.9	4274.399	0	0	3161.199	2143.4	3020.399
	324	5648	0	0	0	3108.399	4314.799	4153.199	3777.199	3266.799	3037.999	2009.2	2857.599
	325	5446	0	0	0	3002.799	0	3785.999	3838.466	3249.199	2934.599	1911.6	2811.399
	326	5284.4	0	0	0	2846.049	4314.799	3477.999	3910.799	3117.199	2641.999	1838.4	2811.399
	327	5143	0	0	0	2677.932	4102.699	3407.599	3941.099	2967.599	2426.4	1753	2872.999
	328	5082.4	0	0	0	2665.099	3951.199	3389.999	3951.199	2919.199	2210.8	1740.8	2949.999
	329	4981.4	0	0	0	2693.332	3794.799	3389.999	3653.999	0	2303.2	1753	2949.999
	330	0	0	0	0	2631.732	0	3340.719	3389.999	0	2364.8	1826.2	2780.599
	331	0	0	0	0	2626.599	3794.799	3301.999	3213.999	2511.1	2488	1850.6	2580.399
	332	0	0	0	0	2657.399	3978.132	3225.732	3049.732	2180	2718.999	1838.4	2518.8
	333	0	0	0	0	2549.6	0	3155.332	2786.759	2131.2	2765.199	0	2503.4
	334	0	0	0	0	2457.2	4173.399	3096.666	2641.999	2131.2	2795.999	1838.4	2441.8



December (12)	335	0	0	0	0	2334	4193.599	3055.599	0	1936	2749.799	1887.2	2395.6
	336	0	0	0	0	2372.5	4153.199	3011.599	0	1960.4	2765.199	1911.6	2349.4
	337	0	0	0	0	2380.2	3930.999	2919.199	3167.066	1960.4	2857.599	1887.2	2241.6
	338	0	0	0	0	2426.4	3750.799	2903.799	3253.599	2058	2919.199	1838.4	2155.6
	339	0	0	0	0	2503.4	3724.399	2826.799	3121.599	1984.8	2985.199	1740.8	2106.8
	340	0	0	0	0	2570.133	3665.732	2785.732	2925.066	1972.6	3002.799	1655.4	2033.6
	341	0	0	0	0	2557.3	3583.599	2780.599	2952.199	1911.6	2872.999	1692	1960.4
	342	0	0	0	0	2488	3513.199	2772.899	3260.932	1789.6	2703.599	1875	1911.6
	343	0	0	0	4011.799	2364.8	3401.732	2734.399	3627.599	1753	2657.399	1911.6	1862.8
	344	0	0	0	3930.999	0	3161.199	2718.999	3611.759	1814	2580.399	1984.8	1765.2
	345	0	0	0	3850.199	2264.7	0	2657.399	3460.399	2058	2457.2	1972.6	1582.2
	346	0	0	0	3741.999	2334	0	2626.599	2872.999	2303.2	2287.8	1862.8	1494.8
	347	0	0	0	3548.399	2411	3090.799	2626.599	2549.6	2372.5	0	1765.2	1513.6
	348	0	0	0	3266.799	2380.2	3061.466	2603.499	2403.3	0	0	1704.2	1594.4
	349	0	0	0	3090.799	2330.15	2943.399	2595.799	2364.8	2395.6	0	1704.2	1655.4
	350	0	0	0	3055.599	2045.8	2811.399	2565	2390.467	2441.8	0	1777.4	1513.6
	351	0	0	0	3037.999	2021.4	2688.199	2534.2	2318.6	2380.2	2045.8	1789.6	1429
	352	0	0	0	3046.799	0	2688.199	2503.4	2241.6	0	2131.2	1753	1447.8



	353	0	0	0	3152.399	0	2703.599	2480.3	2082.4	2364.8	2257	1692	1523
	354	0	0	0	0	2197	2580.399	2467.467	0	2349.4	2287.8	1728.6	1560.6
	355	0	0	0	3196.399	2218.5	2359.667	2416.133	0	0	2155.6	1704.2	1618.8
	356	0	0	0	3002.799	2098.667	2262.133	2411	2106.8	2349.4	2045.8	1570	1667.6
	357	0	0	0	2888.399	2151.533	2195.4	0	0	2380.2	2070.2	1419.6	1606.6
	358	0	0	0	2919.199	2094.6	2070.2	2472.6	0	0	2082.4	1344.4	1570
	359	0	0	0	2934.599	1972.6	2009.2	2441.8	0	0	0	1278.6	1513.6
	360	0	0	0	2985.199	1950.233	2049.867	2411	2318.6	2434.1	2287.8	1212.8	1457.2
	361	0	0	0	2919.199	1936	2070.2	2349.4	2106.8	2441.8	2364.8	1156.4	1344.4
	362	0	0	0	2857.599	2082.4	2058	0	0	2334	2364.8	1128.2	1278.6
	363	0	0	0	2811.399	2118.033	2027.5	0	0	0	2441.8	1100	1269.2
	364	0	0	0	2865.299	2079.35	1997	0	0	0	2503.4	1100	1212.8
	365	0	0	0	0	2033.6	1997	0	2045.8	2334	2611.199	1109.4	1184.6
	366	0	0	0	0	0	0	0	0	0	0	0	0



**Table D.4:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Lokoja) (1998-2005)

Month	Julian Day	2005	2004	2003	2002	2001	2000	1999	1998
Jan (1)	1	2718.999	2903.799	2526.5	3266.799	3249.199	3671.599	3090.799	0
	2	2688.199	2842.199	2495.7	3293.199	3284.399	3671.599	3108.399	0
	3	2672.799	2765.199	2588.1	3266.799	3337.199	3689.199	3125.999	0
	4	2657.399	2595.799	2665.099	3213.999	3407.599	3706.799	3143.599	0
	5	2611.199	2565	2765.199	3178.799	3460.399	3741.999	3143.599	0
	6		2565	2837.066	3178.799	3442.799	0	3178.799	0
	7	2611.199	2518.8	2861.449	3172.932	3442.799	0	3213.999	0
	8	2549.6	2611.199	2742.099	3161.199	3425.199	0	3161.199	0
	9	2549.6	2780.599	2657.399	3222.799	3407.599	0	3196.399	0
	10	2441.8	2765.199	2722.849	3240.399	3389.999	3741.999	3231.599	0
	11	2457.2	2580.399	2849.899	3213.999	3372.399	3777.199	3231.599	0
	12	2472.6	2380.2	2852.466	3266.799	3319.599	3794.799	3161.199	0
	13	2395.6	2226.2	2914.066	3213.999	3301.999	3777.199	3020.399	0
	14	2082.4	2094.6	3029.199	3108.399	3301.999	3689.199	2949.999	0
	15	2082.4	2021.4	3099.599	2821.666	3284.399	3653.999	2949.999	0





	16	2058	2058	3134.799	2703.599	3301.999	3583.599	3020.399	0
	17	1948.2	0	3168.239	2641.999	3354.799	3495.599	3143.599	0
	18	1692	2058	3196.399	2657.399	3389.999	3460.399	3249.199	0
	19	1655.4	2155.6	3167.066	2765.199	3372.399	3284.399	3319.599	0
	20	1643.2	2106.8	3161.199	2811.399	3319.599	3196.399	3354.799	0
	21	1643.2	2580.399	3131.866	2884.549	3284.399	3213.999	3301.999	0
	22	1655.4	2094.6	3010.719	2924.332	3196.399	3266.799	3284.399	0
	23	1692	2395.6	2872.999	2888.399	3161.199	3284.399	3266.799	0
	24	1728.6	2364.8	2857.599	2945.599	3125.999	3284.399	3231.599	0
	25	1765.2	2395.6	2842.199	2985.199	3125.999	3319.599	3125.999	0
	26	1777.4	2472.6	2826.799	3002.799	3108.399	3337.199	3037.999	0
	27	1923.8	2580.399	2811.399	2985.199	3055.599	3337.199	2985.199	0
	28	1984.8	2641.999	2780.599	2967.599	3002.799	3301.999	2949.999	0
	29	1801.8	2657.399	2749.799	2949.999	2872.999	3284.399	0	0
	30	1777.4	2611.199	2734.399	2944.499	2826.799	3249.199	2949.999	0
	31	1753	2595.799	2718.999	2942.299	2857.599	3178.799	3002.799	0
Feb (2)	32	1618.8	2472.6	2641.999	2934.599	2872.999	3161.199	3055.599	0
	33	1679.8	2626.599	0	2819.099	2903.799	3178.799	3090.799	0
	34	1704.2	2657.399	2595.799	2734.399	2888.399	3196.399	3073.199	0



	35	0	2657.399	2572.7	2680.499	2872.999	3178.799	3055.599	0
	75	0	2580.399	2580.399	2667.666	2857.599	3161.199	3020.399	0
	37	1704.2	2488	2657.399	2734.399	2842.199	3125.999	2985.199	0
	38	1728.6	2549.6	2765.199	2772.899	2795.999	3090.799	3125.999	0
	39	1765.2	2611.199	2880.699	2826.799	2749.799	2967.599	2967.599	0
	40	1716.4	2703.599	2856.499	2857.599	2734.399	2934.599	2949.999	0
	41	1631	2503.4	2974.639	2888.399	2749.799	2919.199	0	0
	42	1704.2	2472.6	2971.37	2903.799	0	2888.399	2949.999	0
	43	1789.6	0	3017.649	2949.999	2749.799	0	2967.599	0
	44	1960.4	2472.6	3099.966	2857.599	2703.599	0	2967.599	0
	45	1887.2	2534.2	3067.424	2888.399	2672.799	2888.399	2985.199	0
	46	1838.4	2611.199	3169.999	2811.399	2626.599	2903.799	0	0
	47	1765.2	2626.599	0	2795.999	2611.199	3002.799	0	0
	48	1826.2	2549.6	3020.949	2734.399	2611.199	3020.399	2985.199	0
	49	1801.8	2441.8	2982.999	2634.299	2626.599	3020.399	3477.999	0
	50	1753	2303.2	3084.932	2595.799	2641.999	3037.999	3636.399	0
	51	1777.4	2210.8	3015.559	2580.399	2641.999	3055.599	3618.799	0
	52	1862.8	2180	2935.699	2557.3	2657.399	3090.799	3583.599	0
	53	1960.4	2210.8	0	2565	2641.999	3037.999	3601.199	0



	54	1875	2287.8	2903.799	2580.399	2626.599	3125.999	3653.999	0
	55	1862.8	2472.6	2971.999	2595.799	2626.599	3143.599	3689.199	0
	56	1789.6	2565	2942.299	2611.199	2611.199	3161.199	3724.399	0
	57	1875	2626.599	2919.199	2665.099	2611.199	3143.599	3759.599	0
	58	1899.4	2718.999	2903.799	2718.999	2595.799	3125.999	3741.999	0
	59	1923.8	2857.599	2934.599	2780.599	0	3125.999	0	0
Mar (3)	60	1923.8	2934.599	2688.199	2724.132	0	3196.399	3741.999	2734.399
	61	1936	2888.399	2641.999	2672.799	0	3213.999	3759.599	2688.199
	62	1948.2	2672.799	2695.899	2595.799	0	3213.999	3741.999	2518.8
	63	2045.8	2842.199	2703.599	2534.2	0	3161.199	3759.599	2395.6
	64	2257	2349.4	2734.399	2480.3	0	3125.999	3741.999	2318.6
	65	2226.2	2318.6	2749.799	2541.9	0	3108.399	0	2272.4
	66	2180	2241.6	2626.599	2565	0	3125.999	3741.999	2210.8
	67	2106.8	2167.8	2590.666	2580.399	0	3143.599	3724.399	2155.6
	68	2106.8	2131.2	2603.499	2557.3	0	3125.999	3724.399	2119
	69	2119	2155.6	2665.099	2272.4	0	3055.599	3671.599	2106.8
	70	2131.2	2303.2	2665.099	2094.6	0	3055.599	3601.199	2143.4
	71	2119	2318.6	2652.266	2015.3	0	3002.799	3513.199	2210.8
	72	2033.6	2195.4	2454.633	1911.6	0	2934.599	3442.799	2287.8



	73	2045.8	2318.6	2318.6	1838.4	0	2872.999	3020.399	2303.2
	74	2131.2	2380.2	2318.6	1826.2	0	2811.399	2780.599	2380.2
	75	2131.2	2426.4	2277.533	1704.2	2595.799	2857.599	2703.599	2457.2
	76	2058	2457.2	2253.15	1923.8	2565	2457.2	2703.599	2472.6
	77	2180	2488	2249.3	2171	2534.2	2565	2749.799	2441.8
	78	2241.6	2534.2	2257	2143.4	2441.8	2795.999	2734.399	2364.8
	79	2287.8	2503.4	2318.6	1905.5	2441.8	2919.199	2718.999	2349.4
	80	2272.4	2488	2334	1814	2349.4	2934.599	2718.999	2364.8
	81	2143.4	2488	2303.2	1875	2287.8	2934.599	2703.599	2411
	82	2210.8	2503.4	2257	1814	2287.8	2985.199	2703.599	2472.6
	83	2226.2	2457.2	2503.4	1765.2	2272.4	3037.999	2749.799	2472.6
	84	2195.4	2303.2	2595.799	1734.7	2210.8	3055.599	2734.399	2426.4
	85	2167.8	2303.2	2611.199	1698.1	2143.4	3073.199	2657.399	2395.6
	86	2131.2	2287.8	2400.733	1834.333	2131.2	3090.799	2595.799	2411
	87	2094.6	2318.6	2292.933	1838.4	2106.8	2985.199	2565	2441.8
	88	1899.4	2318.6	2210.8	1746.9	2094.6	3002.799	2565	2457.2
	89	1887.2	2226.2	0	1777.4	2021.4	3037.999	2534.2	2441.8
	90	1875	1972.6	2287.8	1826.2	2009.2	2985.199	2457.2	2426.4
Apr (4)	91	2718.999	2009.2	2287.8	1838.4	1972.6	0	2488	2411



	92	2688.199	2058	2272.4	1850.6	1936	0	2518.8	2380.2
	93	2672.799	2241.6	2155.6	1801.8	2082.4	2985.199	2549.6	2257
	94	2657.399	2272.4	2143.4	1722.5	2106.8	2967.599	2611.199	2334
	95	2611.199	2241.6	2131.2	1716.4	2021.4	2967.599	2641.999	2364.8
	96	0	2155.6	2119	1740.8	2287.8	2985.199	2672.799	2349.4
	97	2611.199	2155.6	2119	0	2287.8	3073.199	2672.799	2334
	98	2549.6	2210.8	2082.4	1746.9	2272.4	2967.599	2688.199	2380.2
	99	2549.6	2119	2070.2	1757.067	2241.6	3073.199	2703.599	2334
	100	2441.8	2045.8	2033.6	1753	2143.4	2949.999	0	2318.6
	101	2457.2	2021.4	1997	1679.8	2143.4	2967.599	2703.599	2334
	102	2472.6	2058	1948.2	1655.4	2082.4	0	2457.2	2380.2
	103	2395.6	2195.4	1911.6	1679.8	2033.6	0	2749.799	2395.6
	104	2082.4	2287.8	1789.6	1716.4	2021.4	2967.599	2765.199	2426.4
	105	2082.4	2303.2	1789.6	1740.8	2009.2	2985.199	2780.599	2426.4
	106	2058	2318.6	0	1875	1984.8	3002.799	2795.999	2380.2
	107	1948.2	2195.4	1801.8	1972.6	1997	3020.399	0	2349.4
	108	1692	2226.2	1801.8	2106.8	2287.8	2985.199	2795.999	2380.2
	71.5	1655.4	2318.6	1753	2195.4	2318.6	2967.599	2811.399	2334
	110	1643.2	2349.4	1716.4	2287.8	2143.4	2826.799	2749.799	2441.8



	111	1643.2	2441.8	1673.7	2380.2	0	2872.999	2657.399	2488
	112	1655.4	2534.2	1765.2	2364.8	2143.4	2934.599	2572.7	2488
	113	1692	2626.599	1724.533	2303.2	2155.6	2985.199	2672.799	2503.4
	114	1728.6	2657.399	1777.4	2380.2	2167.8	2985.199	0	2518.8
	115	1765.2	2672.799	1801.8	2457.2	2195.4	3002.799	0	2534.2
	71.5	1777.4	2734.399	1753	2534.2	2303.2	3020.399	2662.532	2534.2
	117	1923.8	2703.599	1759.1	2503.4	2318.6	3055.599	2657.399	2565
	118	1984.8	2688.199	1801.8	2488	0	3073.199	2742.099	2565
	119	1801.8	0	1728.6	2503.4	0	3037.999	2749.799	2580.399
	120	1777.4	2688.199	1683.867	2518.8	2318.6	3002.799	2795.999	0
May (5)	121	1875	2626.599	0	2488	2380.2	2985.199	2718.999	2580.399
	122	1753	2595.799	0	2418.7	2395.6	2967.599	2688.199	2611.199
	123	1692	2318.6	0	2334	2411	2934.599	2672.799	2641.999
	124	1643.2	2318.6	0	2318.6	0	2919.199	2544.466	2595.799
	125	1594.4	2457.2	0	2303.2	0	2903.799	2292.933	2595.799
	126	1594.4	2565	0	2303.2	2411	2919.199	2171.867	2580.399
	127	1582.2	2688.199	0	2334	2395.6	2934.599	2062.067	2580.399
	128	1582.2	2734.399	0	2457.2	2411	0	2045.8	2565
	129	1570	2872.999	0	2380.2	0	0	1997	2565



	130	1594.4	2857.599	0	2341.7	0	0	1911.6	2718.999
	131	1765.2	2765.199	0	2395.6	0	0	1887.2	2780.599
	132	1899.4	2641.999	0	2426.4	0	0	1899.4	2780.599
	133	1936	2580.399	0	2457.2	2411	0	1923.8	2703.599
	134	1984.8	2534.2	0	2318.6	2426.4	2934.599	1923.8	2549.6
	135	1826.2	2503.4	0	2195.4	2426.4	2949.999	1940.067	2503.4
	136	1838.4	2580.399	0	2051.9	2441.8	2949.999	1968.533	2518.8
	137	1948.2	2611.199	0	2085.45	2457.2	2903.799	2029.533	2549.6
	138	1984.8	2780.599	0	2137.3	2472.6	2872.999	2053.933	2503.4
	139	1911.6	2811.399	0	2155.6	2549.6	2749.799	2100.7	2472.6
	140	1911.6	2967.599	0	2131.2	2718.999	2641.999	2167.8	2488
	141	1984.8	2967.599	0	2155.6	2857.599	2580.399	2203.1	2503.4
	142	2070.2	2934.599	0	2218.5	2872.999	2534.2	2230.05	2595.799
	143	2009.2	2919.199	0	2163.733	2888.399	2411	2082.4	2611.199
	144	2009.2	2795.999	0	2100.7	2919.199	2395.6	1948.2	2595.799
	145	2033.6	2765.199	0	2082.4	2934.599	2380.2	1807.9	2565
	146	2045.8	2780.599	0	2070.2	0	2426.4	1781.467	2565
	147	1948.2	2657.399	0	1936	0	2411	1774.35	2595.799
	148	1911.6	2919.199	0	1875	0	2395.6	1643.2	2565



	149	1936	2934.599	0	1850.6	0	3002.799	1618.8	2488
	150	1862.8	2888.399	0	1838.4	0	3055.599	1655.4	2441.8
	151	1814	2857.599	0	1807.9	2934.599	3002.799	1663.533	2472.6
June (6)	152	1801.8	2919.199	0	1801.8	2919.199	2919.199	0	2580.399
	153	1789.6	3020.399	0	1850.6	2888.399	2903.799	0	2611.199
	154	1801.8	3759.599	0	1911.6	2641.999	2903.799	0	2718.999
	155	1826.2	3794.799	0	1997	2611.199	3108.399	0	2565
	156	1875	3850.199	0	2155.6	2595.799	3284.399	0	2934.599
	157	1923.8	3971.399	0	2226.2	2611.199	3442.799	0	3213.999
	158	1936	3812.399	0	2149.5	2795.999	3477.999	0	3372.399
	159	2106.8	3930.999	0	2070.2	2826.799	3530.799	0	3477.999
	160	2119	4031.999	0	2033.6	2903.799	3601.199	0	3601.199
	161	2082.4	4132.999	0	1990.9	2949.999	3636.399	0	3706.799
	162	2106.8	4233.999	0	2003.1	3073.199	3706.799	0	3794.799
	163	2257	4415.8	0	2045.8	3266.799	3741.999	0	3971.399
	164	2611.199	4436	0	2210.8	3301.999	3794.799	0	4233.999
	165	2919.199	4496.6	0	2457.2	0	3671.599	0	4759.2
	166	2765.199	4516.8	0	2626.599	3301.999	3636.399	0	4920.8
	167	2488	4557.2	0	2657.399	3284.399	3653.999	0	4900.6





	168	2457.2	4577.4	0	2749.799	3249.199	3777.199	0	5001.6
	169	2595.799	4375.4	0	2834.499	3231.599	3951.199	3037.999	5506.6
	170	2780.599	4153.199	0	2826.799	3231.599	4112.799	3337.199	5850
	171	2919.199	4274.399	0	2903.799	3108.399	4375.4	3372.399	6092.4
	172	3213.999	4436	0	3117.199	2872.999	4375.4	3706.799	6233.8
	173	3636.399	4375.4	0	3178.799	2872.999	4658.2	3794.799	6334.8
	174	3583.599	4314.799	0	3213.999	2888.399	4799.6	3794.799	6355
	175	3319.599	4233.999	0	3257.999	2903.799	4739	3870.399	6355
	176	3178.799	4092.599	0	3442.799	2934.599	4617.8	3910.799	6375.2
	177	3266.799	4072.399	0	3548.399	3284.399	4537	3951.199	6355
	178	3143.599	4132.999	0	3472.132	3301.999	4698.6	3890.599	6355
	179	3249.199	4597.6	0	3337.199	3337.199	4718.8	3741.999	6395.4
	180	3090.799	4597.6	0	3460.399	3354.799	4739	4031.999	6883
	181	3618.799	4799.6	0	3777.199	3372.399	4799.6	4233.999	6952
July (7)	182	3829.999	4799.6	0	3937.732	0	4880.4	4617.8	0
	183	3890.599	5001.6	0	4072.399	3372.399	4920.8	4779.4	0
	184	3910.799	5042	0	4173.399	3389.999	4961.2	4779.4	0
	185	4031.999	5163.2	0	4244.099	4213.799	4961.2	4819.8	0
	186	4193.599	5264.2	0	4752.467	4314.799	5042	5264.2	0



	187	4314.799	5526.8	0	4961.2	4819.8	4900.6	5365.2	0
	188	4456.2	5728.8	0	5173.3	4779.4	4941	5385.4	0
	189	5143	5749	0	5496.5	4678.4	5506.6	5385.4	0
	190	5405.6	5991.4	0	5627.8	4233.999	6132.8	5062.2	0
	191	5749	6052	0	5506.6	4052.199	6294.4	5122.8	0
	192	6011.6	6233.8	0	5395.5	3991.599	6314.6	5385.4	0
	193	6153	6375.2	0	5587.4	3829.999	6132.8	5466.2	0
	194	6153	6415.6	0	5547	4638	5971.2	5668.2	0
	195	6112.6	6779.2	0	5506.6	4658.2	5910.6	6072.2	0
	196	6233.8	7067	0	5506.6	4678.4	5728.8	6072.2	4920.8
	197	6274.2	7113	0	5536.9	4840	5971.2	6375.2	4900.6
	198	6375.2	6617.6	0	5233.9	4840	6456	6052	5001.6
	199	6395.4	6678.2	0	5021.8	4799.6	6617.6	6476.2	5506.6
	200	6536.8	6456	0	5264.2	4860.2	6718.6	6213.6	5850
	201	6860	6658	0	5516.7	4920.8	7182	6577.2	6092.4
	202	7113	6658	0	5627.8	5062.2	7159	6577.2	6233.8
	203	7067	6577.2	0	6536.8	5547	7228	6496.4	6334.8
	204	7021	6617.6	0	6435.8	6052	7251	6738.8	6355
	205	6975	6860	0	6375.2	5668.2	7274	6779.2	6355



	206	6929	7113	0	6748.9	5587.4	7021	6998	6375.2
	207	6906	7481	0	6769.1	5446	7228	7435	6355
	208	6929	7918	0	6883	5425.8	7044	7389	6355
	209	6883	8263	0	6799.4	5284.4	7021	7228	6395.4
	210	6698.4	8378	0	6728.7	5244	7826	7297	6883
	211	6536.8	8493	0	6435.8	5143	8056	7251	6952
	212	6536.8	8700	0	6410.55	5143	8240	7251	7136
August (8)	213	6839.8	8746	0	6435.8	5809.6	8493	7573	7596
	214	6906	8792	0	6476.2	5850	8792	7964	7895
	215	6929	8884	0	6597.4	5870.2	8884	8240	8240
	216	6998	8953	0	6839.8	5890.4	9022	8585	8654
	217	0	9114	0	6718.6	5910.6	9688	8654	9068
	218	6998	9114	0	7527	5930.8	9767.2	8999	9292
	219	6819.6	9265.6	0	7941	5951	9872.8	9068	9292
	220	6536.8	9265.6	0	8148	6617.6	10585.6	7182	9239.2
	221	6476.2	9091	0	8355	7780	11430.4	7435	9661.6
	222	6678.2	9068	0	8569.667	7941	11773.6	9688	9793.6
	223	6738.8	9114	0	8868.667	8010	11955	9424	9820
	224	6839.8	9137	0	9265.6	8240	12048	9160	9925.6



	225	6952	9212.8	0	9239.2	8355	12110	8976	10057.6
	226	7205	9397.6	0	9415.2	8470	12172	8884	10163.2
	227	7481	9608.8	0	9392.32	8516	12203	8746	10453.6
	228	7343	9846.4	0	9336	8631	12296	8700	10770.4
	229	7435	10163.2	0	9318.4	9740.8	12513	8769	11192.8
	230	7918	10453.6	0	9318.4	9820	12699	8861	11456.8
	231	8125	10717.6	0	9305.2	10216	0	9114	11694.4
	232	8309	10902.4	0	9286.72	10559.2	12699	9872.8	11862
	233	8539	11192.8	0	9204	10744	12730	11008	12048
	234	9045	11483.2	0	9212.8	10876	0	11456.8	12296
	235	9344.8	11562.4	0	9292	11008	12730	11831	12451
	236	9846.4	11862	0	9344.8	11140	13009	12947	12668
	237	10189.6	12327	0	9629.92	11166.4	13226	13722	12947
	238	10400.8	12575	0	10025.92	11192.8	13443	14280	13133
	239	10585.6	12885	0	10295.2	11219.2	13660	14404	13288
	240	10770.4	13443	0	10462.4	11245.6	14001	14249	13319
	241	10928.8	13753	0	10495.84	11404	14342	14342	13319
	242	11060.8	13877	0	11047.6	12265	14528	14404	13288
	243	11060.8	13877	0	11219.2	12575	14621	14218	13288



September (9)	244	11404	14156	0	11417.2	12513	14934	14373	13443
	245	11456.8	14280	0	11421.6	12420	15002	14807	13660
	246	11588.8	14342	0	11606.4	12513	15070	15308	13815
	247	11747.2	14528	0	12071.25	13040	15206	15648	13877
	248	12203	14590	0	12303.75	13598	15342	15784	14032
	249	12389	14652	0	12575	13226	15512	15818	14218
	250	12606	14621	0	12869.5	13536	15614	15988	14032
	251	12792	14683	0	12900.5	13970	15818	16294	14404
	252	12761	14838	0	13055.5	14218	15920	16634	14094
	253	12699	14900	0	13327.86	14218	16056	17110	14249
	254	12637	15308	0	13412	14776	16498	17416	14342
	255	12606	15342	0	13644.5	14968	16804	17620	14590
	256	12761	15478	0	13777.8	15197.5	17144	17994	14621
	257	12823	15716	0	14238.67	15410	17314	18504	14714
	258	12854	15818	0	14729.5	15648	17484	18674	14745
	259	12885	15886	0	15144.8	15784	17892	18742	14776
	260	12978	16022	0	15387.33	15699	18096	18810	14807
	261	13040	15920	0	15659.33	15716	18266	18980	14968



	262	13071	16124	0	15954	15750	18266	19150	15308
	263	13040	16090	0	16141	15818	18198	19252	15784
	264	12885	15988	0	16039	15920	18096	19422	15988
	265	12792	16022	0	15988	16158	18028	19524	16090
	266	12885	15954	0	15784	16430	17960	19490	16430
	267	12947	15886	0	15790.8	16600	17756	19354	16702
	268	12978	0	0	15852	16736	17586	19286	16872
	269	0	0	0	15993.67	17620	17280	19048	16974
	270	0	0	0	15954	17110	17416	19048	17178
	271	0	0	0	15874.67	17280	17382	19218	17348
	272	0	15886	0	15801	17586	16906	19252	17518
	273	12978	15750	0	15908.67	17620	16736	19320	17790
October (10)	274	12978	15308	0	16107	17824	16532	19354	17892
	275	13071	15206	0	16268.5	17960	16124	19388	18164
	276	13257	14934	0	16593.2	18028	16090	19490	18368
	277	13257	14745	0	16685	18096	16056	19694	18572
	278	13133	14435	0	16877.67	18164	15954	20442	18844
	279	13071	14063	0	17064.67	18266	15988	20612	19218
	280	13071	13877	0	17064.67	18674	16056	20850	19524



	281	13164	13784	0	17062.4	18674	16124	21156	19966
	282	13226	13691	0	17348	18708	16226	21326	20340
	283	13288	13660	0	17359.33	18708	16192	21360	20680
	284	13381	13598	0	17354.8	18742	16328	21394	21020
	285	13536	13536	0	17166.67	18708	16464	21394	21530
	286	13753	13505	0	16974	18606	16532	21598	21700
	287	13846	0	0	16787	18504	16498	21762.63	21731.31
	288	13567	13505	0	16627.2	18402	0	21825.25	22138.38
	289	13412	13350	0	16627.2	18402	16498	21919.19	22326.26
	290	13226	13257	0	16792.67	17994	16464	22013.13	22576.77
	291	12823	11562.4	0	16804	17654	16192	22138.38	22858.59
	292	12544	11166.4	0	16583	17586	15682	22263.64	23046.47
	293	12017	10823.2	0	16334.8	17518	15410	22420.2	23234.34
	294	11694.4	10321.6	0	15750	16906	14125	22576.77	23265.66
	295	11536	9899.2	0	15233.2	15920	14125	22639.39	23203.03
	296	11377.6	9740.8	0	14721.75	15376	13908	22827.27	23797.98
	297	11219.2	9371.2	0	14087.8	15376	12947	22639.39	23109.09
	298	11113.6	8953	0	13350	14776	11694.4	22639.39	22983.84
	299	10612	8539	0	12556.4	14032	10295.2	22545.46	22889.9



	300	10506.4	8263	0	12097.6	13040	10268.8	22326.26	22733.33
	301	10216	7895	0	11483.2	12885	9292	22075.76	22357.58
	302	9608.8	7665	0	11008	10216	8907	21919.19	21981.82
	303	9318.4	7205	0	10097.2	9846.4	8447	21793.94	21020
	304	9137	7044	0	9679.2	8976	8033	21762.63	21020
November (11)	305	9137	6476.2	0	9167.657	7941	7757	20986	19728
	306	9137	6476.2	0	8899.333	7665	7665	20714	19150
	307	5244	6395.4	0	8711.5	7320	7481	20408	18130
	308	5244	6355	0	8217	7067	7044	19966	17008
	309	5042	6334.8	0	7858.2	6738.8	6536.8	19694	15512
	310	4961.2	6132.8	0	7382.429	6496.4	6072.2	19456	13164
	311	4799.6	5951	0	7051.667	6294.4	5850	19252	13660
	312	4577.4	5809.6	0	7038.25	6092.4	5587.4	18368	11272
	313	4496.6	5668.2	0	6819.6	5870.2	5324.8	17960	10796.8
	314	4375.4	5668.2	0	6684.933	5627.8	5163.2	17450	10084
	315	3991.599	5587.4	0	6590.667	5284.4	4900.6	17144	9318.4
	316	3890.599	5506.6	0	6031.8	5082.4	4759.2	15954	8930
	317	3689.199	5304.6	0	5695.133	4941	4617.8	15478	8470





	318	3513.199	5102.6	0	5506.6	4840	4537	15852	7895
	319	3354.799	4880.4	0	5432.533	4799.6	4213.799	12079	7596
	320	3301.999	4840	0	5284.4	4718.8	3850.199	10216	7205
	321	2949.999	4718.8	0	4928.88	4557.2	3671.599	9978.4	6883
	322	2919.199	4112.799	0	0	4496.6	3636.399	9318.4	6516.6
	323	2811.399	3689.199	0	4456.2	4335	3319.599	8769	6254
	324	2688.199	3636.399	0	4415.8	4153.199	3231.599	8608	6072.2
	325	2488	3636.399	0	4385.5	4072.399	3125.999	8033	5890.4
	326	2488	3583.599	0	4294.6	3991.599	3037.999	7458	5789.4
	327	2411	3548.399	0	4092.599	3930.999	2919.199	7113	5648
	328	2364.8	3583.599	0	3842.699	3812.399	2857.599	6718.6	5486.4
	329	2349.4	3583.599	0	3607.066	3618.799	2780.599	6435.8	5345
	330	2349.4	3319.599	0	3504.399	3354.799	2749.799	5648	5082.4
	331	2058	3266.799	0	3583.599	3213.999	2842.199	5991.4	5021.8
	332	1972.6	3108.399	0	3616.285	3143.599	2811.399	5769.2	4920.8
	333	1826.2	3020.399	0	3507.332	3125.999	2780.599	5648	4860.2
	334	1704.2	2949.999	0	3463.919	3055.599	2795.999	5547	4860.2
December (12)	335	1679.8	2842.199	0	3372.399	3143.599	2718.999	5405.6	4436



	336	1631	2842.199	0	3354.799	3196.399	2795.999	5163.2	4335
	337	1606.6	2826.799	0	3337.199	3143.599	2842.199	4941	4294.599
	338	1582.2	2811.399	0	3319.599	3108.399	2872.999	4880.4	4254.199
	339	1570	2780.599	0	3301.999	3249.199	2888.399	4840	4213.799
	340	1570	2611.199	0	3284.399	3037.999	2903.799	4779.4	4132.999
	341	2318.6	2457.2	0	3266.799	3178.799	0	4698.6	4031.999
	342	2303.2	2334	0	3178.799	0	0	4658.2	3910.799
	343	2272.4	2457.2	0	2964.574	0	2903.799	4557.2	3850.199
	344	2257	2441.8	0	2943.949	3178.799	2888.399	4496.6	3850.199
	345	2241.6	2426.4	0	2989.599	3161.199	2872.999	4456.2	3812.399
	346	2226.2	2395.6	0	2939.439	3178.799	2795.999	4415.8	3759.599
	347	2226.2	2318.6	0	2899.949	0	2780.599	4233.999	3706.799
	348	2082.4	2257	0	3064.399	0	0	4335	3653.999
	349	1960.4	2180	0	3108.399	0	0	4153.199	3583.599
	350	2009.2	2143.4	0	2912.819	0	2780.599	4112.799	3565.999
	351	2195.4	2119	0	2683.066	3178.799	2765.199	4072.399	3636.399
	352	2287.8	2241.6	0	2698.466	3213.999	2780.599	4052.199	3583.599
	353	2334	2503.4	0	2749.799	3266.799	2985.199	4011.799	3442.799
	354	2426.4	2703.599	0	2657.399	3213.999	3037.999	3991.599	3354.799



	355	2272.4	2688.199	0	2549.6	3372.399	3073.199	3930.999	0
	356	2210.8	2657.399	0	2426.4	3389.999	0	3812.399	0
	357	2143.4	2703.599	0	2457.2	0	3073.199	3777.199	3354.799
	358	2155.6	2734.399	0	2565	0	3125.999	3706.799	3301.999
	359	2167.8	0	0	2795.999	3389.999	3125.999	3706.799	3284.399
	360	2155.6	0	0	2703.599	3213.999	3073.199	3689.199	3249.199
	361	2155.6	2734.399	0	2549.599	3213.999	2967.599	3689.199	3249.199
	362	2131.2	2703.599	0	2326.3	3178.799	3055.599	3671.599	3231.599
	363	2119	2765.199	0	2323.733	3125.999	3073.199	0	3213.999
	364	2106.8	2765.199	0	2512.64	3073.199	3143.599	3671.599	3143.599
	365	2070.2	2749.799	0	2513.667	3073.199	3231.599	3653.999	3090.799
	366	0	0	0	0	0	0	0	0



**Table D.5:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Lokoja) (2006-2013)

Month	Julian Day	2013	2012	2011	2010	2009	2008	2007	2006
Jan (1)	1	3003		2949.999	3812.399	2811.399	1948.2	2595.799	2039.7
	2	3038		2949.999	3653.999	2780.599	1899.4	2641.999	2027.5
	3	2950		2949.999	3548.399	2749.799	1862.8	2703.599	2015.3
	4	2811		2967.599	3425.199	2734.399	2256.31	2765.199	1978.7
	5	2734		3002.799	3389.999	2718.999	2242.57	2888.399	1960.4
	6	2796		3073.199	3284.399	2688.199	2254.95	2919.199	1948.2
	7	2750		3161.199	3161.199	2657.399	2226.58	2872.999	1972.6
	8	2796		3249.199	3055.599	2626.599	2176.65	2734.399	1997
	9	2765		3266.799	2985.199	2565	2112.8	2611.199	2039.7
	10	2642		3196.399	2949.999	2580.399	2000.5	2611.199	2027.5
	11	2565		3161.199	2949.999	2518.8	2067.61	2641.999	2009.2
	12	2488		3249.199	2949.999	2503.4	2405.08	2657.399	2033.6
	13	2426		3266.799	2949.999	2488	2586.56	2641.999	2119
	14	2396		3196.399	2949.999	2734.399	2678.96	2641.999	1997
	15	2411		3161.199	2934.599	2472.6	2971.779	2672.799	2518.8



	16	2396		3125.999	2919.199	2549.6	2985.199		2572.7
	17	2334		3090.799	2903.799	2611.199	2959.679	2672.799	2518.8
	18	2365		3055.599	2888.399	2672.799	2945.159	2703.599	2188.9
	19	2442		3020.399	2872.999	2765.199	2928.659	2718.999	2226.2
	20	2503		3002.799	2842.199	2688.199	2899.179	2765.199	2112.9
	21	2488		2985.199	2872.999	2657.399	2873.769	2780.599	2112.9
	22	2550		2967.599	2888.399	2595.799	2860.679	2718.999	2137.3
	23	2519		2967.599	2903.799	2534.2	2832.189	2703.599	2218.5
	24	2503		2949.999	2903.799	2411	2805.239	2688.199	2076.3
	25	2519		2949.999	2934.599	2411	2769.819	2611.199	1997
	26	2550		2934.599	2985.199	2457.2	2729.009	2518.8	1984.8
	27	2380		2919.199	3020.399	2534.2	2699.749	2503.4	1984.8
	28	2180		2903.799	3002.799	2595.799	2695.129	2488	1960.4
	29	2272		2934.599	3020.399	2641.999	2694.359	2549.6	1942.1
	30	2426		2985.199	3055.599	2580.399	2677.419	2595.799	1972.6
	31	2442		2919.199	3055.599	2595.799	2672.799	2718.999	2021.4
Feb (2)	32	2426		2919.199	3020.399	2457.2	2552.114	2842.199	2070.2
	33	2396		2919.199	2985.199	2426.4	2467.886	2888.399	2106.8
	34	2380		2949.999	2967.599	2411	2290.445	2934.599	2131.2



	35	2272		3002.799	3002.799	2441.8	2072.514	2919.199	2226.2
	75	2211		3037.999	3020.399	2457.2	2059.849	2872.999	2303.2
	37	2257		2934.599	3020.399	2488	2166.547	2811.399	2318.6
	38	2195		2888.399	3037.999	2472.6	2219.286	2795.999	2303.2
	39	2143		2872.999	3037.999	2457.2	2246	2780.599	2287.8
	40	2272		2903.799	3037.999	2426.4	2244.114	2765.199	2272.4
	41	2365		2903.799	3002.799	2411	2245.686		2226.2
	42	2411		2888.399	3020.399	2426.4	2326.771	2765.199	2195.4
	43	2426		2872.999	2985.199	2441.8	2387.429	2749.799	2210.8
	44	2365		2872.999	2967.599	2441.8	2376.114	0	2226.2
	45	2334		2857.599	2934.599	2472.6	2341.058	2749.799	2380.2
	46	2396		2857.599	2949.999	2503.4	2258.063	2734.399	2534.2
	47	2457		2718.999	2949.999	2549.6	2163.835	0	2364.8
	48	2473		2457.2	2949.999	2595.799	2161.574	0	2380.2
	49	2534		2318.6	2949.999	2703.599	2192.183	2734.399	2472.6
	50	2426		2180	2934.599	2780.599	2259.816	2718.999	2472.6
	51	2272		2082.4	2857.599	2780.599	2343.856	2688.199	2441.8
	52	2242		1936	2780.599	2734.399	2337.696	0	2334
	53	2319		1875	2718.999	2718.999	2311.208	2688.199	2167.8



	54	2272		1814	2703.599	2703.599	2295.192	2672.799	2070.2
	55	2426		2045.8	2672.799	2688.199	2332.152	2672.799	2143.4
	56	2426		2045.8	2641.999	2672.799	2375.888	2657.399	2210.8
	57	2380		2180	2641.999	2657.399	2366.032	2595.799	2210.8
	58	2365		2257	2595.799	2626.599	2356.176	2441.8	2287.8
	59	2349		2549.6	2565	2580.399	2410.384	2303.2	2349.4
Mar (3)	60	2380		2718.999	2565	2518.8	2463.8	2349.4	2364.8
	61	2411		2826.799	2534.2	2457.2	2503.4	2349.4	2287.8
	62	2426		2934.599	2549.6	2472.6	2460.408	2334	2257
	63	2473		3002.799	2549.6	2472.6	2387.9	2318.6	2334
	64	2488		3090.799	2441.8	2472.6	2274.967	2318.6	2349.4
	65	2488		3125.999	2380.2	2488	2141.817	2303.2	2318.6
	66	2488		3125.999	2349.4	2503.4	2111.158	2272.4	0
	67	2488		3178.799	2195.4	2503.4	2154.608	2257	2318.6
	68	2488		2985.199	2180	2518.8	2188.283	0	2334
	69	2488		2919.199	2180	2534.2	2206.95	0	2287.8
	70	2457		2919.199	2195.4	2549.6	2200.533	0	2241.6
	71			2919.199	2210.8	2565	2237.75	2257	2210.8
	72			2919.199	2226.2	2580.399	2323.092	2241.6	2195.4



	73			2919.199	2241.6	2580.399	2405.225	0	2210.8
	74			2703.599	2241.6	2595.799	2461.692	0	2210.8
	75			2626.599	2257	2611.199	2482.225	0	2241.6
	76			2641.999	2272.4	2626.599	2444.367	0	2257
	77			2672.799	2241.6	2641.999	2435.383	0	2318.6
	78			2795.999	2226.2	2641.999	2415.758	2241.6	2395.6
	79			2934.599	2210.8	2657.399	2436.958	2226.2	2349.4
	80			2985.199	2180	2672.799	2456.742	0	2226.2
	81			2934.599	2180	2672.799	2450.483	2226.2	2257
	82			2842.199	2180	2688.199	2425.483	2210.8	2287.8
	83			2595.799	2210.8	2657.399	2242.367	0	2318.6
	84			2457.2	2241.6	2626.599	2113.917	0	2318.6
	85			2303.2	2241.6	2611.199	2159.9	0	2226.2
	86			2210.8	2272.4	2611.199	2324.425	2210.8	2180
	87			2131.2	2287.8	2641.999	2447.467	2195.4	2195.4
	88			2119	2303.2	2657.399	2480.3	0	2195.4
	89			2672.799	2334	2688.199	2460.408	2195.4	0
	90			2703.599	2334	2672.799	2340.696	2210.8	0
Apr (4)	91	1513.6		2780.599	2334	2669.381	2229.28	2257	2226.2





	92		1504.2	2826.799	2364.8	2646.281	2047.02	2303.2	2380.2
	93		1532.4	2872.999	2380.2	2677.081	2044.58	2318.6	2503.4
	94		1541.8	2903.799	2395.6	2724.559	2104.36	2303.2	2549.6
	95		1532.4	1911.6	2426.4	2785.735	2127.54	2303.2	2534.2
	96		1523	2934.599	2349.4	2847.335	2092.16	2349.4	2457.2
	97		1532.4	2949.999	2131.2	2910.645	2033.6	2411	2549.6
	98		1541.8	2903.799	2045.8	2982.753	1788.56	2472.6	2749.799
	99		1541.8	2888.399	2009.2	2989.106	1821.93	2518.8	2826.799
	100		1551.2	2888.399	1997	3019.422	1812.78	2565	2734.399
	101		1570	2919.199	1997	3022.353	1820.71	2595.799	2549.6
	102		1582.2	2888.399	1984.8	3039.469	1889.03	2641.999	2364.8
	103		1606.6	2872.999	1972.6	3043.376	1954.3	2718.999	2257
	104		1618.8	2919.199	2033.6	2949.145	1994.87	2780.599	2287.8
	105		1655.4	2985.199	2094.6	2916.635	1983.58	2842.199	2349.4
	106		1618.8	3002.799	2155.6	2863.59	1967.11	2888.399	2395.6
	107		1582.2	3055.599	2167.8	2651.84	2011.64	2919.199	2426.4
	108		1560.6	3143.599	2226.2	2544.041	2073.4	2903.799	2518.8
	71.5		1541.8	3178.799	2318.6	2469.605	2123.21	0	2626.599
	110		1513.6	3213.999	2272.4	2422.55	2169.76	2903.799	2626.599



	111		1504.2	3249.199	2210.8	2386.614	2252.38	2872.999	2565
	112		1494.8	3284.399	2210.8	2435.386	2359.41	2857.599	2488
	113		1504.2	3301.999	2257	2523.081	2392.52	2872.999	2457.2
	114		1466.6	3319.599	2272.4	2585.535	2407.92	2872.999	2472.6
	115		1429	3337.199	2364.8	2641.999	2409.46	2826.799	2518.8
	71.5		1391.4	3354.799	2395.6	2027.244	2408.69	2765.199	2534.2
	117		1344.4	3372.399	2287.8	2204.702	2403.3	2703.599	2457.2
	118		1297.4	3372.399	2195.4	2426.076	2400.22	2611.199	2395.6
	119		1278.6	3301.999	2180	2559.871	2347.09	2534.2	2349.4
	120		1269.2	3301.999	2195.4	2590.671	2341.7	2503.4	2426.4
May (5)	121		1269.2	3301.999	2226.2	2614.726	2360.95	2565	2457.2
	122		1250.4	3319.599	2226.2	2683.379	2372.5	2688.199	2472.6
	123		1231.6	3442.799	2257	2698.471	2387.9	2718.999	0
	124		1316.2	3495.599	2303.2	2666.701	2403.3	2718.999	2472.6
	125		1410.2	3301.999	2318.6	2645.526	2334	2672.799	2534.2
	126		1447.8	3354.799	2287.8	2557.946	2131.2	2626.599	2457.2
	127		1466.6	3477.999	2257	2509.821	1984.8	2611.199	2380.2
	128		1447.8	3513.199	2226.2	2575.271	1960.4	2657.399	2303.2
	129		1438.4	3495.599	2272.4	2709.374	1986.4	2688.199	2131.2



	130		1438.4	3583.599	2303.2	2849.899	2070.5	2718.999	2595.799
	131		1410.2	3618.799	2441.8	2959.169	2163.6	2795.999	2626.599
	132		1353.8	3565.999	2580.399	2998.399	2218.5	2749.799	2549.6
	133		1269.2	3601.199	2734.399	3048.26	2249.3	2765.199	2488
	134		1147	3636.399	2826.799	3080.89	2303.2	2811.399	2441.8
	135		999.12	3565.999	2872.999	3046.06	2334	2734.399	2441.8
	136		929.28	3530.799	2985.199	3117.938	2695.9	2765.199	2426.4
	137		859.44	3495.599	3161.199	3210.69	2495.7	2718.999	2457.2
	138		820.64	3477.999	3495.599	3048.26	2541.9	2749.799	2565
	139		937.04	3337.199	3495.599	2949.044	2380.2	2795.999	2641.999
	140		975.84	3495.599	3495.599	3065.138	2181.9	2842.199	2611.199
	141		1006.88	3495.599	3354.799	3192.369	2021.4	2949.999	2549.6
	142		1022.4	3460.399	3249.199	3189.06	1929.9	3002.799	2441.8
	143		1037.92	3301.999	3055.599	3170.369	1868.9	2949.999	2426.4
	144		1045.68	3249.199	2949.999	3151.66	1954.3	2703.599	2534.2
	145		1053.44	3161.199	2919.199	3204.09	2082.4	2488	0
	146		1203.4	2934.599	2903.799	3114.999	2210.8	2272.4	2534.2
	147		1278.6	2672.799	2888.399	2952.569	2257	2395.6	2688.199
	148		1335	2488	2888.399	2825.521	2287.8	2611.199	3125.999



	149		1419.6	2488	2872.999	2824.874	2343.3	2457.2	3161.199
	150		1494.8	2457.2	2888.399	2871.721	2412.6	2626.599	3425.199
	151		1541.8	2318.6	2903.799	2817.821	2503.4	2688.199	3495.599
June (6)	152		1716.4	2580.399	2888.399	2672.799	2553.642	3108.399	3442.799
	153		1826.2	2657.399	2872.999	2626.599	2980.863	3020.399	3477.999
	154		1948.2	2826.799	2934.599	2688.199	3474.039	2967.599	3601.199
	155		3319.6	3143.599	2903.799	2703.599	3711.272	2734.399	3601.199
	156		3951.2	3231.599	2967.599	2718.999	3713.106	2595.799	3636.399
	157		4011.8	3389.999	3266.799	2795.999	3738.437	2780.599	3583.599
	158		4052.2	3495.599	3548.399	2842.199	3553.931	2934.599	3618.799
	159		4112.8	3389.999	3565.999	2749.799	3185.032	3161.199	3653.999
	160		4133	3495.599	3618.799	2718.999	3026.486	3249.199	3689.199
	161		4173.4	3389.999	3636.399	2795.999	2987.619	3196.399	3671.599
	162		4193.6	3249.199	3636.399	3020.399	2985.657	0	3653.999
	163		4213.8	3354.799	3653.999	3108.399	2887.336	3196.399	3671.599
	164		4234	3460.399	3653.999	3020.399	3084.272	3161.199	3724.399
	165		4173.4	3548.399	3653.999	2888.399	3117.364	3090.799	3671.599
	166		4153.2	3724.399	3653.999	2826.799	2926.991	3178.799	3565.999
	167		4153.2	4112.799	3636.399	2826.799	3084.199	3301.999	3618.799



	168		4153.2	3991.599	3618.799	2857.599	2932.472	3354.799	3724.399
	169		4193.6	3951.199	3601.199	2842.199	2779.307	3407.599	3777.199
	170		4173.4	3951.199	3583.599	2842.199	2863.942	3354.799	3971.399
	171		4112.8	3971.399	3601.199	3090.799	3050.704	3178.799	4132.999
	172		4092.6	3991.599	3583.599	3337.199	3194.309	3125.999	4112.799
	173		4072.4	3910.799	3583.599	3495.599	3446.411	3143.599	3971.399
	174		4274.4	3724.399	3601.199	3530.799	3677.906	3319.599	3991.599
	175		4880.4	3636.399	3618.799	3601.199	3614.514	3460.399	0
	176		5405.6	3530.799	3653.999	3759.599	3297.067	3530.799	0
	177		5627.8	3372.399	3689.199	3741.999	2992.111	3477.999	0
	178		5870.2	3284.399	3706.799	3513.199	3158.669	3407.599	0
	179		6112.6	3249.199	3741.999	3495.599	3540.996	3389.999	0
	180		6112.6	3249.199	3759.599	3636.399	3855.326	3284.399	3870.399
	181		6314.6	3425.199	3812.399	3583.599	3987.671	3178.799	3890.599
July (7)	182		6173.2	3477.999	3971.399	3812.399	4346.018	3073.199	3951.199
	183		6173.2	3513.199	3971.399	3910.799	4544.575	3055.599	3991.599
	184		6213.6	3513.199	4294.599	4011.799	4665.339	3213.999	3829.999
	185		6233.8	3530.799	4617.8	4052.199	4688.5	3389.999	3794.799
	186		6294.4	3677.466	4698.6	4112.799	4473.033	3460.399	3870.399



	187		6375.2	3638.599	4880.4	4173.399	4461.25	3442.799	3910.799
	188		6415.6	3610.732	5102.6	4294.599	4518.483	3442.799	3951.199
	189		6415.6	3664.266	5365.2	4415.8	4390.875	3495.599	3951.199
	190		6435.8	3692.132	5466.2	4335	4621.167	3618.799	3971.399
	191		6435.8	3674.749	5466.2	4920.8	4493.233	3653.999	3991.599
	192		6779.2	3804.166	5547	5648	4485.658	3870.399	4254.199
	193		6952	3973.924	5648	6435.8	4248.308	3870.399	4557.2
	194		7619	4026.107	5728.8	7044	3992.466	3741.999	4819.8
	195		8079	3858.124	5789.4	7297	4096.39	3741.999	4779.4
	196		8424	3995.807	5769.2	7527	4330.791	3706.799	4718.8
	197		8953	4223.899	5728.8	7412	4224.741	3930.999	4819.8
	198		9212.8	4334.158	5688.4	7205	4085.866	4294.599	4779.4
	199		9767.2	4334.158	5648	6759	4494.916	4617.8	4920.8
	200		9978.4	4355.2	5627.8	6658	5037.792	4739	5627.8
	201		10110.4	4394.758	5627.8	6415.6	5785.917	4900.6	6395.4
	202		10163.2	4328.94	5708.6	6233.8	6126.395	5001.6	6906
	203		10242.4	4355.2	6173.2	6617.6	6106.944	5042	6860
	204		10427.2	4375.4	6314.6	6759	5951.808	4739	6819.6
	205		10770.4	4335	6536.8	6799.4	5839.496	4880.4	6975



	206		11060.8	4355.2	6738.8	7780	5985.744	5547	7320
	207		11404	4375.4	6906	8125	6252.384	5829.8	7435
	208		11893	4415.8	7159	8585	6421.256	6294.4	7757
	209		12544	4355.2	7481	8953	6484.617	6637.8	7941
	210		13009	4395.6	7780	9091	6452.768	6839.8	7941
	211		13598	4375.4	8309	9767.2	6499.767	6929	7918
	212		14156	4415.8	8378	9978.4	6693.771	6929	8079
August (8)	213		14156	4450.729	8746	10268.8	7000.992	7113	8700
	214		14032	4766.775	9045	10532.8	7274	7481	8976
	215		13970	5170.775	9767.2	10770.4	7491.542	7596	9556
	216		13908	5315.542	9952	10849.6	7448.896	7550	9793.6
	217		13908	5545.317	10189.6	11008	7582.645	7435	10057.6
	218		13908	5697.658	10506.4	11324.8	7770.417	7711	10189.6
	219		13908	5686.717	11034.4	11562.4	8058.875	7987	10268.8
	220		14032	5754.05	11324.8	11694.4	8281.148	7964	10163.2
	221		14094	5966.15	11430.4	11800	8375.591	8217	10189.6
	222		14218	6367.625	11536	12048	8377	8424	9978.4
	223		14218	6893.392	11641.6	12234	8693	8746	9952
	224		14218	7150.375	11747.2	12513	9110.27	9068	10189.6



	225		14218	7336.267	11862	12823	9535.636	9265.6	10189.6
	226		14218	7511.667	11924	13009	9850.527	9556	10242.4
	227		14218	7516.458	11986	13443	10172	9952	10242.4
	228		14218	7449.375	12110	13722	9651.6	10348	10004.8
	229		14218	7562.458	12606	13877	10277.13	10559.2	9714.4
	230		14218	7434.042	12916	14001	10438.83	10770.4	9318.4
	231		14218	7314.25	13195	14063	10661.63	11087.2	9186.4
	232		15002	7306.583	13381	14187	10712.32	11509.6	9212.8
	233		15206	7457.042	13536	14435	10767.23	12234	9022
	234		15546	7585.458	13660	14528	11006.94	12544	8976
	235		15716	7628.583	13691	14621	11132.61	12916	9186.4
	236		15818	7826	14125	14683	11242.3	13381	9582.4
	237		15954	8097.208	14125	14745	11567.9	13970	9899.2
	238		16056	8312.833	14125	14776	11815.03	14528	10427.2
	239		16532	8348.292	14156	14838	12183.16	14900	10928.8
	240		16838	8519.833	14125	14934	12769.68	15070	11483.2
	241		17246	8749.354	14249	15002	13559.56	15172	12234
	242		17586	9119.025	13784	15036	14095.24	15614	12389
	243		17892	9449.3	13536	15172	14493.28	15818	12358





September (9)	244		18198	9813.4	13350	15478	14676.8	16090	12420
	245		18640	10091.7	13319	15920	14953.29	16158	12916
	246		18980	10329.3	13505	16430	15176.08	16226	13567
	247		19320	10617.5	13691	16872	16005.68	16294	14001
	248		19456	10874.9	13784	17314	16389.2	16464	14435
	249		19762	11349	13846	17722	16558.92	16668	14745
	250		19898	11467.8	14063	18062	16631.28	16940	15002
	251		20000	11587.7	14311	18164	16654.4	17314	15138
	252		20068	12014.28	14559	18300	16782.24	17654	15444
	253		20306	12639.03	15104	18470	17040.52	17892	16022
	254		20408	12808.79	15920	18640	17289.92	18198	16566
	255		20476	12824.29	16294	19456	17504.4	18538	17144
	256		21054	12953.46	16668	19524	17588.72	18878	17382
	257		21258	13210.5	16906	19558	17637.68	19218	17450
	258		21564	13439.13	17144	19626	17881.8	19354	17586
	259		21762.63	13586.38	17518	19660	17835	19422	17654
	260		22608.08	13663.88	17620	19694	17791.42	19388	17790
	261		23610.1	13740.08	18028	19762	17819.75	19286	17892



	262		24941.18	13948.04	18096	19830	17841	19082	17926
	263		26317.65	14422.08	18266	19864	17900.5	19150	17892
	264		27360	14818.21	18300	19932	17989.75	19082	17926
	265		28044	15133.75	18334	20000	18142.75	19048	17994
	266		28424	15410	18402	20034	18450.17	19150	18164
	267		28804	15631	18606	20102	18649.92	19218	18300
	268		29260	15846.33	18776	20170	18788.75	19252	0
	269		30134	16080.08	18980	20238	18936.73	19252	18300
	270		31274	16267.08	19184	20272	18876.58	19218	18334
	271		31616	16459.75	19252	20306	19074.92	19184	18334
	272		31692	16648.17	19388	20340	19185.42	19218	18368
	273		31540	16773.54	19558	20408	19286	19218	18436
October (10)	274		31236	16794.08	19660	20510	19328.5	19150	18538
	275		30628	16740.25	19762	20578	19286	19116	18606
	276		30248	16792.67	19898	20612	19218	19014	18776
	277		29450	16770.71	20000	20646	19150	18946	18980
	278		28804	16754.42	20170	20680	19048	18912	19116
	279		28424	16692.08	20272	20748	18946	18878	19218
	280		28006	16646.75	20340	20782	18946	18878	19286



	281		27170	16544.75	20408	20816	18912	18844	19422
	282		26980	16428.58	20442	20850	18708	18708	19490
	283		26676	16228.83	20442	20918	18504	18504	19558
	284		26388.24	16114.08	20408	20952	18028	18300	19762
	285		26070.59	15999.33	20578	21020	16328	18130	19932
	286		25647.06	15912.92	20442	21054	16532	18062	20034
	287		25152.94	15820.83	20748	21088	17093	17926	20170
	288		24706.06	15883.17	20884	21156	17042	17688	20136
	289		24361.62	15894.5	20748	21190	16770	17382	20068
	290		23891.92	15906.54	20884	21224	16532	17008	20000
	291		23578.79	16003.58	20952	21258	16396	16532	19796
	292		23265.66	16138.17	20986	21326	16294	16056	19456
	293		22795.96	16270.63	20918	21360	16226	15444	19014
	294		22357.58	16294	20782	21428	15988	14968	18470
	295		22013.13	16305.33	20510	21462	15682	14373	17722
	296		21632	16328	20102	21530	15546	13753	17042
	297		21224	16268.5	19898	21462	15342	13319	15954
	298		20884	16223.17	19558	21360	15172	12978	15070
	299		20544	16164.48	19218	21224	14869	12668	14311



	300		20272	16067.33	18844	21122	13939	12327	13691
	301		19728	15988	18470	21054	14435	11924	13288
	302		19354	15670.67	18266	20884	11955	11668	12482
	303		18810	14652	18130	20578	10876	11430.4	12079
	304		18436	14435	18062	20306	10374.4	11298.4	11773.6
November (11)	305		17722	15315.67	17824	19932	9925.6	11087.2	11668
	306		16940	13469.96	17450	18878	9899.2	10928.8	11298.4
	307		16056	12745.5	16838	18470	9635.2	10823.2	11113.6
	308		15036	12016.33	16498	17960	9186.4	10506.4	11008
	309		14342	11385.3	16226	13970	8815	10110.4	10612
	310		12854	10741.8	15716	10717.6	8539	9688	10163.2
	311		11773.6	10068.6	14869	10717.6	8194	9212.8	9582.4
	312		11008	9412.217	14559	10216	7665	8769	9045
	313		10321.6	8866.75	13908	9661.6	7251	8332	8654
	314		9767.2	8623.333	12699	9318.4	6819.6	7918	8286
	315		9397.6	8221.792	12048	8907	6557	7642	7918
	316		9068	7732.629	11430.4	8723	6274.2	7435	7573
	317		8769	7216.5	10955.2	8585	6011.6	7228	7251



	318		8608	6865.042	10585.6	8332	5850	6952	6906
	319		8424	6631.067	10189.6	8079	5789.4	6678.2	6637.8
	320		8194	6341.533	9661.6	7734	5708.6	6536.8	6435.8
	321		7941	5981.3	9137	7527	5587.4	6031.8	6233.8
	322		7504	5546.158	8677	7251	5486.4	5930.8	6031.8
	323		7136	4945.391	8194	6952	5405.6	5829.8	5850
	324		6839.8	4484.817	7872	6779.2	5324.8	5607.6	5627.8
	325		6536.8	4555.517	7274	6738.8	5223.8	5345	5446
	326		6314.6	4644.733	6536.8	6658	5082.4	5183.4	5284.4
	327		6052	4549.625	6314.6	6577.2	5021.8	5122.8	5163.2
	328		5829.8	4430.95	6193.4	6577.2	4920.8	5042	5102.6
	329		5627.8	4391.392	6173.2	6536.8	4819.8	4860.2	5021.8
	330		5425.8	4334.121	5991.4	6516.6	4718.8	4678.4	4961.2
	331		5365.2	4160.774	5829.8	6476.2	4617.8	4516.8	4819.8
	332		5324.8	3911.666	5688.4	6456	4537	4415.8	4658.2
	333		5223.8	3725.237	5607.6	6375.2	4456.2	4335	4537
	334		5122.8	3638.913	5506.6	6314.6	4355.2	4193.599	4456.2
December (12)	335		5082.4	3599.461	5365.2	6415.6	4274.399	4052.199	3565.999



	336		5001.6	3625.999	5223.8	6476.2	4173.399	3991.599	3477.999
	337		4799.6	3625.504	5062.2	6456	4052.199	3930.999	3354.799
	338		4799.6	3543.042	4981.4	6355	3951.199	3870.399	3266.799
	339		4537	3451.599	4860.2	6355	3870.399	3794.799	3196.399
	340		4355.2	3326.639	4739	6355	3759.599	3653.999	3143.599
	341		4314.8	2934.599	4678.4	6334.8	3671.599	3548.399	3178.799
	342		4314.8	2842.199	4577.4	6213.6	3601.199	3530.799	3266.799
	343		4314.8	2795.999	4496.6	6031.8	3565.999	3530.799	3249.199
	344		4294.6	2718.999	4436	5971.2	3530.799	3513.199	3213.999
	345		4274.4	2657.399	4395.6	5890.4	3495.599	3442.799	3266.799
	346		4234	2580.399	4375.4	5829.8	3513.199	3337.199	3037.999
	347		4193.6	2503.4	4294.599	5668.2	3548.399	3266.799	3037.999
	348		4173	2349.4	4031.999	5587.4	3530.799	3196.399	3002.799
	349		4153	2241.6	3759.599	5506.6	3477.999	3125.999	2949.999
	350		4133	2167.8	3706.799	5405.6	3319.599	3037.999	2903.799
	351		4072	2106.8	3618.799	5345	3319.599	2985.199	2857.599
	352		3992	2045.8	3548.399	5244	3284.399	2919.199	2857.599
	353		3951	1984.8	3460.399	5244	3284.399	2826.799	2811.399
	354		3891	1923.8	3407.599	5183.4	3249.199	2749.799	2780.599



	355		3795	1862.8	3372.399	5102.6	3213.999	2734.399	2795.999
	356		3689	1789.6	3319.599	5001.6	3178.799	2780.599	2811.399
	357		3584	1740.8	3266.799	4920.8	3143.599	2872.999	2795.999
	358		3496	1704.2	3231.599	4819.8	3108.399	2888.399	2749.799
	359		3443	1667.6	3178.799	4718.8	3073.199	2857.599	2718.999
	360		3390	1643.2	3108.399	4597.6	3037.999	2872.999	2672.799
	361		3337	1618.8	3090.799	4496.6	3002.799	2842.199	2672.799
	362		3179	1606.6	3055.599	4335	2949.999	2749.799	2657.399
	363		3109	1594.4	3073.199	4011.799	2919.199	2641.999	2641.999
	364		3038	1570	3020.399	3971.399	2888.399	2611.199	2626.599
	365		3020	1560.6	3002.799	3951.199	2857.599	2641.999	2611.199
	366		0	0	0	0	0	0	0



**Table D.6:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Onitsha) (1960-1970)

Month	Julian Day	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	1960
Jan (1)	1	0	0	0	0	2660	2840	2800	3430	2160	2990	0
	2	0	0	0	0	2640	2810	2760	3410	2160	3000	0
	3	0	0	0	0	2620	2810	2730	3360	2160	3030	0
	4	0	0	0	0	2580	2800	2720	3350	2150	3070	0
	5	0	0	0	0	2540	2800	2700	3290	2130	3040	0
	6	0	0	0	0	2510	2800	2680	3250	2130	3070	0
	7	0	0	0	0	2510	2800	2640	3210	2130	3030	0
	8	0	0	0	0	2490	2760	2620	3190	2130	2950	0
	9	0	0	0	0	2490	2760	2610	3150	2130	2910	0
	10	0	0	0	0	2480	2750	2590	3110	2140	2850	0
	11	0	0	0	0	2470	2730	2580	3070	2150	2810	0
	12	0	0	0	0	2470	2730	2570	3040	2150	2770	0
	13	0	0	0	0	2440	2720	2540	3030	2150	2770	0
	14	0	0	0	0	2440	2720	2510	3000	2150	2730	2250
	15	0	0	0	0	2440	2720	2510	2990	2150	2700	2250





	16	0	0	0	0	2430	2700	2490	2950	2150	2700	2250
	17	0	0	0	0	2430	2680	2470	2920	2150	2660	2230
	18	0	0	0	0	2410	2660	2470	2910	2150	2640	2200
	19	0	0	0	0	2410	2660	2440	2880	2150	2660	2200
	20	0	0	0	0	2410	2640	2470	2840	2150	2640	2200
	21	0	0	0	0	2410	2640	2490	2810	2150	2640	2200
	22	0	0	0	0	2400	2620	2430	2800	2130	2660	2200
	23	0	0	0	0	2400	2620	2430	2770	2130	2290	2200
	24	0	0	0	0	2370	2610	2430	2700	2120	2610	2160
	25	0	0	0	0	2370	2570	2410	2680	2120	2580	2160
	26	0	0	0	2440	2360	2540	2410	2660	2120	2570	2150
	27	0	0	0	2440	2340	2530	2410	2640	2120	2540	2150
	28	0	0	0	2430	2340	2510	2400	2640	2070	2540	2150
	29	0	0	0	2410	2330	2470	2370	2620	2070	2530	2150
	30	0	0	0	2400	2310	2430	2370	2610	2060	2520	2150
	31	0	0	0	2400	2300	2410	2370	2610	2060	2510	2150
Feb (2)	32	0	0	0	0	2300	2370	2360	2580	2000	2510	2120
	33	0	0	0	0	2300	2330	2360	2570	2000	2490	2120
	34	0	0	0	0	2300	2290	2340	2540	2000	2490	2070



	35	0	0	0	0	2290	2250	2330	2540	2000	2490	2070
	36	0	0	0	0	2290	2230	2330	2530	2000	2490	2060
	37	0	0	0	0	2290	2200	2330	2530	2000	2490	2060
	38	0	0	0	0	2270	2160	2300	2510	1990	2470	2060
	39	0	0	0	0	2270	2160	2290	2490	1970	2470	2060
	40	0	0	0	0	2250	2140	2290	2490	1970	2460	2040
	41	0	0	0	0	2250	2120	2290	2490	1970	2440	2020
	42	0	0	0	0	2230	2070	2270	2440	1970	2430	2020
	43	0	0	0	0	2230	2060	2270	2440	1970	2430	2020
	44	0	0	0	0	2230	2020	2270	2440	1960	2400	2020
	45	0	0	0	0	2230	1990	2250	2430	1960	2400	2020
	46	0	0	0	0	2230	1990	2250	2410	1960	2360	2020
	47	0	0	0	0	2230	1970	2250	2410	1960	2360	1990
	48	0	0	0	0	2230	1970	2250	2410	1960	2360	1990
	49	0	0	0	0	2220	1970	2230	2410	1960	2360	1990
	50	0	0	0	0	2220	1970	2220	2400	1950	2340	1990
	51	0	0	0	0	2220	1970	2220	2400	1940	2330	1990
	52	0	0	0	0	2220	1970	2220	2370	1920	2330	1990
	53	0	0	0	0	2220	1970	2220	2370	1920	2330	1970



	54	0	0	0	0	2200	1940	2200	2370	1920	2300	1970
	55	0	0	0	0	2200	1940	2200	2370	1900	2300	1970
	56	0	0	0	0	2200	1940	2200	2370	1900	2300	1970
	57	0	0	0	0	2200	1940	2200	2370	1900	2300	1970
	58	0	0	0	0	2180	1940	2180	2370	1890	2290	1970
	59	0	0	0	0	2180	1940	2180	2370	1870	2290	1970
Mar (3)	60	0	0	0	2250	2180	1940	2160	2370	1900	2270	1940
	61	0	0	0	2250	2180	1940	2160	2370	1890	2220	1940
	62	0	0	0	2250	2180	1940	2150	2370	1870	2160	1940
	63	0	0	0	2250	2180	1940	2150	2360	1870	2150	1940
	64	0	0	0	2270	2180	1940	2130	2400	1870	2150	1900
	65	0	0	0	2270	2160	1940	2130	2400	1870	2150	1900
	66	0	0	0	2220	2160	1940	2130	2400	1870	2130	1900
	67	0	0	0	2210	2150	1940	2130	2400	1860	2120	1900
	68	0	0	0	2200	2150	1940	2130	2410	1860	2120	1900
	69	0	0	0	2200	2130	1920	2130	2410	1860	2120	1890
	70	0	0	0	2200	2120	1900	2130	2400	1800	2120	1890
	71	0	0	0	2180	2120	1900	2120	2400	1790	2090	1890
	72	0	0	0	2180	2120	1890	2120	2400	1770	2060	1890



	73	0	0	0	2180	2090	1890	2120	2370	1770	2070	1890
	74	0	0	0	2180	2090	1860	2090	2370	1760	2070	1860
	75	0	0	0	2160	2070	1860	2090	2360	1770	2060	1860
	76	0	0	0	2180	2060	1860	2090	2360	1770	2040	1860
	77	0	0	0	2160	2040	1830	2080	2350	1780	2020	1840
	78	0	0	0	2150	2020	1800	2070	2340	1790	2020	1830
	79	0	0	0	2130	2000	1960	2090	2330	1790	2020	1830
	80	0	0	0	2120	2000	2360	2060	2330	1800	2000	1830
	81	0	0	0	2130	1990	2360	2060	2300	1790	2000	1800
	82	0	0	0	2120	1990	2360	2060	2290	1770	1990	1800
	83	0	0	0	2090	1970	2360	2040	2290	1760	1970	1800
	84	0	0	0	2090	1970	2360	2020	2270	1740	1970	1770
	85	0	0	0	2090	1940	2340	2020	2250	1720	1960	1770
	86	0	0	0	2070	1940	2360	2000	2230	1690	1940	1770
	87	0	0	0	2050	1920	2360	1990	2220	1670	1920	1750
	88	0	0	0	2020	1920	2370	1990	2220	1650	1920	1740
	89	0	0	0	2020	1900	2370	2000	2180	1620	1900	1740
	90	0	0	0	2000	1900	2340	2000	2160	1600	1900	1720
Apr (4)	91	0	0	0	0	1890	2270	1990	2180	1600	1890	1690



	92	0	0	0	0	1860	2230	1990	2180	1600	1870	1690
	93	0	0	0	0	1830	2200	1990	2160	1590	1870	1690
	94	0	0	0	0	1770	2200	1970	2160	1550	1870	1660
	95	0	0	0	0	1740	2180	1970	2150	1510	1870	1690
	96	0	0	0	0	1710	2160	1970	2150	1480	1870	1660
	97	0	0	0	0	1710	2150	1970	2130	1460	1850	1640
	98	0	0	0	0	1710	2150	1970	2120	1440	1840	1620
	99	0	0	0	0	1680	2200	1960	2120	1420	1800	1620
	100	0	0	0	0	1650	2200	1960	2090	1400	1790	1620
	101	0	0	0	0	1620	2180	1960	2070	1390	1770	1620
	102	0	0	0	0	1600	2130	1910	2070	1360	1770	1590
	103	0	0	0	0	1550	2070	1870	2070	1340	1770	1590
	104	0	0	0	0	1540	2040	1840	2090	1300	1790	1560
	105	0	0	0	0	1510	2040	1830	2090	1300	1770	1560
	106	0	0	0	0	1500	2040	1790	2090	1270	1740	1540
	107	0	0	0	0	1480	2020	1720	2060	1270	1720	1500
	108	0	0	0	0	1470	2020	0	2040	1260	1710	1470
	109	0	0	0	0	1450	2020	0	2020	1260	1710	1470
	110	0	0	0	0	1420	2000	0	2020	1260	1680	1440



	111	0	0	0	0	1390	1960	1880	2020	1230	1680	1440
	112	0	0	0	0	1360	1960	2040	2000	1220	1650	1440
	113	0	0	0	0	1340	1940	1630	1990	1220	1620	1440
	114	0	0	0	0	1310	1940	1620	1990	1230	1590	1390
	115	0	0	0	0	1300	1920	1600	1990	1200	1550	1390
	116	0	0	0	0	1270	1900	1600	1970	1200	1590	1440
	117	0	0	0	0	1270	1890	1580	1970	1210	1550	1500
	118	0	0	0	0	1260	1890	1550	1970	1230	1530	1560
	119	0	0	0	0	1250	1870	1510	1970	1200	1500	1590
	120	0	0	0	0	1250	1860	1480	1990	1230	1450	1590
May (5)	121	0	0	0	0	1270	1860	1480	2000	1220	1420	0
	122	0	0	0	0	1300	1860	1480	2020	1250	1390	0
	123	0	0	0	0	1310	1840	1470	2000	1250	1370	0
	124	0	0	0	0	1330	1840	1440	1940	1250	1330	0
	125	0	0	0	0	1330	1830	1440	1900	1250	1300	1600
	126	0	0	0	0	1390	1790	1410	1880	1240	1270	1530
	127	0	0	0	0	1450	1760	1390	1860	1230	1260	1470
	128	0	0	0	0	1500	1740	1360	1860	1230	1250	1480
	129	0	0	0	0	1530	1720	1330	1830	1250	1230	1440



	130	0	0	0	0	1560	1710	1310	1770	1250	1220	1480
	131	0	0	0	0	1590	1710	1310	1740	1220	1190	1480
	132	0	0	0	0	1590	1690	1310	1760	1220	1200	1440
	133	0	0	0	0	1560	1680	1360	1710	1230	1180	1400
	134	0	0	0	0	1540	1660	1370	1720	1270	1150	1360
	135	0	0	0	0	1510	1650	1340	1740	1260	1130	1340
	136	0	0	0	0	1470	1610	1330	1750	1240	1120	1370
	137	0	0	0	0	1440	1560	1330	1760	1220	1110	1400
	138	0	0	0	0	1420	1510	1330	1800	1250	1100	1390
	139	0	0	0	0	1440	1450	1340	1790	1270	1060	1420
	140	0	0	0	0	1480	1420	1370	1790	1300	1030	1440
	141	0	0	0	0	1530	1400	1370	1830	1310	1030	1440
	142	0	0	0	0	1550	1360	1400	2000	1280	1010	1440
	143	0	0	0	0	1600	1340	1400	2200	1270	1030	1450
	144	0	0	0	0	1650	1340	1420	2330	1260	1030	1500
	145	0	0	0	0	1680	1340	1440	2410	1230	1010	1530
	146	0	0	0	0	1720	1320	1430	2380	1210		1580
	147	0	0	0	0	1770	1310	1420	2360	1200		1630
	148	0	0	0	0	1840	1310	1420	2270	1200		1680



	149	0	0	0	0	1970	1300	1420	2220	1220		1650
	150	0	0	0	0	2070	1280	1400	2070	1220		1600
	151	0	0	0	0	2200	1310	1400	2020	1250		1560
June (6)	152	2160	0	0	0	2250	1330	1400	1960	1300		1630
	153	2250	0	0	0	2250	1310	1440	1890	1330		1680
	154	2330	0	0	0	2290	1310	1470	1860	1360		1650
	155	2490	0	0	0	2640	1330	1500	1860	1360		1600
	156	2570	0	0	0	3110	1380	1540	1800	1400		1540
	157	2640	0	0	0	3620	1440	1590	1760	1450		1510
	158	2660	0	0	0	4030	1500	1650	1720	1510		1470
	159	2640	0	0	0	4260	1540	1710	1710	1600		1500
	160	2610	0	0	0	4390	1560	1800	1680	1620		1510
	161	2570	0	0	0	4260	1600	1890	1680	1680		1480
	162	2580	0	0	0	4140	1620	1970	1680	1680		1480
	163	2510	0	0	0	4120	1620	2040	1680	1740		1530
	164	2430	0	0	0	4120	1600	2120	1690	1770		1590
	165	2410	0	0	0	4050	1600	2160	1720	1800		1690
	166	2420	0	0	0	4330	1600	2180	1770	1850		1770
	167	2440	0	0	0	4620	1600	2220	1830	1890		1870





	168	2470	0	0	0	4830	1660	2230	1860	1940		1940
	169	2470	0	0	0	4880	1800	2270	1940	1970	1010	1990
	170	2510	0	0	0	4930	2020	2340	2000	2020	1080	2000
	171	2510	0	0	0	4990	2370	2490	2020	2180	1150	2070
	172	2490	0	0	0	5030	2680	2540	2060	2410	1220	2180
	173	2490	0	0	0	5040	2810	2610	2160	2620	1270	2270
	174	2580	0	0	0	5100	2960	2580	2200	2850	1340	2360
	175	2660	0	0	0	5230	3070	2580	2300	3040	1360	2470
	176	2730	0	0	0	5290	3140	2710	2470	3290	1430	2570
	177	2810	0	0	0	5340	3210	2850	2640	3560	1510	2680
	178	2800	0	0	0	5340	3290	3000	2700	3830	1650	2920
	179	2810	0	0	0	5490	3350	3150	2680	4030	1900	3110
	180	3120	0	0	0	5650	3350	3240	2720	4210	2200	3250
	181	3150	0	0	0	5650	3580	3320	2770	4300	2330	3430
July (7)	182	3290	0	0	0	5610	3610	3410	3040	4350	2360	3530
	183	3390	0	0	0	5610	3860	3410	3040	4330	2330	3810
	184	3410	0	0	0	5770	4050	3410	3040	4380	2270	3860
	185	3380	0	0	0	5860	4100	3310	3040	4510	2300	3990
	186	3360	0	0	0	5970	4140	3210	3040	4650	2340	4120



	187	3350	0	0	0	5900	4140	3110	2960	4880	2470	4170
	188	3410	0	0	0	5900	4260	3040	0	5150	2770	4170
	189	3530	0	0	0	5950	4330	3250	5540	5340	3360	4100
	190	3650	0	0	0	5950	4390	3360	5910	5400	3830	4080
	191	3650	0	0	0	5910	4420	3480	5830	5430	4050	4140
	192	3620	0	0	0	5830	4510	3520	3560	5500	4530	4230
	193	3580	0	0	0	5810	4610	3530	3560	5700	4990	4480
	194	3620	0	0	0	5810	4530	3530	3580	5900	5180	4750
	195	3780	0	0	0	5830	4640	3720	3710	5930	5340	4980
	196	3960	0	0	0	5860	4750	3920	3860	5970	5500	5230
	197	4180	0	0	0	5970	4880	4120	4080	6100	5700	5250
	198	4440	0	0	0	6280	4990	4180	4300	6260	5950	5720
	199	4560	0	0	0	6680	5040	4050	4440	6220	6150	6100
	200	4610	0	0	0	6870	5080	4420	4620	6100	6280	6420
	201	4720	0	0	0	7030	5100	4560	4930	6070	6400	6620
	202	4890	0	0	0	7030	5380	4670	5080	6020	6640	6750
	203	5040	0	0	0	7010	5490	4830	5430	5970	6910	7070
	204	5180	0	0	0	7010	5540	4990	5760	5900	7190	7770
	205	5200	0	0	0	7010	5630	5230	5930	5770	7330	7930



	206	5230	0	0	0	7010	5720	5490	6100	5670	7500	8100
	207	5180	0	0	0	7070	5860	5700	6120	5670	7680	8050
	208	5040	0	0	0	7090	5860	5910	6260	5770	7840	8520
	209	4980	0	0	0	7030	6310	6220	6420	5810	8030	8940
	210	4940	0	0	0	6970	6620	6470	6730	5830	8470	9200
	211	4930	0	0	0	6930	6810	6910	6850	6000	8940	9330
	212	4980	0	0	0	6930	7030	7380	7090	6170	9450	9390
August (8)	213	5180	0	0	0	6930	7090	7880	8760	6210	9920	9370
	214	5490	0	0	0	6930	7090	8170	7680	6220	10100	9390
	215	5760	0	0	0	6850	7380	8490	8050	6310	10300	9620
	216	6020	0	0	0	6790	7700	8800	8440	6420	10400	9860
	217	6170	0	0	0	6690	8390	8730	8730	6620	10400	10000
	218	6530	0	0	0	6690	8940	8890	8940	6930	10400	10000
	219	6730	0	0	0	6730	9310	9370	9030	7310	10500	10100
	220	7210	0	0	0	6810	9680	9390	9140	7750	10500	10200
	221	7310	0	0	0	7030	9900	9390	9390	8130	10500	10200
	222	8050	0	0	0	7270	10000	9310	9520	8470	10500	10200
	223	8130	0	0	0	7500	10200	9030	9760	8890	10400	10300
	224	8660	0	0	0	7840	10500	9030	10100	9030	10200	10500



	225	9110	0	0	0	8270	10700	8920	10500	9140	10100	10600
	226	9560	0	0	0	8730	10800	8830	10800	9270	10000	10700
	227	9920	0	0	0	9030	11000	8800	11300	9450	9600	11000
	228	10100	0	0	0	9270	11200	8830	11700	9620	9000	11200
	229	10200	0	0	0	9310	11400	8830	12000	9760	8730	11400
	230	10500	0	0	0	9450	11600	8800	12400	9800	8350	11600
	231	10700	0	0	0	9740	11900	8800	12700	9960	8100	11700
	232	11000	0	0	0	10000	12200	8760	12900	10000	7880	11900
	233	11400	0	0	0	10300	12400	8620	13200	10200	7680	11900
	234	11600	0	0	0	10600	12900	8470	13600	10400	7460	12000
	235	11900	0	0	0	10800	13400	8440	13800	10700	7330	12100
	236	12200	0	0	0	11100	13800	8440	14000	11000	7210	12200
	237	12400	0	0	0	11400	13900	8590	14300	11400	7150	12300
	238	12900	0	0	0	11800	13800	8660	14500	11800	7130	12300
	239	13200	0	0	0	11900	13900	8760	14600	12200	7150	12400
	240	13700	0	0	0	12300	14300	8870	14900	12700	7250	12500
	241	14000	0	0	0	12700	14400	9070	15100	13200	7310	12600
	242	14300	0	0	0	12900	14500	9270	15300	13700	7400	12800
	243	14600	0	0	0	13300	14600	9680	15400	14000	8130	13200



September (9)	244	14500	0	0	0	13600	14900	9960	15600	14300	8620	13600
	245	15100	0	0	0	13800	15000	10200	15900	14700	8940	13900
	246	15700	0	0	0	14000	15200	10400	16200	15200	9270	14200
	247	16000	0	0	0	14200	15400	10700	16500	15500	9500	14400
	248	16300	0	0	0	14400	15600	11200	16800	15700	9760	14600
	249	16600	0	0	0	14700	15800	11300	17100	15900	9900	14800
	250	17100	0	0	0	14900	16200	0	17400	16200	9960	15100
	251	17400	0	0	0	15100	16200	9390	17900	16300	10000	15400
	252	17700	0	0	0	15400	16300	9680	18200	16500	10000	15700
	253	18200	0	0	0	15600	16600	12700	18500	16900	9970	16000
	254	18500	0	0	0	15800	16900	13100	18800	17100	10000	16200
	255	18600	0	0	0	16200	17100	13700	18900	17400	10200	16600
	256	18900	0	0	0	16500	17300	14200	19000	17800	10300	16900
	257	19100	0	0	0	17000	17700	14600	19200	18200	10700	17300
	258	19400	0	0	0	17300	18000	14500	19300	18500	11000	17500
	259	19700	0	0	0	17600	18300	15300	19300	18900	11300	17800
	260	19800	0	0	0	17800	18500	15700	19300	19100	11600	18000
	261	19900	0	0	0	18000	18700	16000	19300	19600	11900	18300



	262	20000	0	0	0	18300	19000	16400	19400	20000	12300	18500
	263	20200	0	0	0	18500	19000	16700	19400	20400	12700	18900
	264	20300	0	0	0	18800	19300	17100	19600	20800	13000	18900
	265	20500	0	0	0	19200	19500	17600	19600	21200	13400	19100
	266	20600	0	0	0	19600	19700	18200	19700	21600	13800	19400
	267	21000	0	0	0	19900	19900	18500	19800	22000	14200	19700
	268	21100	0	0	0	20300	20200	19000	20000	22400	14500	20000
	269	21200	0	0	0	20700	20500	19300	20000	22700	15100	20300
	270	21400	0	0	0	21000	20600	19800	20200	22900	15800	20700
	271	21600	0	0	0	21300	20800	20300	20300	23100	15900	21000
	272	21700	0	0	0	21500	20700	21000	20600	23300	16000	21200
	273	22200	0	0	0	21700	20900	21600	20800	23600	16300	21300
October (10)	274	22500	0	0	0	22000	20900	22100	21000	23800	16300	21600
	275	22800	0	0	0	22200	21000	22600	21200	23900	16400	21900
	276	23000	0	0	0	22500	21200	23000	21500	24200	16600	22100
	277	23100	0	0	0	22600	21100	23300	21600	24300	16900	22300
	278	23300	0	0	0	22700	21100	23700	21900	24500	17300	22400
	279	23500	0	0	0	22700	20900	24000	22100	24500	17600	22900
	280	23600	0	0	0	22900	20800	24200	22200	24500	17900	23200



	281	23700	0	0	0	23000	20500	24300	22300	24600	18000	23300
	282	23700	0	0	0	23000	20500	24400	22400	24700	18100	23400
	283	23700	0	0	0	23100	20400	24500	22400	24700	18300	23500
	284	23500	0	0	0	23100	20100	24500	22400	24700	18300	23700
	285	23500	0	0	0	23100	19900	24500	22400	24800	18300	23900
	286	23400	0	0	0	23000	19600	24400	22400	24800	18200	24000
	287	23300	0	0	0	23000	19300	24400	22300	24900	18300	24200
	288	22900	0	0	0	22900	19000	24200	22300	25100	18000	24300
	289	22400	0	0	0	23000	18700	24000	22100	25100	17900	24500
	290	22100	0	0	0	22900	18300	23700	22000	25500	17600	24700
	291	21100	0	0	0	22800	17900	23900	21700	25500	17300	24800
	292	20400	0	0	0	22700	17500	23000	21600	25500	16900	24900
	293	19200	0	0	0	22400	17100	22600	21600	25600	16500	25000
	294	17800	0	0	0	22000	16500	21900	21300	25800	16100	25000
	295	16500	0	0	0	21600	15900	21200	21100	25900	15800	25000
	296	15200	0	0	0	0	15400	20700	20900	26000	15200	25000
	297	14500	0	0	0	0	14800	20000	20700	26000	14600	24900
	298	13800	0	0	0	0	14500	19400	20500	26100	14100	24700
	299	12700	0	0	0	0	13900	19000	20100	26100	13800	24400



	300	12000	0	0	0	0	13300	18600	20000	26000	13300	24200
	301	11500	0	0	0	0	13000	18300	19900	25800	12700	23800
	302	11200	0	0	0	0	12600	18000	19800	25500	12000	23300
	303	10900	0	0	0	0	12200	17600	19600	25000	11500	22800
	304	10700	0	0	0	0	11800	17200	19400	24400	11000	22200
November (11)	305	10500	0	0	0	15000	11500	16800	19100	23900	10600	21600
	306	10300	0	0	0	14400	11300	16300	18900	23300	10100	20900
	307	10200	0	0	0	13800	10900	15900	18600	22600	9520	20400
	308	10100	0	0	0	12900	10400	15600	18300	21700	9200	19400
	309	9960	0	0	0	12200	10100	14500	17900	20800	8690	18500
	310	9560	0	0	0	11700	9580	14900	17500	19800	8170	17500
	311	9180	0	0	0	11200	8870	14500	16900	18700	7700	16200
	312	8620	0	0	0	10800	8350	14100	16000	17500	7250	15500
	313	7980	0	0	0	10400	7840	13500	15300	16400	6910	15000
	314	7500	0	0	0	9960	7360	13100	14500	15300	6580	14500
	315	7090	0	0	0	9430	6930	12800	13800	14500	6280	13800
	316	6690	0	0	0	9000	6530	11900	13000	13800	6000	13100
	317	6470	0	0	0	8620	6280	11200	12400	12800	5720	12300





	318	6150	0	0	0	8250	5970	10500	11500	12200	5380	11600
	319	5830	0	0	0	8030	5760	10100	11100	11600	5180	11000
	320	5650	0	0	0	7770	5540	9700	10600	11300	4980	10500
	321	5450	0	0	0	7440	5320	9580	10000	10800	4800	10000
	322	5230	0	0	0	7070	5100	8760	9640	10400	4620	9450
	323	5040	0	0	0	6730	4980	8320	8800	10100	4510	8890
	324	4890	0	0	0	6440	4800	7860	8170	9860	4360	8320
	325	4750	0	0	0	6170	4620	7440	7570	9520	4210	7770
	326	4610	0	0	0	6000	4530	7070	7090	8960	4100	7380
	327	4470	0	0	0	5760	4420	6790	6450	8960	4000	6810
	328	4380	0	0	0	5560	4260	6420	6120	8520	3920	6640
	329	4260	0	0	0	5340	4140	6150	5900	8130	3810	6330
	330	4170	0	0	0	5150	4100	5900	5650	7810	3690	6150
	331	4100	0	0	0	5030	3990	5670	5400	7500	3610	5900
	332	4000	0	0	0	4840	3920	5490	5200	7250	3480	5650
	333	3900	0	0	0	4700	3830	5320	4990	7030	3410	5450
	334	3810	0	0	0	4590	3740	5130	4840	6850	3310	5230
December (12)	335	3740	0	0	0	4480	3650	4940	4700	6680	3210	5040



	336	3650	0	0	0	4330	3580	4840	4580	6510	3190	4940
	337	3580	0	0	0	4210	3520	4750	4440	6400	3110	4830
	338	3490	0	0	0	4120	3450	4560	4330	6330	3110	4700
	339	3410	0	0	0	4050	3410	4420	4210	6220	3070	4580
	340	3360	0	0	0	3950	3320	4350	4120	6070	3000	4470
	341	3290	0	0	0	3870	3250	4260	4030	5860	2950	4380
	342	3250	0	0	0	3810	3210	4170	3900	5610	2760	4050
	343	3220	0	0	0	3740	3170	4080	3830	5400	2710	4060
	344	3190	0	0	0	3670	3120	3990	3750	5200	2660	4100
	345	3170	0	0	0	3620	3080	3920	3670	4990	2640	4030
	346	3120	0	0	0	3530	3040	3860	3620	4930	2610	3950
	347	3110	0	0	0	3480	2990	3780	3560	4750	2570	3860
	348	3080	0	0	0	3390	2960	3670	3490	4620	2530	3810
	349	3070	0	0	0	3350	2950	3580	3430	4440	2490	3740
	350	2960	0	0	0	3290	2920	3520	3390	4330	2440	3690
	351	2950	0	0	0	3280	2880	3490	3290	4300	2410	3620
	352	2880	0	0	0	3210	2850	3450	3250	4210	2370	3580
	353	2910	0	0	0	3170	2810	3390	3210	4110	2360	3520
	354	0	0	0	0	3120	2770	3350	3170	4000	2360	3480



	355	0	0	0	0	3080	2800	3320	3120	3900	2340	3430
	356	0	0	0	0	3070	2800	3250	3110	3780	2290	3390
	357	0	0	0	0	2990	2800	3210	3080	3750	2290	3320
	358	2610	0	0	0	2960	2800	3170	3030	3650	2270	3290
	359	0	0	0	0	2960	2800	3120	2990	3650	2270	3250
	360	0	0	0	0	2910	2770	3040	2950	3650	2250	3210
	361	0	0	0	0	2880	2770	3030	2910	3650	2230	3170
	362	0	0	0	0	2840	2760	2990	2880	3610	2220	3120
	363	0	0	0	0	2830	2720	2920	2840	3580	2200	3080
	364	0	0	0	0	2810	2700	2850	2810	3560	2180	3040
	365	0	0	0	0	2770	2680	2850	2810	3480	2160	3030
	366	0	0	0	0	0	0	0	0	0	0	0



**Table D.7:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Onitsha) (1971-1981)

Month	Julian Day	1981	1980	1979	1978	1977	1976	1975	1974	1973	1972	1971
Jan (1)	1	1862.9	2070	0	1320	0	2710	2730	1480	2200	1840	0
	2	1807.4	2060	0	1300	0	2710	2720	1370	2180	1830	0
	3	1710.4	2050	0	1280	0	2710	2680	1340	2180	1830	0
	4	1645	2070	0	0	0	2660	2660	1340	2160	1800	0
	5	1642	2110	0	0	0	2660	2570	1340	2150	1790	0
	6	1702.6	2060	0	0	0	2630	2470	1340	2150	1790	0
	7	1727.8	2030	0	0	0	2590	2370	1340	2150	1790	0
	8	1717	2010	0	0	0	2580	2340	1340	2120	1800	2290
	9	1693.6	2000	0	0	0	2590	2330	1340	2120	1840	2290
	10	1666.6	2010	0	0	0	2540	2290	1350	2090	1870	2290
	11	1652.2	2020	0	0	0	2490	2250	1360	2070	1900	2290
	12	1628.8	2030	0	0	0	2480	2250	1360	2040	1940	2250
	13	1594.9	2040	0	0	0	2470	2230	1390	1990	1960	2250
	14	1562.9	2070	0	0	0	2460	2250	1420	1870	1970	2230
	15	1560.6	2060	0	0	0	2430	2270	1540	1740	1990	2220



	16	1560.6	1970	0	0	0	2430	2290	1630	1650	1990	2180
	17	1556.4	1970	0	0	0	2410	2290	1720	1610	2000	2160
	18	1538.6	1990	0	0	0	2380	2300	1720	1580	2000	2150
	19	1519.8	2010	0	0	0	2400	2300	1710	1550	2020	2150
	20	1492.7	2060	0	0	0	2410	2310	1690	1540	2040	2150
	21	1446.7	2070	0	0	0	2420	2330	1680	1530	2060	2150
	22	1419.6	2070	0	0	0	2410	2340	1660	1530	2070	2180
	23	1378.3	2070	0	0	0	2400	2340	1660	1540	2070	2180
	24	1326.1	2050	0	0	0	2400	2340	1660	1530	2090	2200
	25	1225.3	2040	0	0	0	2400	2340	1660	1510	2090	2220
	26	1200.2	1980	0	0	0	2380	2360	1630	1500	2120	2220
	27	1183.5	1950	0	0	0	2400	2440	1600	1500	2120	2230
	28	1173.6	1920	0	0	0	2420	2510	1510	1510	2120	2230
	29	1166.3	1940	0	0	0	2440	2570	1450	1530	2120	2250
	30	1163.7	1980	0	0	0	2430	2560	1390	1540	2120	2240
	31	1154.8	2050	0	0	0	2420	2540	1340	1560	2120	2230
Feb (2)	32	1143.3	2070	0	1110	0	2400	2530	1280	1650	2130	2220
	33	1127.1	2110	0	1080	0	2400	2530	1330	1710	2130	2220
	34	1117.2	2110	1720	1070	0	2400	2430	1280	1740	2150	2200



	35	1118.2	2100	1730	1050	0	2370	2340	1230	1760	2160	2200
	36	1149	2100	1720	1030	0	2350	2230	1250	1720	2150	2180
	37	1185.6	2090	1720	1010	0	2330	2130	1260	1660	2130	2160
	38	1260.8	2090	1700	1000	0	2290	2040	1250	1550	2130	2160
	39	1298.9	2110	1680		0	2240	2000	1170	1480	2120	2160
	40	1343.3	2130	1600		0	2250	2060	1070	1420	2090	2170
	41	1349.1	2140	1530		0	2270	2120		1370	2070	2180
	42	1331.8	2130	1500		0	2270	2150		1360	2040	2180
	43	1308.8	2130	1500		0	2280	2230		1360	1990	2180
	44	1266	2150	1540		0	2330	2270		1420	1970	2160
	45	1203.9	2150	1680		0	2350	2220		1530	1970	2200
	46	1157.4	2120	1720		0	2360	2150	1000	1600	1970	2200
	47	1147.5	2100	1760		0	2340	2040	1000	1630	1970	2180
	48	1147	2080	1790		0	2360	1970	1010	1650	1970	2160
	49	1151.1	2070	1810		0	2370	1960	1030	1620	1970	2160
	50	1164.7	2060	1780		0	2380	1990	1020	1540	1970	2140
	51	1165.8	2050	1760		0	2400	2040	1010	1480	1970	2130
	52	1165.8	2050	1730		0	2400	2020	1000	1420	1970	2090
	53	1161.6	2050	1700		0	2380	2020		1360	1960	2070



	54	1152.2	2060	1590		0	2360	2000		1330	1940	2060
	55	1171	2040	1540		0	2330	1990		1300	1940	2040
	56	1194.5	2030	1540		0	2280	1960		1270	1920	2040
	57	1202.8	2030	1700		0	2240	1890		1230	1870	2020
	58	1184.6	1970	1670		0	2220	1790		1200	1830	2020
	59	1115.9	1940	1530		0	2160	1660		1170	1710	2000
Mar (3)	60	1078	1900	1510		0	2060	1560		1010	1600	2000
	61	1039.9	1850	1510		0	2050	1540		1110	1510	2000
	62	1008.4	1770	1540		0	2050	1540		1110	1560	1970
	63	1002.4	1670	1480		0	2070	1590		1110	1560	1920
	64	1007.5	1540	1490		0	2080	1590		1110	1560	1900
	65	1006.3	1540	1500		0	2080	1560		1080	1550	1860
	66	0.65	1520	1500		0	2060	1540		1070	1540	1870
	67	0.8	1500	1520		0	2040	1450		1060	1540	1870
	68	0.78	1470	1540		0	2020	1360		0	1540	1870
	69	0.56	1410	1520		0	1990	1260		0	1540	1840
	70	0.07	1380	1430		0	1960	1190		0	1530	1800
	71	0.15	1280	0		0	1910	1150		0	1470	1770
	72	0.17	1250	0		0	1900	1130		0	1450	1720



	73	0.93	1230	0	0	1890	1100		0	1440	1690
	74	0.5	1210	0	0	1870	1070		0	1420	1680
	75	1017.8	1210	0	0	1830	1060		0	1370	1660
	76	1030.1	1200	0	0	1750	1050		0	1340	1630
	77	1025.8	1170	0	0	1710	1040		0	1320	1610
	78	1007.5	1110	0	0	1680	1030		0	1300	1600
	79	1000.7	1110	0	0	1620	1030		0	1330	1590
	80	1002	1140	0	0	1540	1030		0	1310	1560
	81	1005.8	1120	0	0	1430	1030		0	1300	1530
	82	1004.1	1110	0	0	1410	1030		0	1280	1540
	83	1009.7	1110	0	0	1390	1030		0	1270	1540
	84	0.13	1090	0	0	1350	1030		0	1250	1540
	85		1070	0	0	1290	1030		0	1250	1510
	86	0.06	1050	0	0	1270	1030		0	1250	1500
	87	0.39	1030	0	0	1260	1030		0	1270	1490
	88	0.02	1000	0	0	1250	1030		0	1280	1480
	89	0.93		0	0	1230	1030		0	1270	1510
	90	0.74		0	0	1220	1030		0	1270	1540
Apr (4)	91	0.52		0	1480	1230	1030			1270	1530





	92	0.26		0		1430	1190	1030			1300	1530
	93	0.07		0		1400	1200	1030			1330	1530
	94	0.2	1070	0		1340	1200	1030			1310	1540
	95	0.02	1040	0		1350	1190	1030			1280	1560
	96	0.7	1010	0		1370	1190	1030			1330	1600
	97	0.9	1020	0		1350	1190	1030			1360	1590
	98	0.78	1050	0		1340	1190	1030			1390	1590
	99	0.98	1040	0		1330	1180	1030			1400	1530
	100	1005	1040	0		1290	1150	1030			1390	1510
	101	1000.7	1040	0		1280	1010	1030			1370	1470
	102	1000.3	1050	0		1270	1130	1030			1370	1420
	103	1002	1040	0		1290	1130	1030			1370	1360
	104	1010.9	1040	0		1270	1150	1030			1390	1330
	105	1015.6	1050	0		1230	1170	1030			1390	1310
	106	0.85	1060	0		1190	1010	1030			1450	1260
	107	0.94	1100	0	1010	1210	1040	1030			1460	1260
	108	0.32	1130	0	1070	1230	1080	1030			1480	1260
	109	0.63	1130	0	1110	1250	1130	1030			1450	1260
	110	0.07	1130	0	1160	1270	1200	1030			1470	1270



	111	0.37	1130	0	1210	1280	1240	1030			1470	1260
	112	0.2	1150	0	1250	1280	1250	1030			1450	1270
	113	1010.9	1150	0	1290	1290	1250	1050			1450	1270
	114	1029.7	1140	0	1330	1270	1250	1080			1440	1260
	115	1031	1130	0	1340	1270	1260	1110			1420	1230
	116	1027.5	1130	0	1300	1280	1270	1130			1420	1230
	117	1018.2	1150	0	1330	1300	1280	1070			1410	1250
	118	1026.3	1170	0	1370	1320	1310	1010			1400	1270
	119	1036.1	1180	0	1400	1300	1340	1010			1420	1260
	120	1028	1180	0	1420	1290	1360	1170			1440	1250
May (5)	121	1013.1	1190	0	1450	1310	1360	1200			1440	1220
	122	1001.1	1210	0	1460	1340	1280	1190	1030		1440	1180
	123	1000.3	1240	0	1470	1350	1290	1200	1090		1470	1190
	124	1005.4	1270	0	1480	1360	1300	1200	1010		1480	1220
	125	1039	1260	0	1490	1380	1320	1190	1050		1500	1250
	126	1116.6	1310	0	1500	1370	1310	1190			1470	1270
	127	1209.6	1470	0	1510	1360	1310	1190			1450	1280
	128	1307.8	1420	0	1520	1330	1320	1230			1450	1280
	129	1396.6	1430	0	1540	1320	1360	1260			1440	1300



	130	1403.4	1430	0	1540	1360	1370	1270			1440	1340
	131	1383.5	1380	0	1550	1400	1400	1280	1030		1420	1330
	132	1398.7	1340	0	1560	1420	1430	1310	1180		1420	1330
	133	1471.8	1310	0	1590	1380	1490	1310	1260		1440	1330
	134	1550.5	1300	0	1610	1360	1550	1330	1330		1470	1330
	135	1603.8	1240	0	1620	1310	1600	1330	1450		1480	1340
	136	1634.8	1220	0	1640	1150	1620	1360	1490		1470	1360
	137	1703.8	1210	0	1670	1010	1640	1390	1540		1470	1390
	138	1834	1220	0	1680	1130	1660	1400	1550		1530	1450
	139	1974.4	1220	0	1720	1170	1670	1410	1560		1550	1390
	140	2068	1240	0	1800	1230	1670	1410	1550		1600	1330
	141	2095	1310	0	1900	1210	1660	1420	1540		1650	1330
	142	2081.8	1390	0	1960	1220	1620	1450	1550		1720	1310
	143	2048.2	1450	0	2020	1230	1620	1460	1560		1790	1280
	144	2010.4	1460	0	2060	1270	1670	1440	1590		1890	1300
	145	2004.4	1420	0	2070	1300	1780	1450	1560	1030	1940	1310
	146	2044.6	1460	0	2090	1290	1880	1470	1540	1030	1970	1350
	147	2060.2	1550	0	2130	1280	1990	1500	1530	1030	2000	1400
	148	2078.8	1620	0	2180	1250	2090	1520	1500	1010	2000	1450



	149	2113.9	1720	0	2270	1250	2200	1530	1470	1030	2150	1500
	150	2215.4	1740	0	2370	1230	2290	1560	1450	1050	2330	1480
	151	2279.3	1730	0	2380	1250	2530	1560	1440	1080	2520	1480
June (6)	152	2298	1760	0	2510	1240	2800	1590	1420	1070	2730	1500
	153	2285.3	1820	0	2610	1240	2840	1600	1400	1080	2800	1530
	154	2259.3	1870	0	2680	1280	2840	1600	1360	1070	2910	1550
	155	2221.3	1980	0	2730	1260	2810	1610	1330	1060	2960	1590
	156	2168.6	2110	0	2770	1340	2810	1640	1380	1100	3110	1600
	157	2104.4	2180	0	2810	1430	2830	1670	1440	1150	3280	1620
	158	2069.2	2260	0	2850	1530	2810	1700	1480	1190	3430	1630
	159	2079	2290	0	2880	1620	2810	1690	1510	1250	3580	1630
	160	2129.6	2370	0	2890	1700	2800	1710	1550	1270	3710	1660
	161	2167.3	2440	0	2930	1750	2770	1730	1650	1270	3920	1690
	162	2175.3	2500	0	3170	1790	2770	1740	1770	1270	4030	1760
	163	2187.3	2560	0	3420	1800	2790	1760	1840	1270	4140	1800
	164	2174	2590	0	3740	1830	2870	1780	1830	1300	4050	1830
	165	2178.6	2620	0	4150	1880	2870	1790	1830	1340	4380	1900
	166	2168	2680	0	4230	1900	2990	1810	1840	1410	4450	1940
	167	2164	2760	0	4300	1920	3110	1840	1860	1480	4530	1970



	168	2191.3	2770	0	4330	1950	3190	1880	1900	1500	4580	2000
	169	2251.3	2770	0	4390	1960	3320	1950	1970	1500	4610	2060
	170	2356	2770	0	4410	1960	3390	1960	2000	1560	4670	2130
	171	2464	2790	0	4420	1960	3460	2000	2000	1600	4750	2230
	172	2574.6	2800	0	4420	1950	3480	2050	2020	1600	4780	2410
	173	2690.6	2820	0	4450	1950	3510	2150	2060	1620	4720	2510
	174	2776.2	2820	0	4480	1970	3530	2240	2120	1650	4670	2580
	175	2807.3	2860	0	4510	2000	3590	2370	2180	1620	4650	2610
	176	2894.7	2960	0	4550	2020	3580	2410	2310	1620	4610	2670
	177	3042.7	3040	5200	4580	2050	3580	2460	2440	1630	4560	2730
	178	3162.3	3090	4990	4610	2120	3640	2470	2830	1630	4380	2800
	179	3311.9	3150	5230	4670	2230	3800	2460	3290	1650	4180	2770
	180	3510.7	3180	5290	4730	2310	4020	2460	3780	1690	4080	2760
	181	3715.5	3150	5380	4760	2360	4210	2570	3830	1690	4000	2800
July (7)	182	3866.3	3140	5500	4800	2430	4450	2590	3710	1650	4030	2920
	183	3965.3	3130	5540	4830	2480	4590	2660	3610	1600	4100	2990
	184	4033.4	3090	5560	4880	2560	4650	2640	3520	1650	4170	2950
	185	4078.9	3120	5610	4890	2750	4670	2640	3550	1760	4140	3040
	186	4136.7	3150	5680	4930	2950	4700	2640	3580	1890	4120	3150



	187	4247.2	3160	0	4980	3120	4810	2670	3740	2000	4080	3290
	188	4370.4	3110	0	5060	3290	4940	2800	3960	2090	4080	3360
	189	4457.6	3060	0	5130	3450	5060	2880	4140	2180	4080	3360
	190	4574	2990	0	5230	3610	5110	3080	4610	2270	4050	3290
	191	4725.4	2940	0	5340	3650	5100	3240	4940	2370	4120	3360
	192	4882.8	2880	0	0	3690	5080	3480	5180	2540	4050	3620
	193	5084.1	2880	0	0	3810	5060	3960	5250	2580	4470	3830
	194	5416.2	2950	0	0	4020	5100	4390	5380	2620	4580	4050
	195	5901.3	3100	0	0	4100	5150	4590	5410	2530	4680	4260
	196	6574.5	3380	0	0	4180	5200	4800	5450	2440	4800	4470
	197	7102.5	3730	0	0	4300	5320	4910	5670	2410	5030	4580
	198	7430.5	4020	0	0	4330	5430	4980	5970	2440	5290	4800
	199	7439.6	4210	6190	0	4390	5540	4930	6210	2490	5380	5030
	200	7385.8	4380	6510	0	4480	5680	4890	6370	2510	5400	5500
	201	7407.6	4610	6750	0	4560	6100	4380	6580	2540	5450	5950
	202	7668.7	4850	6770	6870	4720	6210	5130	6730	2580	5560	6210
	203	7991.6	5250	6910	7070	4930	6220	5310	6910	2540	5720	6750
	204	8154.3	5550	7070	7230	5060	6290	5470	7090	2490	5900	7090
	205	8342.2	5980	7610	7380	5160	6470	5670	7290	2570	6070	7380



	206	8630.3	6310	8250	7550	5270	6680	5880	7500	2640	6260	7700
	207	8838.2	6660	8570	7720	5450	6910	6150	7500	2770	6510	7910
	208	8971.2	6990	9050	7880	5670	7270	6870	7880	2850	6690	8250
	209	9026.2	7370	9450	8150	6020	7840	7290	8030	2950	6910	8270
	210	9120.3	7850	9600	8350	6420	8170	7700	8130	3070	6930	8270
	211	9267	8230	9900	8490	6550	8350	8030	8130	3240	6970	8320
	212	9292.6	8500	10600	8690	6660	8540	8220	8170	3530	7030	8470
August (8)	213	9286.5	8640	10700	8710	6750	8660	8490	8270	3750	7250	8730
	214	9100.7	8800	10900	8800	6790	8760	8640	8540	3990	7400	8830
	215	9039.6	9020	10900	8940	6870	8760	8830	8660	4180	7570	8980
	216	9040.8	9160	10900	9090	6950	8760	9000	8800	4390	7770	9140
	217	9091	9180	10600	9180	6870	8730	9290	8890	4720	7880	9500
	218	9271.8	9240	10600	9270	6640	8690	9500	8940	4890	7840	9760
	219	9643.1	9360	10700	9350	6450	8590	9700	8960	5200	7810	10000
	220	10225	9370	10700	9390	6210	8470	9900	8960	5650	7630	10200
	221	10646	9420	10600	9500	6020	8320	10100	9070	6070	7500	10400
	222	10815	9580	10700	9540	5770	8150	10200	9270	6330	7310	10600
	223	11011	9800	10600	9560	5670	8100	10300	9500	6420	7250	10800
	224	11112	10000	10600	9600	5580	8050	10400	9740	6790	7270	11300



	225	11063	10200	10400	9620	5590	8150	10600	9900	7270	7250	11400
	226	11016	10300	10300	9660	5630	8270	10700	10000	7810	7250	11600
	227	10774	10300	10200	9680	5840	8590	11000	10200	8250	7310	12000
	228	10545	10500	10200	9700	6090	8760	11300	10400	8540	7570	12500
	229	10389	10700	10200	9740	6280	8920	11500	10400	8760	8030	13100
	230	10227	10900	10400	9760	6510	9160	11800	10400	8870	8470	13200
	231	10263	11200	10500	9800	7090	9410	12000	10400	9030	9000	13200
	232	10437	11400	10900	9920	7460	9580	12100	10400	8890	9200	13300
	233	10592	11600	11300	10000	8350	9820	12200	10500	9450	9370	13300
	234	10933	11700	11500	10200	8980	10000	12200	10600	9680	9640	13300
	235	11286	11900	0	10400	9240	10200	12300	10600	9960	9900	13300
	236	11744	12200	0	10500	9520	10300	12400	10700	10200	10100	13400
	237	12208	12400	0	10700	9580	10600	12400	10600	10500	10300	13500
	238	12532	12600	0	10900	9640	10800	12300	10700	10700	10600	13400
	239	12849	12800	0	11100	9660	11000	12100	10700	11000	10700	13400
	240	13162	13000	0	11400	9700	11200	11700	11000	11100	11000	13400
	241	13386	13200	0	11600	9700	11300	11500	11100	11300	11200	13500
	242	13562	13400	0	11800	9680	11400	11400	11300	11400	11500	13600
	243	13654	13600	0	12000	9700	11500	11200	11600	11500	11800	13700





September (9)	244	13552	13900	0	12200	9880	11600	11000	11800	11600	12100	13800
	245	14358	14200	0	12600	10000	11600	10800	12200	11600	12300	13900
	246	14778	14500	0	12900	10200	11600	10700	12700	11600	12600	14000
	247	15100	14800	15300	13300	10400	11600	10600	13100	11600	12800	14200
	248	15301	15000	15800	13500	10500	11500	10700	13400	11600	13100	14400
	249	15470	15300	16200	13700	10700	11500	10800	13700	11500	13300	14800
	250	15746	15500	16500	14000	10900	11500	10900	13900	11500	13600	15300
	251	16142	15800	16900	14200	11100	11400	11000	14200	11400	13900	15800
	252	16450	16100	17300	14300	11400	11400	11200	14400	11600	14200	16500
	253	16790	16100	17600	14400	11600	11400	11500	14500	11700	14400	16700
	254	17202	16200	18200	14700	11800	11300	11700	14800	11700	14600	17000
	255	17589	16400	18600	14900	12000	11300	12100	15100	11700	14700	17200
	256	17794	16500	19000	15100	12300	11300	12500	15400	11700	14900	17400
	257	17937	16600	18900	15400	12500	11300	12800	15700	11700	15100	17600
	258	18017	16800	19100	15600	12900	11300	13200	16000	11700	15300	17900
	259	18001	17000	19700	15900	13400	11200	13600	16400	11800	15400	18200
	260	18055	17000	19800	16200	14000	11200	14000	16900	11900	15500	18400
	261	18078	17100	19100	16500	14100	11100	14200	17100	12100	15600	18700



	262	18210	17100	19700	16800	14500	10900	14600	17300	12400	15800	19000
	263	18267	17100	19100	17000	14700	10700	14800	17500	12900	15900	19300
	264	18366	17300	19100	17300	14800	10600	15100	17600	13400	15900	19600
	265	18467	17500	18900	17600	15000	10600	15400	17800	13800	16000	19800
	266	18646	17700	18700	17900	15300	10500	15700	18000	14200	16100	20000
	267	18687	17700	18800	18100	15500	10500	16100	18300	14400	16200	20100
	268	18736	17600	18300	18300	15600	10400	16400	18400	14700	16300	20200
	269	18815	17700	17900	18500	15700	10300	16800	18600	14500	16200	20500
	270	18788	17700	17600	18700	15800	10200	17200	18900	15000	16100	20600
	271	18738	17800	16800	18800	15900	10300	17600	19000	15000	15900	20700
	272	18707	17900	16700	18900	16000	10300	17900	19200	15000	15700	20800
	273	18671	17700	16500	19000	16100	10400	18300	19300	14500	15400	20800
October (10)	274	18607	17700	16200	19100	16100	10600	18600	19500	14700	15000	20800
	275	18527	17600	16000	19300	16200	10700	19000	19800	14800	14700	20800
	276	18461	17600	15800	19300	16300	10800	19200	20300	14800	14400	20800
	277	18368	17500	15600	19400	16500	11000	19500	20500	14800	13900	20600
	278	18258	17300	15200	19600	16600	11100	19700	20700	14800	13500	20500
	279	18162	17300	15000	19700	16600	11100	20100	20800	14800	13100	20200
	280	18027	17200	14900	19700	16800	11200	20300	20900	14700	12800	20000



	281	17846	17100	14700	19700	17200	11300	20400	21100	14700	12600	19700
	282	17711	17000	14700	19400	17400	11400	20700	21100	14600	12200	19400
	283	17506	16800	14700	19000	17500	11500	20900	21400	14500	11900	19100
	284	17204	16600	14600	18800	17600	11500	21100	21500	14400	11700	18900
	285	16924	16500	14500	18600	17700	11500	21200	21600	14200	11600	18600
	286	16624	16300	14200	18400	17800	11500	21400	21600	13800	11500	18300
	287	16306	16000	14000	18100	18000	11500	21600	21600	13200	11400	17800
	288	15785	15800	13800	17400	17800	11400	21800	21700	12700	11400	17400
	289	15346	15500	13500	17000	17700	11500	21900	21400	12200	11500	16800
	290	14776	15100	13700	16500	17700	11500	21900	21300	11700	11500	16500
	291	14287	14700	13600	16000	17600	11500	22000	21100	11200	11400	16100
	292	13966	14200	13500	15500	17400	12000	21400	20800	10600	11400	15500
	293	13436	13600	13300	15000	17100	12200	21600	20200	10100	11500	15200
	294	13002	13000	12500	14900	16800	12400	21200	19700	9760	11500	14500
	295	12540	12500	11800	14800	16500	12600	20900	19300	9310	11600	13800
	296	12228	12000	11700	14700	16000	12900	20600	18700	8690	11600	13300
	297	11670	11700	11300	14600	15700	13000	20200	18300	8250	11600	12500
	298	11245	11200	11200	14500	15500	13100	19800	17600	7960	11500	11700
	299	10732	10900	11000	14300	15200	13200	19400	17000	7590	11300	11200



	300	10062	10800	10800	14100	15000	13300	18900	16200	7310	11100	10800
	301	9254.2	10800	10300	13900	14700	13400	17200	15500	7130	10600	10300
	302	8793.4	10700	9520	13500	13100	13700	16000	14500	7030	10400	9900
	303	8435.1	10600	9350	13100	12100	13900	15700	14400	7010	10100	9140
	304	8360	10300	9180	12800	11400	14300	15100	13900	7050	9740	8690
November (11)	305	8515.7	9950	9000	12500	10800	14600	14600	13300	7090	9330	8200
	306	8260.1	9650	8960	12300	10500	13500	13500	12700	7070	8870	7770
	307	8001	9500	8710	12100	9600	12800	12800	11900	6970	8320	7250
	308	7754.6	9400	8470	11900	8730	11900	11900	11500	6730	7750	6930
	309	7478.8	9180	8220	11900	7810	11400	11400	11200	6330	7310	6530
	310	7068.8	8870	7860	11800	7360	11000	11000	11000	5910	6850	6260
	311	6875.4	8530	7530	11500	7010	10300	10300	10600	5610	6420	6050
	312	6711	8200	7360	11200	6870	9820	9820	10300	5180	6050	5670
	313	6486.5	7770	7210	11000	6750	9310	9310	9970	4880	5770	5400
	314	6244	7410	7070	10700	6550	8710	8710	9580	4620	5470	5130
	315	5980.8	7120	6950	10400	6350	8050	8050	9180	4380	5180	4880
	316	5661.5	6840	6680	9800	6120	7460	7460	8660	4170	4700	4650
	317	5238.3	6600	6510	9450	5700	7230	7230	8270	4000	4420	4470



	318	4567.3	6390	6190	9140	5560	6930	6930	7960	3830	4300	4380
	319	4362.7	6200	5650	8710	5410	6640	6640	7590	3650	4100	4180
	320	4247.2	5950	5470	7960	5310	6380	6380	7460	3490	3950	4030
	321	4035.2	5970	5250	7460	5160	10600	6120	7250	3320	3780	3870
	322	3612.5	6010	4930	7210	4670	10100	5840	7030	3320	3610	3740
	323	3454.3	6010	4510	6910	3780	10000	5650	6810	3290	3360	3580
	324	3384.8	5930	4420	6470	3620	9310	5450	6470	3180	3150	3510
	325	3312.6	5720	4350	6090	3460	8470	5250	6170	3070	2960	3430
	326	3265.8	5440	4330	5830	3380	8080	4940	5770	2880	2770	3320
	327	3189.9	5280	4050	5500	3240	7310	4880	5400	2580	2680	3240
	328	3028.1	5170	4320	5030	3120	6580	4730	5180	2370	2570	3120
	329	2844.9	4890	4330	4860	3000	6260	4650	4980	2230	2440	3040
	330	2767.5	4460	4320	4730	2880	6020	4580	4800	2180	2370	2960
	331	2695.1	4200	4260	4590	2800	5560	4530	4620	2220	2330	2880
	332	2564	4020	4210	4420	2630	0	4470	4470	2330	2290	2810
	333	2308	3930	4150	4320	2510	0	4270	4350	2370	2290	2730
	334	2202.6	3840	4100	4200	2430	0	4150	4230	2350	2270	2670
December (12)	335	2296	3750	4050	4080	2370	0	4050	4120	2330	2250	2610



	336	2385.3	3690	3890	4000	2330	0	3900	4030	2270	2200	2570
	337	2408.6	3620	3750	3950	2310	0	3900	3950	2230	2120	2530
	338	2410	3560	3740	3830	2250	0	3890	3920	2200	2060	2470
	339	2415.3	3490	3620	3680	2210	0	3870	3860	2160	2000	2430
	340	2432.6	3380	3560	3530	2150	0	3870	3780	2120	1990	2400
	341	2415.3	3280	3450	3360	2070	0	3870	3740	2060	1970	2360
	342	2344	3160	3340	3340	2010	0	3860	3650	2020	1970	2300
	343	2296.6	3020	3250	3250	1990	0	3780	3580	2040	1970	2280
	344	2252	2880	3170	3180	1970	0	3710	3520	2060	1970	2250
	345	2184.6	2590	3170	3120	1950	0	3690	3450	2090	1970	2220
	346	2127.2	2340	3110	3080	1940	0	3550	3410	2090	1990	2220
	347	2090.9	2440	3060	2970	1910	0	3460	3390	2070	2000	2200
	348	2086	2570	3100	2830	1890	0	3360	3360	1990	2040	2180
	349	2073.4	2580	3070	2760	1860	0	3320	3350	1830	2040	2150
	350	2042.8	2540	3000	0	1840	0	3240	3350	1600	2040	2130
	351	1980.4	2470	2950	0	1800	0	3170	3320	1530	2040	2090
	352	1915.6	2400	2870	0	1790	0	3120	3280	1500	2060	2060
	353	1819.6	2330	2790	0	1760	0	3080	3190	1550	2060	2020
	354	1663	2270	2720	0	1740	0	3040	3110	1630	2070	2000



	355	1628.8	2220	2630	0	1720	0	3030	3070	1840	2070	1970
	356	1580.2	2170	2530	0	1680	0	2990	3070	1970	2070	1940
	357	1477.8	2110	2440	0	1540	0	2950	3040	2040	2070	1900
	358	1376.2	2060	2440	0	1530	0	2910	3040	2000	2070	1890
	359	1281.7	2020	2350	0	1510	0	2890	3030	1970	2040	1890
	360	1189.8	1990	2280	0	1460	0	2870	3030	1920	2020	1870
	361	1123.5	1970	2280	0	1430	0	2850	2990	1890	2040	1860
	362	1111.2	1940	2270	0	1410	0	2840	2950	1860	2070	1860
	363	1129.6	1920	2220	0	1380	0	2790	2910	1730	2120	1850
	364	1334	1910	2170	0	1360	0	2750	2880	1620	2160	1840
	365	1626.3	1900	2130	0	1330	0	2720	2770	1550	2180	1840
	366	0	0	0	0	0	0	0	0	0	0	0



**Table D.8:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Onitsha) (1982-1992)

Month	Julian Day	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982
Jan (1)	1		1734.7		1949.3	0.52	1306.8	1830.5	1058.7	0.53	2851.4	1799.5
	2	2105.5	1723.9		1913	0.97	1210.7	1779.8	1052.6	0.69	2823	1794.1
	3	2069.5	1731.7	0	1890.4	0.25	1212.8	1708	1045	0.15	2750.7	1816.6
	4	2012.1	1743.4	0	1871.2	0.84	1332.3	1694.2	1035.6	0.53	2624.5	1813.6
	5	1940	1763.8	0	1859.8	0.42	1390.8	1724.8	1024.1	0.44	2542	1795.6
	6	1936.4	1808	0	1849	0.75	1502.1	1667.2	1018.2	0.79	2511.3	1786.6
	7	1964.4	1863.2	0	1828.6	0.51	1548.5	1590.4	0.2	0.15	2476	1786
	8	1970.1	1897.3	0	1781.8	0.44	1500	1488.8	0.04	0.14	2440	1786
	9	1935.7	1900.6	0	1755.4	0.86	1416.4	1429	0.11	0.9	2406.6	1783.6
	10	1918.9	1885.8	0	1758.4	1068.6	1445.7	1376.7	0.83	0.89	2374	1775.8
	11	1915.6	1800.4	0	1769.2	1143.6	1585.1	1329.7	0.7	0.04	2313.3	1772.8
	12	1931.9	1648.1	0	1745.2	1203.9	1693.6	1252.4		0.76	2255.3	1762.6
	13	2006.3	1666.7	0	1700.8	1265.1	1760.2	1176.2		0.01	2242.6	1751.8
	14	2091.6	1697.2	0	1649.8	1306.4	1708	1147		0.6	2242	1743.4
	15	2087.7	1661	0	1615.6	1342.8	1610.2	1104.8	0.39	0.96	2242	1742.8





	16	1983.1	1595.9	0	1610.8	1372.3	1572.4	1077.1	0.54	0.97	2236.6	1740.4
	17	1909.1	1554.3	0	1600.6	1400.5	1572.4	1062.9	0.9	0.57	2219.3	1732.6
	18	1834.5	1541.8	0	1583.2	1427.5	1601.8	1036.9	0.72	0.81	2212.6	1732
	19	1824.1	1560.3	0	1534.6	1443.1	1711	1039.5	0.19	0.76	2195.3	1724.8
	20	1792.4	1719.6	0	1458.7	1429.2	1858	1083.3		0.41	2188.6	1696.6
	21	1774	1761.6	0	1402.8	1399.1	1917.4	1067.2	0.7	0.36	2160.6	1672
	22	1769.9	1774.1	0	1363.7	1297.4	1877.2	1056.5	0.95	0.01	2117.2	1649.8
	23	1789.8	1731.9	0	1352.2	1178.4	1746.4	1062.9	0.5	0.96	2087.8	1660.6
	24	1835	1634.1	0	1345.6	1071.1	1615	1067.2	0.56	0.61	2073.4	1679.2
	25	1853	1512.6	0	1350	0.38	1582.6	1085.2	0.54	0.9	2047.6	1693
	26	1815.8	1442	0	1353.4	0.64	1578.4	1166.2	0.43	0.97	2008	1692.4
	27	1761.3	1375	0	1379.7	0.73	1568.5	1196.6	0.41	0.63	1979.8	1629.4
	28	1767.2	1307	0	1473.9	0.27	1568	1207.5	0.3	0.29	1963	1601.2
	29	1866.8	1264.6	0	1536.9	0.81	1633	1190.8	0.52	0.94	1929.4	1617.4
	30	1962.1	1284.2	0	1559	0.38	1840	1169.9	0.96	0.58	1886.8	1606
	31	1987.3	1314.5	0	1620.7	0.25	2087.2	1144.3	1003.3	0.41	1846	1615
Feb (2)	32	1908.8	1315.2	0	1661.7	0.02	2182.2	1122.9	1022	0.99	1817.8	1635.4
	33	1822.8	1287.2	0	1679.8	0.77	2131.6	1101.5	1030.1	0.56	1805.8	1675
	34	1790.6	1293.5	0	1688.8	1006.8	1965.1	1102	1055.7	0.13	1792.6	1682.8



	35	1813.2	1363.2	0	1688.8	1024	1804.6	1113	1058.2	0.25	1776.4	1698.4
	36	1881.2	1453.8	0	1688.8	1043.3	1651.9	1119.1	1017.3	0.94	1770.4	1694.8
	37	1896.2	1511.7	0	1682.7	1046.3	1498.1	1087.5	0.5	0.8	1750	1676.8
	38	1859.8	1561.4	0	1651.7	1045.4	1355.8	1063.3	0.7	0.29	1730.8	1663
	39	1810.2	1603.9	0	1630.6	1039.6	1241	1061.6	0.98	0.22	1721.8	1642
	40	1730.7	1633	0	1620.6	1038.6	1144.9	1054.8	0.1	0.52	1721.2	1615.6
	41	1643.1	1634.8	0	1631.8	1037.7	1105.9	1031	0.07	0.82	1718.8	1574.5
	42	1598.4	1661	0	1647.6	1033.8	1093.6	1016.9	0.89	0.07	1711	1541.8
	43	1591.9	1741.8	0	1663.4	1046.1	1131.5	0.37	0.07	0.99	1705.6	1550.8
	44	1628.9	1782	0	1679.2	1061.5	1208.1	0.15	0.99	0.7	1690	1613.5
	45	1643.9	1759.4	0	1671.7	1076.8	1314.6	0.06	0.57	0.4	1688.8	1645.6
	46	1615.1	1729.4	0	1529	1082.9	1373.1	0.33	0.23	0.11	1688.8	1683.4
	47	1550.1	1627.2	0	1365	1033.4	1384	0.69	0.54	0.32	1686.4	1673.8
	48	1531.4	1538.7	0	1214.1	0.64	1358.5	0.63	0.47	0.8	1676.2	1648
	49	1530.8	1488.2	0	1141.1	0.49	1336.5	0.89	0.82	0.8	1667.8	1610.8
	50	1550.4	1523.1	0	1068	0.94	1337	0.52	0.14	0.8	1667.2	1588
	51	1540.6	1584.5	0	0.97	0.2	1354.3	0.36	0.22	0.8	1667.2	1571.2
	52	1499.4	1592.7	0	0.67	0.86	1397.1	0.41	0.38	0.81	1672	1570
	53	1451.9	1541.4	0	0.46	0.83	1435.2	0.33	0.62	0.94	1687.6	1559.5



	54	1420.9	1505.8	0	1039.4	0.5	1499.4	0.91	0.68	0.7	1693.6	1529.7
	55	1408.9	1471.4	0	1045.8	0.5	1617.6	0.63	0.7	0.46	1702	1528.2
	56	1386.5	1372	0	1046.3	0.5	1624.6	1023.3	0.32	0.22	1672.6	1480.1
	57	1366.7	1287.9	0	1046.3	0.5	1594	1023.7	0.79	0.98	1645	1435.2
	58	1345.4	1240.8	0	1040	0.33	1594		0.42	0.74	1630.6	1364.7
	59	1333.4	1237.6	0	1014.9	0.84	1599.4	0.7	0.29	0.11	1612	1286.9
Mar (3)	60	1346.2	1231	0	0.05	0.81	1599.4	0.91	0.22	0.19	1600.6	1240.4
	61	1366.8	1222.7	0	0.15		1639	0.58	0.44	0.7	1592.2	1160.5
	62	1380.1	1224.2	0	0.07	0.24	1779.4	0.18		0.2	1589.2	1112.1
	63	1406.3	1237.3	0	0.41	0.49	2042.2	0.67	0.38	0.6	1598.2	1069.1
	64	1394.7	1258.2	0	0.2	0.74	1992.4	0.69	0.06	0.33	1654.6	1021.6
	65	1363.5	1259.8	0	1185.6	0.98	1889.2	0.02	0.62	0.34	1671.4	0.44
	66	1343.5	1258.7	0	1222.2	0.23	1774.6	0.11	0.86	0.69	1687.6	0.28
	67	1323.4	1245.9	0	1228.4	0.79	1649.2	0.89	0.94	0.44	1693.6	0.84
	68	1303.4	1250.4	0	1261.3	0.3	1756	0.17	0.38	0.59	1728.4	0.41
	69	1298.3	1292.4	0	1293.2	0.3	2127.4	0.82	0.57	0.35	1801.6	0.98
	70	1292.8	1325	0	1254	0.18	2310	0.83	0.93	0.19	1847.2	0.54
	71	1280.3	1322	0	1197.1	0.47	2381.3	0.78	0.17	0.61	1873.6	0.11
	72	1287.4	1270.1	0	1084.6	0.78	2378	0.78	0.76	0.82	1845.4	0.68



	73	1304.1	1232.9	0	0.72	0.09	2352	0.19	0.31	0.55	1810.6	0.24
	74	1374.1	1270	0	0.95	0.4	2350	0.3	0.64	0.54	1770.4	0.81
	75	1435.2	1267.1	0	0.76	0.71	2347.3	0.06	0.36	0.78	1749.4	0.32
	76	1439.8	1229.1	0	1063.8	0.02	2341.3	0.22	0.93		1758.4	1026.9
	77	1395.7	1194.5	0	1070.1	0.33	2349.3	0.13	0.29	0.05	1753.6	1138.8
	78	1381.3	1166.6	0	1041.2	0.79	2331.3	0.21	0.5	0.14	1788.4	1147
	79	1372.6	1094.7	0	1096.6	0.75	2216.8	0.83	0.18	0.41	1804	1151.1
	80	1372.6	1081.5	0	1386.1	0.36	2005.8	0.39	0.33	0.65	1804.6	1179.3
	81	1375.2	1084.1	0	1504.2	0.67	1862.2	0.51	0.66	0.37	1827.4	1225.8
	82	1420.4	1084.6	0	1436.8	0.67	1727.2	0.01	0.22	0.69	1826.8	1220.6
	83	1454.9	1084.6	0	1258.7	0.67	1595.2	0.48	0.26	0.17	1819	1207
	84	1506.1	1086.9	0	1078	0.67	1523.7	0.46	0.18	0.9	1820.8	1181.9
	85	1601.5	1092.3	0	0.67	0.98	1439.4	0.04	0.05	0.03	1838.2	1177.2
	86	1613.2	1097.8	0	0.41	0.2	1290.6	0.69	0.59	0.18	1872.4	1208.1
	87	1609.1	1130.3	0	0.68	0.61	1209.6	0.56	0.1	0.67	1889.8	1210.1
	88	1556.6	1143.5	0	0.04	0.49	1178.3	0.67	0.26	0.19	1913.8	1242.5
	89	1537.4	1164.1	0	0.74	0.22	1277	0.13	0.08	0.05	1918	1301.5
	90	1482.8	1158.1	0	0.24	0.96	1343.8	0.19	0.89	0.65	1930.6	1369.4
Apr (4)	91	1465.1	1170.7	0	0.72	0.91	1430.3	0.85	0.41	0.08	1944.4	1413.8



	92	1422.3	1223.5	0	0.74	0.55	1577.4	0.82	0.28	0.65	1933	1438.9
	93	1395.2	1249.7	0	1017.8	0.99	1609	0.72	0.11	0.58	1909.6	1451.4
	94		1269.5	0	1093.1	0.2	1598.2	1013.5	0.62	0.09	1877.8	1469.7
	95		1308.3	0	1117.3	0.03	1577.5	1020.7	0.07	0.43	1852.6	1484.3
	96	0	1281.9	0	1125		1557.5	1040.8	0.24	0.57	1846	1491.6
	97	0	1257.8	0	1153.7	0.66	1526.1	1046.3	0.61		1828	1507.8
	98	0	1249.2	0	1186.6	0.03	1443.6	1026.7	0.62	0.23	1816.6	1500
	99	0	1262.6	0	1206.5	0.63	1338.6	1030.5	0.95	0.49	1805.8	1516.7
	100	0	1349	0	1221.1	0.09	1280.6	1032.7	0.28	0.57	1790.2	1539.7
	101	0	1418.9	0	1226.3	0.49	1214.3	1046.7	0.48	0.9	1763.8	1577.5
	102	0	1441.8	0	1231.6	0.28	1109.5	1071.4	0.44	0.35	1759	1613.2
	103	0	1392.9	0	1226.3	0.16	1071.9	1069.3	0.87	0.19	1774	1623.4
	104	0	1350.8	0	1317.2	0.03	1171.6	1098.6	0.41	0.75	1770.4	1616.8
	105	0	1343.3	0	1426.9	1173.2	1729.6	1126.2	1001.6	0.93	1754.8	1588.6
	106	0	1292.3		1499.5	1355.1	2359.8	1144.9	0.57	0.86	1758.4	1567
	107	0	1363.7	0.96	1476	1372.7	2682.4	1195	0.65	0.6	1771.6	1550.1
	108	0	1486.5	0.57	1477.5	1380.2	2746.9	1185.6	0.28	0.89	1757.8	1548.5
	109	0	1554.6	0.57	1488	1503.5	2849.5	1178.3	0.76	0.84	1738.6	1562.1
	110	0	1574.9	0.89	1399.2	1701.7	2931.5	1149.6	0.24	0.55	1752.4	1547.5



	111	0	1527.8	0.07	1339.1	1864.2	2953.8	1115	0.1	0.43	1748.8	1566.4
	112	0	1490.8	0.06	1360	1979.2	2936.1	1085.2	0.29	0.62	1733.2	1589.8
	113	0	1473.2	0.25	1456.1	2088.4	2880.9	1056.1	0.19	0.13	1729.6	1586.8
	114	0	1406.3	0.79	1509.9	2196.4	2798.9	1045.4	0.99	0.98	1714.6	1564.9
	115	0	1384.1	1023.5	1530.9	2252	2789.7	1014.3	0.9	0.37	1707.4	1530.8
	116	0	1334.5	1120.8	1742.4	2283.8	2819.6	0.78	0.74	0.4	1774.6	1486.4
	117	0	1298.3	1250.3	2309.8	2270.9	2982.1	0.44	0.68	0.98	1835.2	1480.7
	118	0	1362.2	1362	2544.6	2190.9	3117.1	0.52	0.19	0.64	1867.6	1493.7
	119	0	1437.6	1434	2568.6	2010.4	3172.3	0.19	0.38	0.13	1857.4	1505.2
	120	0	1485.5	1474.5	2544	1853.6	3166.1	1028.4	0.28	0.07	1846	1539.1
May (5)	121	0	1422	1513.5	2528.6	1713.1	3180.7	1103.7	0.79	0.57	1865.2	1538.5
	122	0	1307.1	1527.7	2445.3	1588.5	3252	1064.7	0.78	0.44	1882	1517.4
	123	0	1160.3	1519.2	2262.1	1532.4	3331.7	0.39	0.47	0.08	1878.4	1502.8
	124	0	1060.3	1607.6	2102.6	1652.1	3338.6	0.76	0.74	0.01	1867.6	1488.1
	125	0	1065.7	1738.5	2186.8	1778.1	3255.8	0.46	0.06	0.69	1877.2	1473.5
	126	0	1092.6	1817.1	2397.3	1823.2	3159.2	0.56	0.47	0.44	1858	1458.9
	127	0	1147.1	1757.5	2576	1630.4	3116.3	0.52	0.39	0.26	1841.2	1444.3
	128	0	1210.8	1670.3	2684.2	1422.5	3117.1	0.19	0.92	0.25	1844.8	1429.7
	129	0	1292.4	1689.7	2936.2	1244.5	3082.6	0.39	0.5	0.08	1865.2	1415



	130	0	1382.9	1804	2917.7	1195.4	3012.8	0.37	0.58	0.01	1877.2	1415.1
	131	0	1486.9	1849.9	2830.3	1176.5	2946.1	0.85	0.92	0.69	1862.8	1427.9
	132	0	1530.6	1856.9	2854.9	1164.7	2931.5	0.17	0.7	0.94	1864	1449.8
	133	0	1657.9	1860.4	2956.1	1153.9	2900.1	1025.4	0.19	0.5	1874.2	1545
	134	0	1793.2	1914.7	3113.2	1197.7	2785.1	1041.6	0.19	0.4	1880.2	1662.7
	135	0	1850.4	1963	3311.8	1332.3	2713.9	1023.3	0.15	0.99	1870.6	1752.4
	136	0	1812	2024.7	3385.4	1465.5	2641.4	0.91	0.59	0.33	1867	1764.4
	137	0	1741.7	2091.8	3351.7	1541.7	2517.3	1026.3	0.52	0.2	1882	1727.2
	138	0	1746.1	2156	3304.1	1623.3	2346	1075.2	0.35	1030.1	1878.4	1713.4
	139	0	1763.3	2230.1	3245.9	1735.9	2200.1	1109.2	0.91	1114.1	1877.2	1750.6
	140	0	1782.9	2237.8	3252.8	1628.2	2006.9	1128.7	0.04	1169.4	1969.6	1772.8
	141	0	1810.4	2236.8	3373.1	1500.3	1874.8	1167.3	1016.9	1140.2	1997.2	1823.2
	142	0	1848.5	2264	3433.7	1401.7	1741	1191.9	1005.4	1141.7	2036.8	1781.8
	143	0	1974.1	2307.6	3331.1	1307.7	1599.4	1226.3	0.82	1155.3	2066.8	1760.2
	144	0	2158.9	2293	3152.3	1223.9	1579	1259.2	0.32	1160.5	2120.3	1802.8
	145	0	2368.2	2256.1	3064.2	1196.7	1573	1311.5	0.87	1174.1	2177.3	1912
	146	0	2568.9	2185	3089.5	1150.6	1577.8	1372.6	0.33	1175.2	2215.3	1982.8
	147	0	2753.6	2153.8	3172.3	1193.9	1573	1394.5	0.85	1177.2	2228.6	2053
	148	0	3026.9	2195.7	3211.4	1373.1	1585	1419.6	1022.4	1186.1	2268.6	2086.6



	149	0	3327.2	2288.3	3216	1577.3	1608.4	1473.3	1044.2	1203.9	2294	2039.2
	150	0	3718.3	2303.5	3268.9	1705.2	1637.8	1550.5	1109.4	1246.7	2318	1967.2
	151	0	4039.7	2325.2	3175.3	1795.3	1645.6	1603.8	1187.8	1280.6	2336.6	1939
June (6)	152	0	4564.7	2334	2999.8	1919.1	1615.6	1632.4	1224.2	1304.7	2359.3	1934.8
	153	0	4989.9	2271.5	2966	1959.6	1610.8	1674.4	1239.9	1339.1	2434	1931.8
	154	0	5301.9	2220.4	3032	2059.4	1603	1720	1249.3	1365.8	2456.6	1954
	155	0	5514.3	2253.3	3072.6	2122.4	1600	1768.6	1284.8	1380.9	2468.6	1983.4
	156	0	5717.5	2313.3	3101	2185.4	1592.2	1804.6	1316.2	1396.6	2508.6	2020
	157	0	5920.3	2344	3104	2217.8	1601.2	1842.4	1316.7	1452.5	2536.6	2088.4
	158	0	6057.5	2374.8	2996.7	2318	1658.8	1865.2	1283.8	1516.5	2566.6	2116.8
	159	0	6069.5	2389.2	2838.8	2385	1811.8	1891.6	1261.3	1636.1	2588	2144
	160	0	5958.6	2286.4	2855.6	2418.1	2201.2	1933.6	1259.8	1675.6	2631.3	2148.6
	161	0	5745.7	2212.1	2945.3	2405.3	2890.8	1976.8	1253.5	1687.6	2662.6	2160
	162	0	5510.1	2263	3173.8	2367.9	3350.4	2008	1235.2	1721.2	2690.5	2190.6
	163	0	5385.1	2310.5	3326.4	2330.6	3543.7	1985.8	1248.8	1741	2750.1	2284.6
	164	0	5346.5	2423.4	3386.2	2293.3	3564.6	1925.8	1286.9	1782.4	2770.5	2384
	165	0	5352.4	2474.7	3308.7	2317.2	3458.4	1896.4	1345.9	1823.2	2794.3	2460.6
	166	0	5388.1	2473.3	3100.2	2414.8	3293.7	1859.2	1471.3	1870.6	2805.8	2538.6
	167	0	5357.4	2438.2	2961.4	2432.8	3104.8	1838.8	1664.7	1957	2812.7	2592





	168	0	5299.7	2370.7	2926.2	2382.5	2959.9	1825	1807	2052.1	2832.6	2607.3
	169	0	5380.6	2318.7	2910.8	2340.9	2830.3	1801.6	1918	2235.2	2843.4	2583.3
	170	0	5612.8	2288.8	2944.6	2299.2	2769.8	1834.6	1980.4	2402.6	2882.5	2537.3
	171	0	5766.4	2284	3005.1	2270.4	2718.4	2029.6	2081	2536.6	2923.9	2448
	172	0	5917	2342.5	3066.5	2173	2674.7	2095.7	2152.9	2721.7	2959.1	2356.6
	173	0	6089.2	2471.1	3189.1	2084.4	2613.3	2172.8	2144.9	2974.8	3011.3	2368.6
	174	0	6209.3	2571.8	3326.9	2033.5	2560.6	2220	2118.2	3227.6	3184.5	2445.3
	175	0	6265.5	2657.5	3458.7	1984.8	2674	2276.6	2192.7	3434.7	3404.7	2502
	176	0	6374	2780.4	3569.5	1956.4	3055.4	2321.3	2310	3565.4	3726.2	2514
	177	0	6594.3	2898.4	3666.8	1916	3193.7	2412.6	2438	3631.9	4015.3	2556
	178	0	6845.8	3040.5	3672	1875.4	3282.7	2364	2573.3	3713.9	4068.7	2649.7
	179	0	6934	3180.1	3725.9	1865.2	3340.2	2317.3	2662.2	3808.8	3969.4	2825.8
	180	0	6917.7	3149.9	3763.8	1943.1	3370.8	2300.6	2810.2	3842.8	3912.1	3021.2
	181	0	6859.3	3114.8	3791.7	2003	3303.4	2262.6	3002.1	3875.3	3748.5	3218.3
July (7)	182	0	6805.6	3044.5	3877.3	2000.8	3179.2	2290	3089.5	3924.7	3778.8	3404
	183	0	6736.7	3021	3934.4	1981.9	3095.6	2326.6	3203.7	3992.9	3880.2	3649.1
	184	0	6636.3	3341.9	3969.4	1969.7	3076.4	2298.6	3312.6	4082.5	3853.7	3885
	185	0	6713.6	3481.9	4168.6	1961.5	3094.8	2279.3	3345.5	4261.1	3827.2	4041.3
	186	0	6920.7	3694.2	4312.3	1979.8	3084.1	2310	3418.8	4260.1	3668.9	4180.8



	187	0	7057.1	3711.5	4456	2069.3	3019.7	2411.3	3519.2	3855.7	3610.8	4251.4
	188	0	7083.2	3729.6	4539.8	2181.7	2912.4	2416	3605.2	3763.3	3436.8	4344.7
	189	0	7104.9	3885	4719.6	2229.6	2814.2	2494	3648.2	3661.1	3320.9	4484.2
	190	0	7151.4	4083.8	4844.9	2268.5	2759	2802	3709	3537	3464.1	4608.2
	191	0	7256.9	4206.2	4881.7	2325.3	2691.7	3202.9	3766.6	3566.2	3763	4750.2
	192	0	7393.4	4282.4	4900.2	2391.1	2563.5	3391	3899.6	3746.3	3938.8	4817.8
	193	0	7488.7	4313.6	5018.5	2485.6	2558.1	3558.3	4011.5	3848.5	4024.2	4876.5
	194	0	7556.2	4364.3	5116.8	2554.4	2604.3	3652.2	4104.7	3955.6	4065.3	4981.4
	195	0	7594.2	4401.5	5215	2720.4	2675.5	3721.2	4223.3	4172.5	4139.3	5270.5
	196	0	7559.3	4432	5294.2	3020	2764.9	3769	4409.7	4417.4	4321.2	5547.2
	197	0	7630	4426.1	5849.9	3153.9	2865.7	3903.7	4652.7	4653.6	4476.5	5709.3
	198	0	7779.7	4456	5993.8	3274.5	3001.6	3994.5	4848.5	4875.9	4562	5883.3
	199	0	7871.6	4564.5	6213.7	3399.5	3166.9	4168.4	5017.9	5134.3	4639.9	6043.9
	200	0	7991.3	4893.2	6349.7	3531.7	3357.6	4419.2	5185.5	5308.7	4674.1	6294.2
	201	0	8410.2	5077.4	6417.9	3674.1	3543	4438	5336	5424	4687.8	6504.2
	202	0	8562.9	5560.1	6703.3	3795.1	3620.5	4448.2	5552.9	5460.2	4645.9	6660.8
	203	0	8863.2	5898.6	6813.7	3832.4	3606.4	4502.1	5871.6	5531.6	4606.5	6578
	204	0	9244.7	6147.8	7268.4	3814.8	3610.9	4592	6072.9	5610.8	4609.9	6617.1
	205	0	9630.7	6438.1	7382.7	3752.4	3753.9	4684.4	6275.9	5665.6	4685.2	6523.3



	206	0	9984.4	6761.8	7331.4	3780.8	3947.4	4810.5	6474	5757.1	4773.3	6498.2
	207	0	10268	6913.6	7296.1	3847.8	4116.5	5027.2	6498.2	5927.8	4799.9	6569.7
	208	0	10413	6930.3	7168.5	3975.4	4279.1	5143.4	6386.1	5960.7	4686.1	6647.5
	209	0	10519	6947.5	7080.8	4049.6	4329.8	5129.7	6299.1	5998.4	4645	6787.6
	210	0	10679	7124.8	6993.1	3991.9	4349.6	5185.5	6352.2	6053.5	4589.4	6889.1
	211	0	10977	7405.6	6905.5	3955.1	4294.5	5199.2	6494.3	6122.2	4496.1	6963.5
	212	0	11195	7775	6886	3970.5	4200.1	5154.2	6620.9	6184	4392.6	7011.6
August (8)	213	0	11668	8077.4	6857.6	4229.4	4151.4	5229.5	6775.2	6240.1	4295.9	7063.1
	214	0	11825	8426.6	6621	4310.6	4141.8	5473.9	6983	6345.5	4247.2	7067.7
	215	0	11999	8821.8	6544	4324.5	4121	5610.8	7155.8	6421.8	4400.3	7033.3
	216	0	12162	9220.6	6559	4308.9	4133.6	5765.9	7353.8	6504	4595.4	7087.1
	217	0	12258	9362.5	6636.7	4345.1	4179.4	5975.2	7593.9	6559.1	4748.5	7210.7
	218	0	12349	9457.5	6784.8	4389.4	4250.5	6185	7816.9	6574.6	4921	7266.8
	219	0	12411	9580.4	6837.6	4422.2	4306.7	6349.3	7983.1	6612.3	5068.1	7082.6
	220	0	12431	9716.2	6980.9	4460.4	4355.4	6536.8	7987.9	6641.2	5241.2	7024.2
	221	0	12414	9912.2	7073.6	4546.6	4615	6806.1	7850	6730.4	5458.3	7016.2
	222	0	12374	9933.6	7141.2	4658	4697.4	7129.5	7943.9	6738.1	5634.3	7005.9
	223	0	12418	9965	7518.9	4796.7	4749	7268	8043.8	6685.4	5747.2	7042.5
	224	0	12479	10013	7656.7	4872.7	4914.3	7442.3	8085.4	6652.2	5863.2	7168.4



	225	0	12609	10015	7943.7	4869.3	5087.5	7774.5	8180.5	6650	6121.9	7397.3
	226	0	12724	10061	8154.6	4861.3	5220.2	8064	8275.6	6727.8	6320.7	7707.4
	227	0	12885	10173	8346.4	4908.7	5269.2	8243.5	8461.1	6994.4	6358.9	8131.9
	228	0	13001	10401	8573.8	5038.7	5302.3	8409.9	8654.1	7072.3	6440.1	8432.5
	229	0	13098	10684	8933.2	5292.8	5324.3	8575.2	8902.9	7129.5	6481.9	8599
	230	0	13367	10924	9296.4	5607.4	5365.6	8714.3	9309.7	7162.7	6608.8	8664.4
	231	0	13666	11033	9699.2	5903.8	5447.3	8615.6	9685.2	7183.3	6648.5	8773.3
	232	0	14005	11177	10120	6418.5	5441.5	8487.2	10133	7265.7	6723	8904
	233	0	14226	11283	10599	6763.5	5395.4	8418.3	10607	7358.4	6753	9040.8
	234	0	14490	11358	11346	6509.1	5376.9	8363.6	10956	7436.2	6747.6	9159.4
	235	0	14779	11363	11599	6738.7	5498.5	8339.8	11265	7547.2	6502.9	9138.6
	236	0	14968	11259	12044	7136.5	5777.8	8332.7	11512	7660.6	6213.6	9009.1
	237	0	15175	11135	12402	7273.9	6172.1	8376.6	11690	7865.6	6267.9	8871
	238	0	15430	11056	12656	7644	6489.5	8458.7	11755	8079.4	6382	8770
	239	0	15620	11043	12865	8321.3	6979	8613.4	11707	8260.1	6452.5	8638.3
	240	0	15765	11202	13072	8972.7	7368.4	8775.9	11848	8351.7	6782.9	8570.4
	241	0	16076	11367	13331	9603.3	7529.1	8805.2	12110	8506.2	6898.2	8731.2
	242	0	16221	11469	13529	9917.2	7869.5	8676.4	12264	8672.7	7207.1	8878.3
	243	0	16419	11553	13759	10514	8311.4	8516.9	12413	8813.6	7402.7	9236.4



September (9)	244	0	16830	11692	13944	10692	9066.5	8438.5	12468	9070.2	7486.7	9573.4
	245	0	16974	11904	14177	10813	9598.6	8570.7	12240	9207.1	7646.4	10029
	246	0	17239	12203	14306	10923	10184	8964.2	12249	9352.5	7781.6	10603
	247	0	17613	12535	14372	11031	10719	9646.7	12296	9583.5	7820.8	11002
	248	0	17824	12880	14459	11151	10949	9994.2	12381	9733.8	7911.8	11209
	249	0	17994	13112	14575	11375	11182	10392	12561	9869.7	8068.7	11457
	250	0	18073	13323	14660	11758	11534	10677	12706	10074	8206.6	11666
	251	0	18127	13489	14851	12181	11721	10803	12930	10269	8544.7	11781
	252	0	18159	13661	15047	12714	11888	10885	13008	10472	8846.9	11941
	253	0	18124	13860	15315	13234	12039	11025	13140	10687	9053.1	12180
	254	0	18067	14170	15615	13554	12140	11220	13296	10842	9185.1	12148
	255	0	18052	14366	15766	13835	12215	11429	13426	11007	9306.1	12165
	256	0	18043	14569	15881	14175	12281	11618	13786	11156	9487	12240
	257	0	18039	14705	15975	14363	12320	11782	14105	11102	9793.5	12273
	258	0	18013	14770	16069	14593	12392	11930	14363	11051	10173	12325
	259	0	17987	14843	16097	14775	12384	12122	14830	11093	10518	12380
	260	0	17978	14957	16087	14929	12348	12281	15218	11149	10925	12405
	261	0	17970	15011	16056	15102	12241	12356	15661	11320	11168	12469



	262	0	17938	15080	16133	15274	12118	12234	16001	11357	11420	12468
	263	0	17873	15153	16097	15425	11989	12004	16202	11444	11560	12485
	264	0	17807	15224	16032	15568	11924	11860	16401	11462	11593	12425
	265	0	17788	15250	15991	15696	11935	11756	16503	11388	11671	12386
	266	0	17684	15260	16085	15871	11956	11729	16678	11370	11696	12389
	267	0	17565	15277	16352	16095	11975	12039	17044	11494	11763	12401
	268	0	17365	15295	16491	16308	11983	12188	17380	11493	11783	12369
	269	0	17215	15357	16560	16524	12026	12289	17568	11145	11722	12305
	270	0	17002	15410	16570	16653	12098	12560	17744	10634	11506	12266
	271	0	16741	15377	16577	16749	12202	12670	17880	10069	11425	12253
	272	0	16521	15359	16620	16848	12379	12721	17838	9248.9	11359	12202
	273	0	16333	15270	16704	16871	12544	12836	17656	8681.9	11374	12148
October (10)	274	0	15935	15201	16739	16922	12667	12977	17581	8707.2	11450	12144
	275	0	15623	15178	16775	16977	12772	13172	17481	8771.2	11544	12138
	276	0	15505	15169	16964	17010	12916	13282	17338	8993.2	11731	12142
	277	0	15290	15120	16974	17050	13081	13310	17217	9273.1	11937	12226
	278	0	14854	14866	16947	17156	13119	13462	17162	9369.6	12078	12310
	279	0	14461	14691	16963	17269	13083	13725	17075	9439.3	11898	12428
	280	0	14202	14561	17160	17354	13056	14276	16919	9366	11730	12553



	281	0	14027	14226	17462	17391	13035	14515	16301	9386.7	11554	12712
	282	0	13910	13835	17709	17421	13026	14566	15736	9302.4	11685	12897
	283	0	13856	13456	17773	17450	12987	14580	15345	9213.2	11703	12989
	284	0	13790	12904	17457	17476	12983	14711	15125	9142.3	11197	13018
	285	0	13768	12729	17061	17480	13114	14725	14595	8923.8	10433	12954
	286	0	13720	12216	16512	17469	13213	14433	14142	8698	9279.3	12842
	287	0	13581	11875	16212	17396	13378	14229	13726	8596.6	8296.9	12801
	288	0	13466	11716	15987	17326	13484	14033	13301	8536	7657.4	12742
	289	0	13330	11471	15827	17206	13553	13778	12881	8413.5	6574.2	12710
	290	0	13132	11236	15708	17012	13566	13545	12428	8244.7	5846.5	12674
	291	0	12879	11204	15464	16796	13453	13090	12024	8137.7	5589.6	12661
	292	0	12511	11204	15188	16518	13235	12580	11792	8027.1	5324.3	12605
	293	0	12134	11204	15310	16254	12909	12236	11572	7864.2	5089.6	12506
	294	0	11807	11231	15491	16010	12514	11661	11313	7735.9	4800.7	12377
	295	0	11476	11337	15689	15598	12037	11135	10989	7513.1	4550.9	12206
	296	0	11247	11421	15853	15460	11731	10570	10687	7367.7	4325	11985
	297	0	11060	11469	15967	15159	11380	9937.6	10350	7277.9	4130.5	11686
	298	0	10789	11428	16050	14647	11014	9389	10057	7282.8	3669.7	11430
	299	0	10472	11109	16065	14146	10651	8862	9683.4	7343.4	3356.6	11132



	300	0	10173	10615	15910	13687	10283	8372.2	9329.3	7384.8	3043.4	10836
	301	0	9931.4	9874.7	15589	13252	9797.9	8022.4	8958.7	7311.3	2730.3	10560
	302	0	9680.5	9624	14960	12756	9313.4	7828.6	8500.7	6973.7	2622	10268
	303	0	9466.4	9127.4	14229	11918	8766.2	7627.2	8037.6	6746.4	2532.6	9827.1
	304	0	9295.3	8707.7	13276	11350	8250.8	7082.7	7848.9	6639.9	2513.3	9313.3
November (11)	305	0		8342.6	12220	10655	7895.3	6933.8	7687.5	6432.6	2495.3	9025
	306	0	8889.5	8021.3	11241	9954.8	7596.9	6733.8	7621.9	6180.2	2486	8811.6
	307	0	8845.4	7718	10362	9330.8	7246.2	6658	7008.8	5886.9	2449.3	8636
	308	0	8823.5	7439.9	9541.1	8744.3	6883.3	6819.7	6742.8	5593.1	2399.3	8450.4
	309	0	8801.5	7227.4	8997.9	8233.1	6547.1	7043.6	6185.8	5326.3	2350.6	8213.8
	310	0	8730.1	7033.4	8487.7	7806.4	6236.2	7213	5860.1	5007.5	2325.3	7962.9
	311	0	8289.8	6813.4	7795.8	7345.8	5988.8	7281.7	5790.3	4330.5	2270.6	7564.7
	312	0	8091.3	6622.3	6773.5	6827.2	5901	7010.5	5886.3	3662.9	2203.6	6990.9
	313	0	7440.9	6398.2	6326.4	6342.7	5811.4	6668.9	5758.1	3389.1	2084.8	6513.2
	314	0	7220.4	6133.2	5922.4	5877.6	5691.1	6500.5	5498.3	3219.8	1990.6	6079.7
	315	0	6819.2	5906.7	5489.4	5462.5	5537.9	6469.2	5254.9	3093.3	1928.2	5751.1
	316	0	6535.4	5687.3	5183.5	5137.1	5287.8	6404.4	4905.3	2958.2	1909	5501.5
	317	0	6318.1	5515.2	4967.4	4865.6	5024	6195.6	4377.9	2888.2	1882.6	5279.3





	318	0	6103.3	5134.8	4795.3	4655.6	4856.9	5840.2	4035.9	2846.1	1870.6	5040.3
	319	0	5839.4	5024.1	4589.4	4461	4714.8	5483.6	3814.4	2804.1	1857.4	4835.3
	320	0	5544.5	4781.4	4442.2	4299.1	4562.8	5105.8	3649.3	2787.3	1838.8	4695.5
	321	0	5266.4	4554.5	4295.9	4141.5	4401.4	4615.5	3351.9	2741	1820.2	4568
	322	0	4977.4	4350.6	4201.8	4034.5	4194.8	4266.2	3178.4	2643	1781.2	4423.4
	323	0	4744.9	4253.1	4189	3888.7	3972.5	3790	3064.2	2585.3	1741	4278
	324	0	4668.6	4241.3	4098.5	3773.2	3668.1	3704.1	2963	2542.6	1685.2	4212.4
	325	0	4623.9	4256.7	3926.4	3698.4	3366.8	3619	2879.4	2481.3	1646.2	4154.1
	326	0	4500.1	4248	3716.3	3576.5	3097.4	3541.1	2754.5	2423.3	1589.8	4138.2
	327	0	4252.5	4237.8	3571.9	3439.1	2846.4	3485.1	2624.5	2405.3	1523.7	4097.3
	328	0	4007.1	4235.3	3460.2	3252.6	2739.3	3407	2528.6	2379.3	1466.6	4083.7
	329	0	3823.7	4224.2	3360.3	3007	2660.3	3361.7	2452	2346.6	1420.6	4038
	330	0	3715.6	4161.3	3222.1	2874.6	2569.8	3355.5	2410	2319.3	1402.3	4006.1
	331	0	3679.1	4039.3	3058.8	2834.4	2494.7	3330.2	2385.3	2289.3	1368.4	3982
	332	0	3667.1	3854.1	2867.1	2805.2	2422.7	3245.9	2328	2257.3	1345.9	3892.8
	333	0	3613.6	3658.3	2713.2	2778.8	2350.7	3098.7	2273.3	2171.3	1338.1	3872
	334	0	3535.5	3518.7	2574.2	2830.1	2276.8	2962.2	2236	2099.6	1311.5	3888.7
December (12)	335	0	3402.8	3319.4	2488	2868.5	2200.1	2881.7	2202.6	2036.8	1281.2	3965.7



	336	0	3292.5	3155	2428.6	2861.9	2150	2818.8	2196.6	1989.4	1235.7	3908.1
	337	0	3222.7	3086.9	2260.6	2849.8	2100.6	2736.1	2257.3	1956.4	1173.1	3863.9
	338	0	3166.9	3120.3	2267.3	2846.3	2049.4	2661.6	2297.3	1886.8	1142.3	3776.3
	339	0	3078.3	3209.3	2288	2839.3	2008	2634	2205.3	1798.6	1114.4	3691.1
	340	0	2994.2	3274.9	2312.6	2861.5	1972.6	2604.6	2116.5	1741.6	1090.4	3648.2
	341	0	2926.9	3266.5	2278	2889.1	1930	2544.6	2015.9	1703.2	1074.4	3587.3
	342	0	2812.8	3175.2	2242.6	2905.1	1889.2	2429.3	1954	1618.9	1055.7	3552.4
	343	0	2757.3	3141.6	2134.1	2845.4	1858.6	2289.3	2025.4	1530.2	1024.1	3509.5
	344	0	2751.4	3241.8	2023.8	2751.8	1834	2200.6	2061.4	1503.3	0.46	3465.7
	345	0	2732.6	3410.1	2022	2656	1795	2145.2	2102	1602.6	0.98	3419
	346	0	2681.2	3455.9	2178.7	2586.3	1732	2070.6	2143.4	1605.4	0.06	3366.3
	347	0	2656.2	3299.5	2455.3	2489.2	1667.2	1977.4	2098.2	1610.2	0.85	3327.1
	348	0	2592	3084.8	2682.1	2355.8	1603	1885.6	2039.2	1605.4		3301.8
	349	0	2559.2	2850.7	2743.9	2240.2	1552.5	1793.2	1999.6	1580	0.78	3281.1
	350	0	2554.7	2683.3	2785.9	2114.2	1540.2	1748.8	1972	1458	0.31	3229
	351	0	2550.3	2597.9	2808.9	2005.7	1532.9	1685.2	1927.6	1378.8	0.28	3135.5
	352	0	2520.1	2555.7	2778.2	1931.5	1530.3	1541.8	1879	1303.6	0.19	3051.1
	353	0	2509.2	2505	2765.9	1953	1519.3	1448.3	1876.6	1238.9	0.54	3015.9
	354	0	2463.4	2414.8	2759	1983.4	1498.9	1373.1	1955.2	1214.3	0.9	3010.5



	355	0	2426.1	2304.5	2736	2008	1469.2	1372.6	1978.6	1210.7	0.5	3003.6
	356	0	2396.5	2199.5	2724.5	2040.7	1430	1350.6	2022.4	1201.8	0.5	3003.6
	357	0	2369	2183.1	2723.8	2066.3	1371	1368.4	2059	1194.5	0.5	2974.5
	358	0	2346.2	2268	2739.1	2021.5	1293.7	1398.1	2041.6	1191.9	0.89	2963
	359	0	2303.6	2334	2798.1	1955.2	1279.6	1418.5	2024.8	1183	0.04	2933.1
	360	0	2299.5	2381.8	2828.8	1934.3	1242	1406	2016.4	1171.5	0.4	2930.8
	361	0	2359.2	2350.7	2821.1	1965.2	1191.3	1459.2	1990.6	1149		2924.6
	362	0	2361.7	2174.4	2808.1	1981.5	1126	1507.8	1973.8	1116.7	0.78	2904.7
	363	0	2322.8	1984.9	2756	2004.3	1062.9	1492.1	1940.2	1095.9	0.31	2903.2
	364	0	2280.4	1846.1	2713	2037.8	1020.7	1445.9	1905.7	1076.2	0.5	2903.2
	365			1789.8	2709	2030.8	0.48	1421.4	1897.2	1066.2	0.5	2903.1
	366	0	0	0	0	0	0	0	0	0	0	0



**Table D.9:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Onitsha) (1993-2003)

Month	Julian Day	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993
Jan (1)	1		2873.8	2891.1	3511.3						0	
	2	0	2846.6	2903.2	3499.5						0	0
	3	0	2834.9	2901.6	3485.1	0	0	0	0	0	0	0
	4	0	2831.1	2878.5	3473.8	0	0	0	0	0	0	0
	5	0	2818.1	2894.2	3473	0	0	0	0	0	0	0
	6	0	2795.1	2921.8	3469.7	0	0	0	0	0	0	0
	7	0	2748.3	2943.5	3455.9	0	0	0	0		0	0
	8	0	2722.2	2945.4	3441.3	0	0	0	0	2727.3	0	0
	9	0	2710.7	2951.3	3426.7	0	0	0	0	2701.8	0	0
	10	0	2710	2930.2	3412.1	0	0	0	0	2683.1	0	0
	11	0	2716.1	2900.1	3400.8	0	0	0	0	2597.6	0	0
	12	0	2739.1	2880.2	3400	0	0	0	0	2566.3	0	0
	13	0	2753.7	2852.9	3396.9	0	0	0	0	2587.5	0	0
	14	0	2764.4	2812.6	3383.9	0	0	0	0	2663.8	0	0
	15	0	2756	2780.3	3373.1	0	0	0	0	2689.8	0	0



	16	0	2696.3	2766.2	3366.2	0	0	0	0	2706.1	0	0
	17	0	2570.7	2765.2	3331	0	0	0	0	2699.4	0	0
	18	0	2452.6	2766	3267.3	0	0	0	0	2817.7	0	0
	19	0	2362.6	2778.7	3211.4	0	0	0	0	2820.8	0	0
	20	0	2336.6	2790.9	3156.2	0	0	0	0	2830.3	0	0
	21	0	2334.6	2779.2	3085.6	0	0	0	0	2833.8	0	0
	22	0	2365.3	2760.3	2974.5	0	0	0	0	2821.4	0	0
	23	0	2398	2731.3	2898.6	0	0	0	0	2821.7	0	0
	24	0	2448	2679.6	2861	0	0	0	0	2831.4	0	0
	25	0	2471.3	2627.6	2848.7	0	0	0	0	2833.6	0	0
	26	0	2484	2591.8	2860.2	0	0	0	0	2812.6	0	0
	27	0	2490.6	2598.9	2897	0	0	0	0	2746.1	0	0
	28	0	2480	2555.4	2890.1	0	0	0	0	2692.2	0	0
	29	0	2494.6	2530.5	2886.3	0	0	0	0	2634.7	0	0
	30	0	2554.3	2506.5	2872.6	0	0	0	0	2615.6	0	0
	31	0	2484.7	2483.8	2856.2	0	0	0	0	2588.8	0	0
Feb (2)	32	0		2443.9	2772.1	0	0	0	0	2578.8	0	0
	33	0		2410.7	2736.8	0	0	0	0	2578	0	0
	34	0	0	2374.7	2721.5	0	0	0	0	2578	0	0



	35	0	0	2338.7	2710.7	0	0	0	0	2572.6	0	0
	36	0	0	2303.4	2710	0	0	0	0	2596	0	0
	37	0	0	2278.5	2702	0	0	0	0	2604.3	0	0
	38	0	0	2342.1	2668	0	0	0	0	2626.7	0	0
	39	0	0	2385.5	2632	0	0	0	0	2633	0	0
	40	0	0	2350.7	2596	0	0	0	0	2609.7	0	0
	41	0	0	2307.2	2560	0	0	0	0	2602.7	0	0
	42	0	0	2279.8	2516	0	0	0	0	2597.9	0	0
	43	0	0	2278	2440.6	0	0	0	0	2595.5	0	0
	44	0	0	2277.3	2356.6	0	0	0	0	2593.1	0	0
	45	0	0	2264.8	2314	0	0	0	0	2590.7	0	0
	46	0	0	2230.7	2313.3	0	0	0	0	2589.3	0	0
	47	0	0	2190.9	2360.6	0	0	0	0	2584.1	0	0
	48	0	0	2159.1	2412	0	0	0	0	2580.5	0	0
	49	0	0	2146.9	2435.3	0	0	0	0	2578.9	0	0
	50	0	0	2138.7	2448	0	0	0	0	2578	0	0
	51	0	0	2134	2460	0	0	0	0	2581.2	0	0
	52	0	0	2132.6	2474.6	0	0	0	0	2583.8	0	0
	53	0	0	2111.8	2498	0	0	0	0	2586.5	0	0



	54	0	0	2108.7	2516.6	0	0	0	0	2589.1	0	0
	55	0	0	2088.8	2520.6	0	0	0	0	2586	0	0
	56	0	0	2056.6	2532	0	0	0	0	2566.9	0	0
	57	0	0	2001.6	2544	0	0	0	0	2474.9	0	0
	58	0	0	1918.2	2556	0	0	0	0	2425.1	0	0
	59	0	0	1868.6	2562.1	0	0	0	0	2428.5	0	0
Mar (3)	60	0	0	1871.5	2525.5	0	0	0	0	2547.7	0	0
	61	0	0	1940.9	2518.5	0	0	0	0	2566.8	0	0
	62	0	0	1999.2	2520.6	0	0	0	0	2575.8	0	0
	63	0	0	2007.9	2529.3	0	0	0	0	2569.7	0	0
	64	0	0	2001.3	2527.3	0	0	0	0	2569.7	0	0
	65	0	0	1991.4	2516	0	0	0	0	2579.1	0	0
	66	0	0	1980	2504	0	0	0	0	2463.4	0	0
	67	0	0	1959.8	2494.6	0	0	0	0	2348.3	0	0
	68	0	0	1962.8	2494	0	0	0	0	2217.4	0	0
	69	0	0	1962.6	2491.3	0	0	0	0	2222.8	0	0
	70	0	0	1927	2477.3	0	0	0	0	2271.8	0	0
	71	0	0	1895	2443.3	0	0	0	0	2305.3	0	0
	72	0	0	1883.4	2382	0	0	0	0	2338.9	0	0



	73	0	0	1872.6	2338.6	0	0	0	0	2342.9	0	0
	74	0	0	1861.8	2272	0	0	0	0	2308.5	0	0
	75	0	0	1840.4	2137.4	0	0	0	0	2223.7	0	0
	76	0	0	1818	1935.8	0	0	0	0	2121.6	0	0
	77	0	0	1797.8	1926.4	0	0	0	0	2101.4	0	0
	78	0		1786.2	1891.6	0	0	0	0	2099.3	0	0
	79	0	1584.4	1774.8	1924	0	0	0	0	2187.7	0	0
	80	0	1666.9	1754.6	2115.6	0	0	0	0	2201.5	0	0
	81	0	1561.9	1743	2241.4	0	0	0	0	2206	0	0
	82	0	1458.1	1732.2	2317.3	0	0	0	0	2262.9	0	0
	83	0	1450.7	1721.4	2356	0	0	0	0	2302.3	0	0
	84	0	1437.6	1710.6	2386.6	0	0	0	0	2284.2	0	0
	85	0	1385.1	1699.8	2394.6	0	0	0	0	2266	0	0
	86	0	1366.9	1682.5	2386.6	0	0	0	0	2247.9	0	0
	87	0	1354.8	1664	2383.3	0	0	0	0	2221.9	0	0
	88	0	1367.9	1650.5	2374.6	0	0	0	0	2226.4	0	0
	89	0	1361.8	1649	2377.2	0	0	0	0	2292.5	0	0
	90	0	1357.8	1645.6	2390.8	0	0	0	0	2315.2	0	0
Apr (4)	91	0	1372.6	1634.1	2405.5	0	0	0	0	2338	0	0





	92	0	1371.2	1626	2393.1	0	0	0	0	2335.5	0	0
	93	0	1355.5	1655.1	2372.6	0	0	0	0	2326.8	0	0
	94	0	1336.1	1677.1	2365.3	0	0	0	0	2331.1	0	0
	95	0	1302.4	1677.3	2378.6	0	0	0	0	2338	0	0
	96	0	1284.2	1672.7	2396.6	0	0	0	0	2338	0	0
	97	0	1301.8	1692.6	2392.6	0	0	0	0	2311.7	0	0
	98	0	1342.5	1716	2372.6	0	0	0	0	2142.7	0	0
	99	0	1361.4	1721.8	2352	0	0	0	0	2012.1	0	0
	100	0	1361.8	1731.1	2308.6	0	0	0	0	1984.4	0	0
	101	0	1353.7	1732	2280	0	0	0	0	1986.1	0	0
	102	0	1340.2	1730.7	2280.6	0	0	0	0	2004	0	0
	103	0	1295	1723.9	2297.3	0	0	0	0	1982.8	0	0
	104	0	1297.2	1762.4	2326.6	0	0	0	0	1972.8	0	0
	105	0	1306.4	1782.3	2340	0	0	0	0	1920.1	0	0
	106	0	1328	1807.7	2352	0	0	0	0	1913	0	0
	107	0	1348.9	1839.5	2364	0	0	0	0	1951.5	0	0
	108	0	1390	1852.1	2376	0	0	0	0	1981.1	0	0
	109	0	1509.9	1831.5	2388	0	0	0	0	1989.4	0	0
	110	0	1610.3	1831.3	2389.3	0	0	0	0	1975.8	0	0



	111	0	1673.9	1797.4	2358.6	0	0	0	0	1863.6	0	0
	112	0	1726.4	1758.9	2331.3	0	0	0	0	1785.2	0	0
	113	0	1745.8	1747.7	2320		0	0	0	1809.6	0	0
	114	0	1708	1752.9	2372.6	1948	0	0	0	1879.3	0	0
	115	0	1728.1	1749.5	2390.6	1948	0	0	0	1893.6	0	0
	116	0	1711.9	1782.8	2411.3	1946.8	0	0	0	1899.9	0	0
	117	0	1712.5	1787.8	2426.6	1932	0	0	0	1902.9	0	0
	118	0	1713.2	1832.2	2450	1937.1	0	0	0	1862.6	0	0
	119	0	1716.6	1926.7	2473.4	1955.9	0	0	0	1706.2	0	0
	120	0	1706.5	1947.1	2495.2	1981.9	0	0	0	1655.8	0	0
May (5)	121	0	1663.3	1968.9	2542	2031.1	0	0	0		0	0
	122	0	1691.2	1959	2536.6	2025	0	0	0		0	0
	123	0	1705.6	1948.2	2514	2021.9	0	0	0	0	0	0
	124	0	1686.5	1926.2	2487.3	2014	0	0	0	0	0	0
	125	0	1714.9	1884.5	2454.6	2001.9	0	0	0	0	0	0
	126	0	1743.7	1851.8	2430	1965.4	0	0	0	0	0	0
	127	0	1780.4	1844.6	2408.6	1917.5	0	0	0	0	0	0
	128	0	1727.3	1875	2401.3	1868.7	0	0	0	0	0	0
	129	0	1760.9	1914.9	2414.6	1854.6	0	0	0	0	0	0



	130	0	1758.8	1950.9	2438	1875.3	0	0	0	0	0	0
	131	0	1728.9	1976.5	2459.3	1883.7	0	0	0	0	0	0
	132	0	1706.2	2004.3	2464	1894.1	0	0	0	0	0	0
	133	0	1676.4	2012.1	2447.3	1941.5	0	0	0	0	0	0
	134	0	1692.2	1991	2446	1957.2	0	0	0	0	0	0
	135	0	1677.5	1953.3	2443.3	1974.8	0	0	0	0	0	0
	136	0	1679.8	1945.2	2434.6	1983.2	0	0	0	0	0	0
	137	0	1625.7	2020.7	2431.3	1993.3	0	0	0	0	0	0
	138	0	1579.7	2092.4	2417.3	2038	0	0	0	0	0	0
	139	0	1592.4	2167.3	2396.6	2085	0	0	0	0	0	0
	140	0	1603.2	2217.9	2376	2202.3	0	0	0	0	0	0
	141	0	1620.7	2263.8	2311.3	2297.8	0	0	0	0	0	0
	142	0	1670.4	2277	2197.3	2383.5	0	0	0	0	0	0
	143	0	1694.7	2278	2135.3	2462.2	0	0	0	0	0	0
	144	0	1686.1	2278.6	2117.6	2507.4	0	0	0	0	0	0
	145	0	1676.7	2302.1	2090.8	2500.6	0	0	0	0	0	0
	146	0	1665.9	2348.5	2078.4	2468.3	0	0	0	0	0	0
	147	0	1654.2	2378.2	2157	2426.4	0	0	0	0	0	0
	148	0	1607.1	2397	2227.3	2415.2	0	0	0	0	0	0



	149	0	1566.9	2399.3	2298.6	2430.7	0	0	0	0	0	0
	150	0	1534.7	2418.7	2397.6	2446.1	0	0	0	0	0	0
	151	0	1477.5	2399.8	2478.4	2492.3	0	0	0	0	0	0
June (6)	152	0	1444.8	2386	2627.5	2485.6	0	0	0	0	0	0
	153	0	1439.9	2385.3	2651.1	2451.4	0	0	0	0	0	0
	154	0	1466.1	2374.9	2661.3	2425.7	0	0	0	0	0	0
	155	0	1507.9	2374.6	2670	2397.2	0	0	0	0	0	0
	156	0	1525.5	2397.5	2723.2	2436.3	0	0	0	0	0	0
	157	0	1629.6	2440.4	2841.2	2440.3	0	0	0	0	0	0
	158	0	1614.2	2559.6	2977.5	2435.1	0	0	0	0	0	0
	159	0	1592.7	2563.5	3126.3	2462.1	0		0	0	0	0
	160	0	1579.4	2593.2	3188.4	2547.3	0	3004	0	0	0	0
	161	0	1571	2554.3	3240.5	2612.8	0	3189.9	0	0	0	0
	162	0	1570	2548.5	3291.9	2684	0	3388.1	0	0	0	0
	163	0	1570	2610	3385.9	2744.1	0	3518.1	0	0	0	0
	164	0	1570	2816.5	3516.9	2796.6	0	3648	0	0	0	0
	165	0	1569.3	2974.7	3618.1	2768.7	0	3758.4	0	0	0	0
	166	0	1568.3	3062.1	3696.8	2690.7	0	4024.1	0	0	0	0
	167	0	1586.2	3101	3736.6	2643	0	4390.5	0	0	0	0



	168	0	1574.4	3084.3	3749.5	2656.7	0	4634.2	0	0	0	0
	169	0	1578.1	3063.6	3756.8	2724.9	0	4877.8	0	0	0	0
	170	0	1576	3017	3784.4	2766.2	0	5121.5	0	0	0	0
	171	0	1608.8	2986	3839.6	2811.3	0	5365.2	0	0	0	0
	172	0	1579.1	2956.6	3975.8	2913.1	0	5467.4	0	0	0	0
	173	0	1607.2	2915.2	4112.5	3064.8	0	5728.7	0	0	0	0
	174	0	1596.5	2861.8	4256.7	3205.9	0	5816.7	0	0	0	0
	175	0	1576	2813.5	4398.6	3378.2	0	6086.2	0	0	0	0
	176	0	1558.4	2815.2	4553.5	3424.7	0	6266	0	0	0	0
	177	0	1558	2882.5	4568.9	3481	0	6445.8	0	0	0	0
	178	0	1553.2	2996.3	4540.6	3593.9	0	6625.6	0	0	0	0
	179	0	1558.8	3099.8	4530.4	3780.2	0	6805.4	0	0	0	0
	180	0	1561.4	3220	4587.5	3861.7	0	6985.3	0	0	0	0
	181	0	1566.4	3340.3	4652.1	3737.4	0	7075.3	0	0	0	0
July (7)	182	0		3628.7	4769.1	3675.8	0	7442.9	0	0	0	0
	183	0		3704.1	4841.2	3874.8	0	7349.6	0	0	0	0
	184	0	0	3765	5000.4	4159.7	0	7287.3	0		0	0
	185	0	0	3830.7	5152.2	4324.7	0	7225.1	0	0.57	0	0
	186	0	0	3940.2	5224.6	4451.7	0	7162.9	0		0	0



	187	0	0	4068.8	5286.2	4763.7	0	7100.7	0		0	0
	188	0	0	4263.3	5391.8	5087.9	0		0	0	0	0
	189	0	0	4412.9	5562.9	5246.5	0		0	0	0	0
	190	0	0	4397.5	5754.1	5285	0	0	0	0	0	0
	191	0	0	4303.2	6002.2	5242.1	0	0	0		0	0
	192	0	0	4215	6232.4	5190.2	0		0		0	0
	193	0	0	4092.2	6302	5185	0		0	0	0	0
	194	0	0	4005.9	6302.9	5294.5	0	0	0	0	0	0
	195	0	0	3982.1	6230.4	5416.3	0	0	0		0	0
	196	0	0	4053.8	6120.2	5680.3	0		0		0	0
	197	0	0	4215.3	5983	5978.2			0	0	0	0
	198	0	0	4432.2	5859.2	6176.5			0		0	0
	199	0	0	4613.1	5801.2	6351	0		0	6683.8	0	0
	200	0	0	4730.6	5426.8	6484.2	0		0	6894.6	0	0
	201	0	0	4848	4561.9	6487.1	0		0	6997.2	0	0
	202	0	0	5044.1	5536.7	6561.2	0		0	7070.6	0	0
	203	0	0	5392.6	5507.2	6630.7	0		0		0	0
	204	0	0	5833.8	5482.7	6715.8	0	0	0		0	0
	205	0	0	6051.8	5420.1	6838.9	0		0	0	0	0



	206	0	0	5980.1	5374.2	7100.2	0		0	0	0	0
	207	0	0	5808	5354.6	7314.2	0		0	0	0	0
	208	0	0	5601.7	5337	7451.4	0	0	0	0	0	0
	209	0	0	5478.6	5303.8	7541.9	0	0	0	0	0	0
	210	0	0	5355.4	5227.5	7604.2	0	0	0		0	0
	211	0	0	5232.9	5205.6	7652.5	0	0	0		0	0
	212	0	0	5205.1	5292.6	7724.6	0	0	0	0	0	0
August (8)	213	0	0	5392.8	5822.5	7577	0	0	0	0	0	0
	214	0	0	5579.7	6223.6	7614.1	0	0	0	0	0	0
	215	0	0	5807.9	6703.4	7782.4	0	0	0		0	0
	216	0	0	5921.3	7179.9	8008.1	0	0	0	8455.2	0	0
	217	0	0	6132.3	7894.2	8268.5	0	0	0	8827.7	0	0
	218	0	0	6404.4	8423.9	8481.3	0	0	0	9063	0	0
	219	0	0	6756.4	8974.3	8690.3	0	0	0	9264	0	0
	220	0	0	7020.8	9500.4	8943.2	0	0	0	9880.6	0	0
	221	0	0	7260.2	10142	9186.3	0	0	0	10453	0	0
	222	0	0	7463.9	10603	9403.8	0	0	0	10782	0	0
	223	0	0	7713.2	11031	9507.7	0	0	0	10941	0	0
	224	0	0	7904.7	11344	9474.7	0	0	0	11235	0	0



	225	0	0	8030.4	11562	9364.7	0	0	0	11501	0	0
	226	0	0	8190.9	11734	9243.7	0	0	0	11589	0	0
	227	0	0	8354.1	11868	9138.6	0	0	0	11793	0	0
	228	0	0	8579	11834	8993.2	0	0	0	12305	0	0
	229	0	0	8835.8	12133	8894.2	0	0	0	12545	0	0
	230	0	0	9192.7	12376	8932.1	0	0	0	12961	0	0
	231	0	0	9459.5	12509	9062.8	0	0	0	13189	0	0
	232	0	0	9734.1	12563	9230.3	0	0	0	13415	0	0
	233	0	0	9978.6	12581	9471.1	0	0	0	13684	0	0
	234	0	0	10204	12680	9817.7	0	0	0	13904	0	0
	235	0	0	10357	12745	10224	0	0	0	14072	0	0
	236	0	0	10460	12835	10669	0	0	0	14123	0	0
	237	0	0	10583	12911	11371	0	0	0	14134	0	0
	238	0	0	10629	12989	11947	0	0	0	14245	0	0
	239	0	0	10804	13056	12500	0	0	0	14445	0	0
	240	0	0	10946	13170	12916	0	0	0	14639	0	0
	241	0	0	11191	13281	12634	0	0	0	14682	0	0
	242	0	0	11371	13455	11408	0	0	0	14871	0	0
	243	0	0	11505	13593	12648	0	0	0	14952	0	0





September (9)	244	0	0	11785	13742	13419	0	0	0	15271	0	0
	245	0	0	11868	13833	13498	0	0	0	15384	0	0
	246	0	0	11930	13939	13665	0	0	0	15523	0	0
	247	0	0	11957	14000	13850	0	0	0	15540	0	0
	248	0	0	11990	14065	14025	0	0	0	15625	0	0
	249	0	0	12093	14164	14216	0	0	0	15882	0	0
	250	0	0	12198	14232	14422	0		0		0	0
	251	0	0	12342	14328	14652	0		0		0	0
	252	0	0	12537	14453	14844	0	0	0	0	0	0
	253	0	0	12783	14562	15144	0	0	0	0	0	0
	254	0	0	12984	14924	15398	0	0	0	0	0	0
	255	0	0	13179	15224	15601	0	0	0	0	0	0
	256	0	0	13389	15478	15817	0	0	0	0	0	0
	257	0	0	13584	15649	16146	0	0	0	0	0	0
	258	0	0	13779	15747	16430	0	0	0	0	0	0
	259	0	0	13989	15892	16661	0	0	0	0	0	0
	260	0	0	14175	16005	16862	0	0	0	0	0	0
	261	0	0	14301	16184	17020	0	0	0	0	0	0



	262	0	0	14399	16309	17119	0	0	0	0	0	0
	263	0	0	14480	16480	17229	0	0	0	0	0	0
	264	0	0	14532	16569	17305	0	0	0	0	0	0
	265	0	0	14660	16624	17344	0	0	0	0	0	0
	266	0	0	14785	16629	17388	0	0	0	0	0	0
	267	0	0	14917	16629	17392	0	0	0	0	0	0
	268	0	0	14997	16629	17392	0	0	0	0	0	0
	269	0	0	15137	16597	17392	0	0	0	0	0	0
	270	0	0	15302	16532	17392	0	0	0	0	0	0
	271	0	0	15430	16548	17392	0	0	0	0	0	0
	272	0	0	15564	16419	17399	0	0	0	0	0	0
	273	0	0	15651	16297	17433	0	0	0	0	0	0
October (10)	274	0	0	15899	16118	17626	0	0	0		0	0
	275	0	0	15970	15916	17691	0	0	0	16424	0	0
	276	0	0	16057	15769	17903	0	0	0	16424	0	0
	277	0	0	16145	15622	17920	0	0	0	16419	0	0
	278	0	0	16239	15487	17920	0	0	0	16400	0	0
	279	0	0	16336	15373	17985	0	0	0	16478	0	0
	280	0	0	16389	15324	18197	0	0	0	16701	0	0



	281	0	0	16489	15239	18213	0	0	0	16717	0	0
	282	0	0	16564	15241	18278	0	0	0	16712	0	0
	283	0	0	16671	15250	18490	0	0	0	16693	0	0
	284	0	0	16767	15250	18506	0	0	0	16693	0	0
	285	0	0	16857	15257	18506	0	0	0	16710	0	0
	286	0	0	16877	15371	18571	0	0	0	16829	0	0
	287	0	0	16919	15437	18783	0	0	0	16834	0	0
	288	0	0	16929	15495	18862	0	0	0	16818	0	0
	289	0	0	16943	15543	19064	0	0	0	17008	0	0
	290	0	0	16904	15571	19080	0	0	0	17025	0	0
	291	0	0	16820	15560	19080	0	0	0	16991	0	0
	292	0	0	16712	15486	19080	0	0	0	16932	0	0
	293	0	0	16541	15342	19080	0	0	0	16742	0	0
	294	0	0	16352	15202	19080	0	0	0	16688	0	0
	295	0	0	16120	15024	19142	0	0	0	16689	0	0
	296	0	0	15847	14669	19344	0	0	0	16643	0	0
	297	0	0	15446	14295	19360	0	0	0	16228	0	0
	298	0	0	15022	13834	19360	0	0	0	16121	0	0
	299	0	0	14544	12963	19360	0	0	0	14978	0	0



	300	0	0	13991	12452	19360	0	0	0	14433	0	0
	301	0	0	13301	12088	19360	0	0	0	14295	0	0
	302	0	0	12500	11661	19360	0	0	0	14157	0	0
	303	0	0	11715	11098	19360	0	0	0	14055	0	0
	304	0	0	11167	10350	19359	0	0	0	13771	0	0
November (11)	305	0	0	9824.5	9414.6	19244	0	0	0		0	0
	306	0	0	9294.8	8852.1	19170	0	0	0		0	0
	307	0	0	8753.8	8469.8	19061	0	0	0	0	0	0
	308	0	0	8269.8	8175.4	18949	0	0	0	0	0	0
	309	0	0	7898.2	7900	18823	0	0	0	0	0	0
	310	0	0	7539.8	7402.7	18653	0	0	0	0	0	0
	311	0	0	7198.1	7010.5	18470	0	0	0	0	0	0
	312	0	0	6896	6634.7	18254	0	0	0	0	0	0
	313	0	0	6634.5	6317.1	17993	0	0	0	0	0	0
	314	0	0	6399.8	6196.3	17722	0	0	0	0	0	0
	315	0	0	6153.1	6005.5	18069	0	0	0	0	0	0
	316	0	0	5896.7	5853	19829	0	0	0	0	0	0
	317	0	0	5650.8	5562.5	19584	0	0	0	0	0	0



	318	0	0	5416.2	5188.1	19053	0	0	0	0	0	0
	319	0	0	5227.5	5079.2	17622	0	0	0	0	0	0
	320	0	0	5082.8	4943	14544	0	0	0	0	0	0
	321	0	0	4976.7	4632.2	13396	0	0	0	0	0	0
	322	0	0	4838.2	4472.8	12421	0	0	0	0	0	0
	323	0	0	4728	4331.7	11500	0	0	0	0	0	0
	324	0	0	4616.8	4103.5	10689	0	0	0	0	0	0
	325	0	0	4491	3917.7	10005	0	0	0	0	0	0
	326	0	0	4360.1	3795.1	9340.2	0	0	0	0	0	0
	327	0	0	4254	3668.6	8640.5	0	0	0	0	0	0
	328	0	0	4167.8	3561.2	8171	0	0	0	0	0	0
	329	0	0	4099.3	3445.4	7823	0	0	0	0	0	0
	330	0	0	4013.2	3347.1	7434.3	0	0	0	0	0	0
	331	0	0	3889.9	3267.5	7062	0	0	0	0	0	0
	332	0	0	3660.3	3200.9	6712	0	0	0	0	0	0
	333	0	0	3481.7	3180.2	6461.2	0	0	0	0	0	0
	334	0	0	3397.2	3175.7	6317.5	0	0	0	0	0	0
December (12)	335	0	0	3211.9	3094.9	6137.9	0	0	0	0	0	0



	336	0	0	3137.2	3021.8	6001.5	0	0	0	0	0	0
	337	0	0	3061.1	2973	5815.6	0	0	0	0	0	0
	338	0	0	2998.2	2923.8	5587.8	0	0	0	0	0	0
	339	0	0	2923.1	2904.2	5341.7	0	0	0	0	0	0
	340	0	0	2866.4	2933.4	5205.8	0	0	0	0	0	0
	341	0	0	2811.2	3025.9	5089.9	0	0	0	0	0	0
	342	0	0	2765.2	3092.8	5015.1	0	0	0	0	0	0
	343	0	0	2749.1	3134.1	4946.6	0	0	0	0	0	0
	344	0	0	2735.3	3138.8	4872.6	0	0	0	0	0	0
	345	0	0	2724.5	3136.7	4775	0	0	0	0	0	0
	346	0	0	2720.7	3127.8	4689.1	0	0	0	0	0	0
	347	0	0	2710.7	3088.6	4612.9	0	0	0	0	0	0
	348	0	0	2710	3055.5	4532.2	0	0	0	0	0	0
	349	0	0	2710	3027.1	4477	0	0	0	0	0	0
	350	0	0	2710	2987.6	4404.7	0	0	0	0	0	0
	351	0	0	2710	2958.9	4313.3	0	0	0	0	0	0
	352	0	0	2710	2931.3	4182.2	0	0	0	0	0	0
	353	0	0	2702	2903.7	4037.2	0	0	0	0	0	0
	354	0	0	2676	2892	4068.2	0	0	0	0	0	0



	355	0	0	2703.4	2916.7	4055.7	0	0	0	0	0	0
	356	0	0	2842.1	2928.1	4027.8	0	0	0	0	0	0
	357	0	0	3013.6	2903.7	3972.6	0	0	0	0	0	0
	358	0	0	3119.4	2875.3	3896.4	0	0	0	0	0	0
	359	0	0	3169.2	2836.6	3812.1	0	0	0	0	0	0
	360	0	0	3147	2821.4	3751.7	0	0	0	0	0	0
	361	0	0	3122.4	2810.4	3713.3	0	0	0	0	0	0
	362	0	0	3098.7	2780.3	3670.3	0	0	0	0	0	0
	363	0	0	3048.8	2765.4	3638.4	0	0	0	0	0	0
	364	0	0	3003	2755.6	3618.3	0	0	0	0	0	0
	365	0		2945.9	2814	3608.7					0	0
	366	0	0	0	0	0	0	0	0	0	0	0

**Table D.10:** Monthly Discharge (m<sup>3</sup>/s) for Niger River (Onitsha) (2004-2014)

Month	Julian Day	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
Jan (1)	1	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0



	3	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0	0





	22	0	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0	0
	27	0	0	0	0	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0	0	0	0	0
	29	0	0	0	0	0	0	0	0	0	0	0	0
	30	0	0	0	0	0	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0	0	0	0	0	0
Feb (2)	32	0	0	0	0	0	0	0	0			0	0
	33	0	0	0	0	0	0	0	0			0	0
	34	0	0	0	0	0	0	0	0	0		0	0
	35	0	0	0	0	0	0	0	0			0	0
	36	0	0	0	0	0	0	0	0	0	1712.8	0	0
	37	0	0	0	0	0	0	0	0	0	1772.8	0	0
	38	0	0	0	0	0	0	0	0	0	1822.6	0	0
	39	0	0	0	0	0	0	0	0	0	1849	0	0
	40	0	0	0	0	0	0	0	0	0	1850.8	0	0



	41	0	0	0	0	0	0	0	0	0	1848.4	0	0
	42	0	0	0	0	0	0	0	0	0	1835.8	0	0
	43	0	0	0	0	0	0	0	0	0	1814.8	0	0
	44	0	0	0	0	0	0	0	0	0	1793.2	0	0
	45	0	0	0	0	0	0	0	0	0	1778.8	0	0
	46	0	0	0	0	0	0	0	0	0	1785.4	0	0
	47	0	0	0	0	0	0	0	0	0	1771.6	0	0
	48	0	0	0	0	0	0	0	0	0	1698.4	0	0
	49	0	0	0	0	0	0	0	0	0	1597.6	0	0
	50	0	0	0	0	0	0	0	0	0	1558.2	0	0
	51	0	0	0	0	0	0	0	0	0	1571.3	0	0
	52	0	0	0	0	0	0	0	0	0	1575.7	0	0
	53	0	0	0	0	0	0	0	0	0	1551.2	0	0
	54	0	0	0	0	0	0	0	0	0	1499.5	0	0
	55	0	0	0	0	0	0	0	0	0	1423.7	0	0
	56	0	0	0	0	0	0	0	0	0	1354.3	0	0
	57	0	0	0	0	0	0	0	0	0	1342.3	0	0
	58	0	0	0	0	0	0	0	0	0	1363.7	0	0
	59	0	0	0	0	0	0	0	0	0	1378.3	0	0



Mar (3)	60	0	0	0	0	0	0	0	0	0	1405.5	0	0
	61	0	0	0	0	0	0	0	0	0	1431.6	0	0
	62	0	0	0	0	0	0	0	0	0	1442.5	0	0
	63	0	0	0	0	0	0	0	0	0	1425.8	0	0
	64	0	0	0	0	0	0	0	0	0	1413.3	0	0
	65	0	0	0	0	0	0	0	0	0	1427.4	0	0
	66	0	0	0	0	0	0	0	0	0	1455.1	0	0
	67	0	0	0	0	0	0	0	0	0	1457.2	0	0
	68	0	0	0	0	0	0	0	0	0	1457.2	0	0
	69	0	0	0	0	0	0	0	0	0	1457.2	0	0
	70	0	0	0	0	0	0	0	0	0	1455.1	0	0
	71	0	0	0	0	0	0	0	0	0	1442	0	0
	72	0	0	0	0	0	0	0	0	0	1414.9	0	0
	73	0	0	0	0	0	0	0	0	0	1388.7	0	0
	74	0	0	0	0	0	0	0	0	0	1373.6	0	0
	75	0	0	0	0	0	0	0	0	0	1372.6	0	0
	76	0	0	0	0	0	0	0	0	0	1372.6	0	0
	77	0	0	0	0	0	0	0	0	0	1372.6	0	0
	78	0	0	0	0	0	0	0	0	0	1380.9	0	0



	79	0	0	0	0	0	0	0	0	0	1414.3	0	0
	80	0	0	0	0	0	0	0	0	0	1449.3	0	0
	81	0	0	0	0	0	0	0	0	0	1479.1	0	0
	82	0	0	0	0	0	0	0	0	0	1433.1	0	0
	83	0	0	0	0	0	0	0	0	0	1404.9	0	0
	84	0	0	0	0	0	0	0	0	0	1411.7	0	0
	85	0	0	0	0	0	0	0	0	0	1416.9	0	0
	86	0	0	0	0	0	0	0	0	0	1410.7	0	0
	87	0	0	0	0	0	0	0	0	0	1404.4	0	0
	88	0	0	0	0	0	0	0	0	0	1367.1	0	0
	89	0	0	0	0	0	0	0	0	0	1341.2	0	0
	90	0	0	0	0	0	0	0	0	0	1315.4	0	0
Apr (4)	91	0	0	0	0	0	0	0	0	0	1308.2	0	0
	92	0	0	0	0	0	0	0	0	0	1313	0	0
	93	0	0	0	0	0	0	0	0	0	1345.9	0	0
	94	0	0	0	0	0	0	0	0	0	1402.8	0	0
	95	0	0	0	0	0	0	0	0	0	1463.9	0	0
	96	0	0	939	0	0	0	0	0	0	1503.6	0	0
	97	0	0	931	0	0	0	0	0	0	1508.9	0	0



	98	0	0	924	0	0	0	0	0	1502.1	0	0
	99	0	0	931	0	0	0	0	0	1543.8	0	0
	100	0	0	931	0	0	0	0	0	1637.5	0	0
	101	0	0	931	0	0	0	0	0	1703.2	0	0
	102	0	0	947	0	0	0	0	0	1676.2	0	0
	103	0	0	1000	0	0	0	0	0	1574	0	0
	104	0	0	1023	0	0	0	0	0	1462	0	0
	105	0	0	1069	0	0	0	0	0	1363.2	0	0
	106	0	0	1085	0	0	0	0	0	1366.8	0	0
	107	0	0	1077	0	0	0	0	0	1387.2	0	0
	108	0	0	1085	0	0	0	0	0	1412.8	0	0
	109	0	0	1092	0	0	0	0	0	1434.2	0	0
	110	0	0	1138	0	0	0	0	0	1472.3	0	0
	111	0	0	1109	0	0	0	0	0	1538.9	0	0
	112	0	0	1085	0	0	0	0	0	1580.5	0	0
	113	0	0	1054	0	0	0	0	0	1582	0	0
	114	0	0	1054	0	0	0	0	0	1553.4	0	0
	115	0	0	1039	0	0	0	0	0	1549.1	0	0
	116	0	0	1000	0	0	0	0	0	1542.3	0	0



	117	0	0	1000	0	0	0	0	0	1541.8	0	0
	118	0	0	1062	0	0	0	0	0	1539.7	0	0
	119	0	0	1100	0	0	0	0	0	1526.6	0	0
	120	0	0	1147	0	0	0	0	0	1497.4	0	0
May (5)	121	1529	0	1175	0	0	0	0	0	1474.9	0	0
	122	1582	0	1128	0	0	0	0	0	1503.6	0	0
	123	1691	0	1069	0	0	0	0	0	1539.1	0	0
	124	1732	0	1000	0	0	0	0	0	1541.8	0	0
	125	1775	0	908	0	0	0	0	0	1541.8	0	0
	126	1930	0	908	0	0	0	0	0	1545.9	0	0
	127	1984	0	908	0	0	0	0	0	1564	0	0
	128	2004	0	908	0	0	0	0	0	1575.1	0	0
	129	2026	0	931	0	0	0	0	0	1551.2	0	0
	130	2149	0	977	0	0	0	0	0	1512	0	0
	131	2259	0	1008	0	0	0	0	0	1517.3	0	0
	132	2346	0	1046	0	0	0	0	0	1612.6	0	0
	133	2490	0	1092	0	0	0	0	0	1706.2	0	0
	134	2534	0	1069	0	0	0	0	0	1718.2	0	0
	135	2616	0	1008	0	0	0	0	0	1703.8	0	0



	136	2686	0	962	0	0	0	0	0	1672.6	0	0
	137	2708	0	908	0	0	0	0	0	1645	0	0
	138	2729	0	916	0	0	0	0	0	1637.8	0	0
	139	2718	0	916	0	0	0	0	0	1671.4	0	0
	140	2751	0	924	0	0	0	0	0	1801	0	0
	141	2812	0	924	0	0	0	0	0	1962.4	0	0
	142	2862	0	924	0	0	0	0	0	2012.8	0	0
	143	2866	0	985	0	0	0	0	0	1976.2	0	0
	144	2812	0	1062	0	0	0	0	0	1924.6	0	0
	145	2719	0	1354	0	0	0	0	0	1948	0	0
	146	2627	0	1429	0	0	0	0	0	1990.6	0	0
	147	2585	0	1721	0	0	0	0	0	2006.2	0	0
	148	2542	0	1797	0	0	0	0	0	2039.2	0	0
	149	2557	0	1862	0	0	0	0	0	2150.7	0	0
	150	2564	0	1916	0	0	0	0	0	2368	0	0
	151	2604	0	1948	0	0	0	0	0	2528.6	0	0
June (6)	152	0	0	2002	0	0	0	0	0	2696	0	0
	153	0	0	2002	0	0	0	0	0	2783	0	0
	154	0	0	0	0	0	0	0	0	2827.3	0	0



	155	0	0	0	0	0	0	0	0	0	2865.6	0	0
	156	0	0	0	0	0	0	0	0	0	2894	0	0
	157	0	0	0	0	0	0	0	0	0	2884.8	0	0
	158	0	0	0	0	0	0	0	0	0	2786.6	0	0
	159	0	0	0	0	0	0	0	0	0	2763.6	0	0
	160	0	0	0	0	0	0	0	0	0	2711.1	0	0
	161	0	0	0	0	0	0	0	0	0	2685.3	0	0
	162	0	0	0	0	0	0	0	0	0	2638.6	0	0
	163	0	0	0	0	0	0	0	0	0	2624	0	0
	164	0	0	0	0	0	0	0	0	0	2612	0	0
	165	0	0	0	0	0	0	0	0	0	2565.3	0	0
	166	0	0	0	0	0	0	0	0	0	2440.6	0	0
	167	0	0	0	0	0	0	0	0	0	2409.3	0	0
	168	0	0	0	0	0	0	0	0	0	2362.6	0	0
	169	0	0	0	0	0	0	0	0	0	2350.6	0	0
	170	0	0	0	0	0	0	0	0	0	2342	0	0
	171	0	0	0	0	0	0	0	0	0	2305.3	0	0
	172	0	0	0	0	0	0	0	0	0	2252.6	0	0
	173	0	0	0	0	0	0	0	0	0	2206	0	0





	174	0	0	0	0	0	0	0	0	0	0	0	0
	175	0	0	0	0	0	0	0	0	0	0	0	0
	176	0	0	0	0	0	0	0	0	0	0	0	0
	177	0	0	0	0	0	0	0	0	0	0	0	0
	178	0	0	0	0	0	0	0	0	0	0	0	0
	179	0	0	0	0	0	0	0	0	0	0	0	0
	180	0	0	0	0	0	0	0	0	0	0	0	0
	181	0	0	0	0	0	0	0	0	0	2318.8	0	0
July (7)	182	0	0	0	0	0	0	0	0	0	3356.6	0	0
	183	0	0	0	0	0	0	0	0	0	3419.4	0	0
	184	0	0	0	0	0	0	0	0	0	3425.1	0	0
	185	0	0	0	0	0	0	0	0	0	3396.8	0	0
	186	0	0	0	0	0	0	0	0	0	3323.3	0	0
	187	0	0	0	0	0	0	0	0	0	3291.1	0	0
	188	0	0	0	0	0	0	0	0	0	3340.2	0	0
	189	0	0	0	0	0	0	0	0	0	3395.9	0	0
	190	0	0	0	0	0	0	0	0	0	3443.8	0	0
	191	0	0	0	0	0	0	0	0	0	3460.8	0	0
	192	0	0	0	0	0	0	0	0	0	3488.4	0	0



	193	0	0	0	0	0	0	0	0	0	3577.6	0	0
	194	0	0	0	0	0	0	0	0	0	3736.6	0	0
	195	0	0	0	0	0	0	0	0	0	3881.8	0	0
	196	0	0	0	0	0	0	0	0	0	3919.9	0	0
	197	0	0	0	0	0	0	0	0	0	3898.8	0	0
	198	0	0	0	0	0	0	0	0	0	3839.6	0	0
	199	0	0	0	0	0	0	0	0	0	3777.1	0	0
	200	0	0	0	0	0	0	0	0	0	3742.2	0	0
	201	0	0	0	0	0	0	0	0	0	3699.3	0	0
	202	0	0	0	0	0	0	0	0	0	3661.9	0	0
	203	0	0	0	0	0	0	0	0	0	3649	0	0
	204	0	0	0	0	0	0	0	0	0	0	0	0
	205	0	0	0	0	0	0	0	0	0	0	0	0
	206	0	0	0	0	0	0	0	0	0	0	0	0
	207	0	0	0	0	0	0	0	0	0	0	0	0
	208	0	0	0	0	0	0	0	0	0	0	0	0
	209	0	0	0	0	0	0	0	0	0	0	0	0
	210	0	0	0	0	0	0	0	0	0	0	0	0
	211	0	0	0	0	0	0	0	0	0	0	0	0



	212	0	0	0	0	0	0	0	0	0	0	0	0
August (8)	213	0	0	0	0	0	0	0	0	0	0	0	0
	214	0	0	0	0	0	0	0	0	0	0	0	0
	215	0	0	0	0	0	0	0	0	0	0	0	0
	216	0	0	0	0	0	0	0	0	0	0	0	0
	217	0	0	0	0	0	0	0	0	0	0	0	0
	218	0	0	0	0	0	0	0	0	0	0	0	0
	219	0	0	0	0	0	0	0	0	0	0	0	0
	220	0	0	0	0	0	0	0	0	0	0	0	0
	221	0	0	0	0	0	0	0	0	0	0	0	0
	222	0	0	0	0	0	0	0	0	0	0	0	0
	223	0	0	0	0	0	0	0	0	0	0	0	0
	224	0	0	0	0	0	0	0	0	0	0	0	0
	225	0	0	0	0	0	0	0	0	0	0	0	0
	226	0	0	0	0	0	0	0	0	0	0	0	0
	227	0	0	0	0	0	0	0	0	0	0	0	0
	228	0	0	0	0	0	0	0	0	0	0	0	0
	229	0	0	0	0	0	0	0	0	0	0	0	0
	230	0	0	0	0	0	0	0	0	0	0	0	0



	231	0	0	0	0	0	0	0	0	0	0	0	0
	232	0	0	0	0	0	0	0	0	0	0	0	0
	233	0	0	0	0	0	0	0	0	0	0	0	0
	234	0	0	0	0	0	0	0	0	0	0	0	0
	235	0	0	0	0	0	0	0	0	0	0	0	0
	236	0	0	0	0	0	0	0	0	0	0	0	0
	237	0	0	0	0	0	0	0	0	0	0	0	0
	238	0	0	0	0	0	0	0	0	0	0	0	0
	239	0	0	0	0	0	0	0	0	0	0	0	0
	240	0	0	0	0	0	0	0	0	0	0	0	0
	241	0	0	0	0	0	0	0	0	0	0	0	0
	242	0	0	0	0	0	0	0	0	0	0	0	0
	243	0	0	0	0	0	0	0	0	0	0	0	0
September (9)	244	0	0	0	0	0	0	0	0	0	0	0	0
	245	0	0	0	0	0	0	0	0	0	0	0	0
	246	0	0	0	0	0	0	0	0	0	0	0	0
	247	0	0	0	0	0	0	0	0	0	0	0	0
	248	0	0	0	0	0	0	0	0	0	0	0	0



	249	0	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0	0
	251	0	0	0	0	0	0	0	0	0	0	0	0
	252	0	0	0	0	0	0	0	0	0	0	0	0
	253	0	0	0	0	0	0	0	0	0	0	0	0
	254	0	0	0	0	0	0	0	0	0	0	0	0
	255	0	0	0	0	0	0	0	0	0	0	0	0
	256	0	0	0	0	0	0	0	0	0	0	0	0
	257	0	0	0	0	0	0	0	0	0	0	0	0
	258	0	0	0	0	0	0	0	0	0	0	0	0
	259	0	0	0	0	0	0	0	0	0	0	0	0
	260	0	0	0	0	0	0	0	0	0	0	0	0
	261	0	0	0	0	0	0	0	0	0	0	0	0
	262	0	0	0	0	0	0	0	0	0	0	0	0
	263	0	0	0	0	0	0	0	0	0	0	0	0
	264	0	0	0	0	0	0	0	0	0	0	0	0
	265	0	0	0	0	0	0	0	0	0	0	0	0
	266	0	0	0	0	0	0	0	0	0	0	0	0
	267	0	0	0	0	0	0	0	0	0	0	0	0



	268	0	0	0	0	0	0	0	0	0	0	0	0
	269	0	0	0	0	0	0	0	0	0	0	0	0
	270	0	0	0	0	0	0	0	0	0	0	0	0
	271	0	0	0	0	0	0	0	0	0	0	0	0
	272	0	0	0	0	0	0	0	0	0	0	0	0
	273	0	0	0	0	0	0	0	0	0	0	0	0
October (10)	274	0	0	0	0	0	0	0	0	0	0	0	0
	275	0	0	0	0	0	0	0	0	0	0	0	0
	276	0	0	0	0	0	0	0	0	0	0	0	0
	277	0	0	0	0	0	0	0	0	0	0	0	0
	278	0	0	0	0	0	0	0	0	0	0	0	0
	279	0	0	0	0	0	0	0	0	0	0	0	0
	280	0	0	0	0	0	0	0	0	0	0	0	0
	281	0	0	0	0	0	0	0	0	0	0	0	0
	282	0	0	0	0	0	0	0	0	0	0	0	0
	283	0	0	0	0	0	0	0	0	0	0	0	0
	284	0	0	0	0	0	0	0	0	0	0	0	0
	285	0	0	0	0	0	0	0	0	0	0	0	0
	286	0	0	0	0	0	0	0	0	0	0	0	0



	287	0	0	0	0	0	0	0	0	0	0	0	0
	288	0	0	0	0	0	0	0	0	0	0	0	0
	289	0	0	0	0	0	0	0	0	0	0	0	0
	290	0	0	0	0	0	0	0	0	0	0	0	0
	291	0	0	0	0	0	0	0	0	0	0	0	0
	292	0	0	0	0	0	0	0	0	0	0	0	0
	293	0	0	0	0	0	0	0	0	0	0	0	0
	294	0	0	0	0	0	0	0	0	0	0	0	0
	295	0	0	0	0	0	0	0	0	0	0	0	0
	296	0	0	0	0	0	0	0	0	0	0	0	0
	297	0	0	0	0	0	0	0	0	0	0	0	0
	298	0	0	0	0	0	0	0	0	0	0	0	0
	299	0	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0	0
	301	0	0	0	0	0	0	0	0	0	0	0	0
	302	0	0	0	0	0	0	0	0	0	0	0	0
	303	0	0	0	0	0	0	0	0	0	0	0	0
	304	0	0	0	0	0	0	0	0	0	0	0	0



November (11)	305	0	0	0	0	0	0	0	0	0	0	0	0
	306	0	0	0	0	0	0	0	0	0	0	0	0
	307	0	0	0	0	0	0	0	0	0	0	0	0
	308	0	0	0	0	0	0	0	0	0	0	0	0
	309	0	0	0	0	0	0	0	0	0	0	0	0
	310	0	0	0	0	0	0	0	0	0	0	0	0
	311	0	0	0	0	0	0	0	0	0	0	0	0
	312	0	0	0	0	0	0	0	0	0	0	0	0
	313	0	0	0	0	0	0	0	0	0	0	0	0
	314	0	0	0	0	0	0	0	0	0	0	0	0
	315	0	0	0	0	0	0	0	0	0	0	0	0
	316	0	0	0	0	0	0	0	0	0	0	0	0
	317	0	0	0	0	0	0	0	0	0	0	0	0
	318	0	0	0	0	0	0	0	0	0	0	0	0
	319	0	0	0	0	0	0	0	0	0	0	0	0
	320	0	0	0	0	0	0	0	0	0	0	0	0
	321	0	0	0	0	0	0	0	0	0	0	0	0
	322	0	0	0	0	0	0	0	0	0	0	0	0





	323	0	0	0	0	0	0	0	0	0	0	0
	324	0	0	0	0	0	0	0	0	0	0	0
	325	0	0	0	0	0	0	0	0	0	0	0
	326	0	0	0	0	0	0	0	0	0	0	0
	327	0	0	0	0	0	0	0	0	0	0	0
	328	0	0	0	0	0	0	0	0	0	0	0
	329	0	0	0	0	0	0	0	0	0	0	0
	330	0	0	0	0	0	0	0	0	0	0	0
	331	0	0	0	0	0	0	0	0	0	0	0
	332	0	0	0	0	0	0	0	0	0	0	0
	333	0	0	0	0	0	0	0	0	0	0	0
	334	0	0	0	0	0	0	0	0	0	0	0
December (12)	335	0	0	0	0	0	0	0	0	0	0	0
	336	0	0	0	0	0	0	0	0	0	0	0
	337	0	0	0	0	0	0	0	0	0	0	0
	338	0	0	0	0	0	0	0	0	0	0	0
	339	0	0	0	0	0	0	0	0	0	0	0
	340	0	0	0	0	0	0	0	0	0	0	0



	341	0	0	0	0	0	0	0	0	0	0	0	0
	342	0	0	0	0	0	0	0	0	0	0	0	0
	343	0	0	0	0	0	0	0	0	0	0	0	0
	344	0	0	0	0	0	0	0	0	0	0	0	0
	345	0	0	0	0	0	0	0	0	0	0	0	0
	346	0	0	0	0	0	0	0	0	0	0	0	0
	347	0	0	0	0	0	0	0	0	0	0	0	0
	348	0	0	0	0	0	0	0	0	0	0	0	0
	349	0	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0	0
	351	0	0	0	0	0	0	0	0	0	0	0	0
	352	0	0	0	0	0	0	0	0	0	0	0	0
	353	0	0	0	0	0	0	0	0	0	0	0	0
	354	0	0	0	0	0	0	0	0	0	0	0	0
	355	0	0	0	0	0	0	0	0	0	0	0	0
	356	0	0	0	0	0	0	0	0	0	0	0	0
	357	0	0	0	0	0	0	0	0	0	0	0	0
	358	0	0	0	0	0	0	0	0	0	0	0	0
	359	0	0	0	0	0	0	0	0	0	0	0	0



	360	0	0	0	0	0	0	0	0	0	0	0	0
	361	0	0	0	0	0	0	0	0	0	0	0	0
	362	0	0	0	0	0	0	0	0	0	0	0	0
	363	0	0	0	0	0	0	0	0	0	0	0	0
	364	0	0	0	0	0	0	0	0	0	0	0	0
	365	0	0	0	0	0	0	0	0	0	0	0	0
	366	0	0	0	0	0	0	0	0	0	0	0	0

**Table D.11:** Annual Peak Discharge (m<sup>3</sup>/s) for Okhunwan River (Ugonoba)

Years	Maximum Flow (m <sup>3</sup> /s)
1989	25.6
1990	23
1991	22.5
1992	16
1993	12.32
1994	22.5



1995	64
1996	75.28
1997	78.4
1998	82.9
1999	70
2000	67
2001	86
2002	86.52
2003	66
2004	90.3
2005	95.84
2006	97.6
2007	102.4
2008	125