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The Environmental Effects of the Drainage System and Flood Control in Awka Urban City

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ABSTRACT

This paper takes a look at the environmental effects of the drainage system and flood control in Awka, the capital city of Anambra State. Usually rainwater falls in Awka urban city and the nearby towns, generally directed by cross slopes in the over stressed existing drains without, offshoots, and turn-outs. The provision of adequate surface water drainage facilities is an essential feature of the road network and erosion control in Awka urban and her environs. More so the environmental measures in dealing with the surface water run-off from the carriage ways, shoulders and verges. The drainage system must consider runoff adjacent catchment areas affected in the new on-going construction work by providing offshoots, turn-outs, sizeable culverts and detention basins. The voted ecological fund has not been effectively utilized by the three tiers of the government as to embark on the mitigation process of flood damage in Nigeria. Even the private sectors interest, and firms should undertake their protection work in combating environmental disaster.

Keywords: *Drainage System, Storm Water, Ecology, Meteorology, Offshoot, Hydrology.*

1. INTRODUCTION

A flood can be defined or described as the result of run-off from rainfall quantities that are too enormous. Flood can also be defined as the discharge that may be expected from the most severed combination of meteorological and hydrologic conditions that are considered reasonably characteristic of the geographic region involved excluding extremely rare combination(Linsley et al 1992). Flood has seriously affected the Awka urban city and her environs. In the Awka metropolitan area, storm water causes a lot of havoc to the entire populace and always brings fears to the residents as rainy season approaches. After about ten minutes of rainfalls, almost every street in the city is blocked to traffic and both commuter and vehicles are trapped to a stop, for at least two hours, before any movement recommences. This flood nuisance has contributed immensely to the massive exodus of some residents from the metropolitan area to the suburbs or nearby towns (GWP, 2012).

Basically, the topographical nature of the Awka urban area creates a very high run-off, and a good adequate drainage system will be a result oriented method of combating the effect of excess flood menace both in the city and the surrounding towns. It has been observed that a good government seeks to reduce flood damage to a minimum, consistently with cost involvement in flood water channels (Luthin, 1973). In recent times the population of Awka urban area has increased tremendously due to the creation of the new Anambra State and Awka as the new capital. This new status of Awka as the capital city of the young state resulted in spontaneous development of buildings all over the capital city. As new buildings sprung up, new landlords began to construct concrete pavement compound to block the drainage ways. The singular act of indifferent, obviously contributed to the erosion menace in the streets and roads as well as rapid rate of generation of flood water. A look at the environmental effects of the drainage system and flood control in Awka metropolitan area as well as the design of the city storm water drainage will be undertaken in the subsequent section.

2. AIMS AND OBJECTIVE

The aims and objectives of this paper are:

- To correct the inadequate drainage system which lack proper outlet.
- To remove the tree roots which had started to probe through and crack the concrete channel sides.
- To redesign the entire drainage systems which had been undermined by tree roots.
- To properly channel some stagnated run off in the drainage system.
- To evacuate the organic and other lither trapped in the stagnated drainage water which had to putrefy and become infested with flies, mosquitoes and other pathogenic vectors.

3. MATERIALS AND METHODS

3.1 Study Area

Awka urban city is located between 6.20°N and 6.28°N, and longitudes 7.00°E and 7.06°E on the south eastern part of Nigeria (MOE, 2006) (Fig. 1).

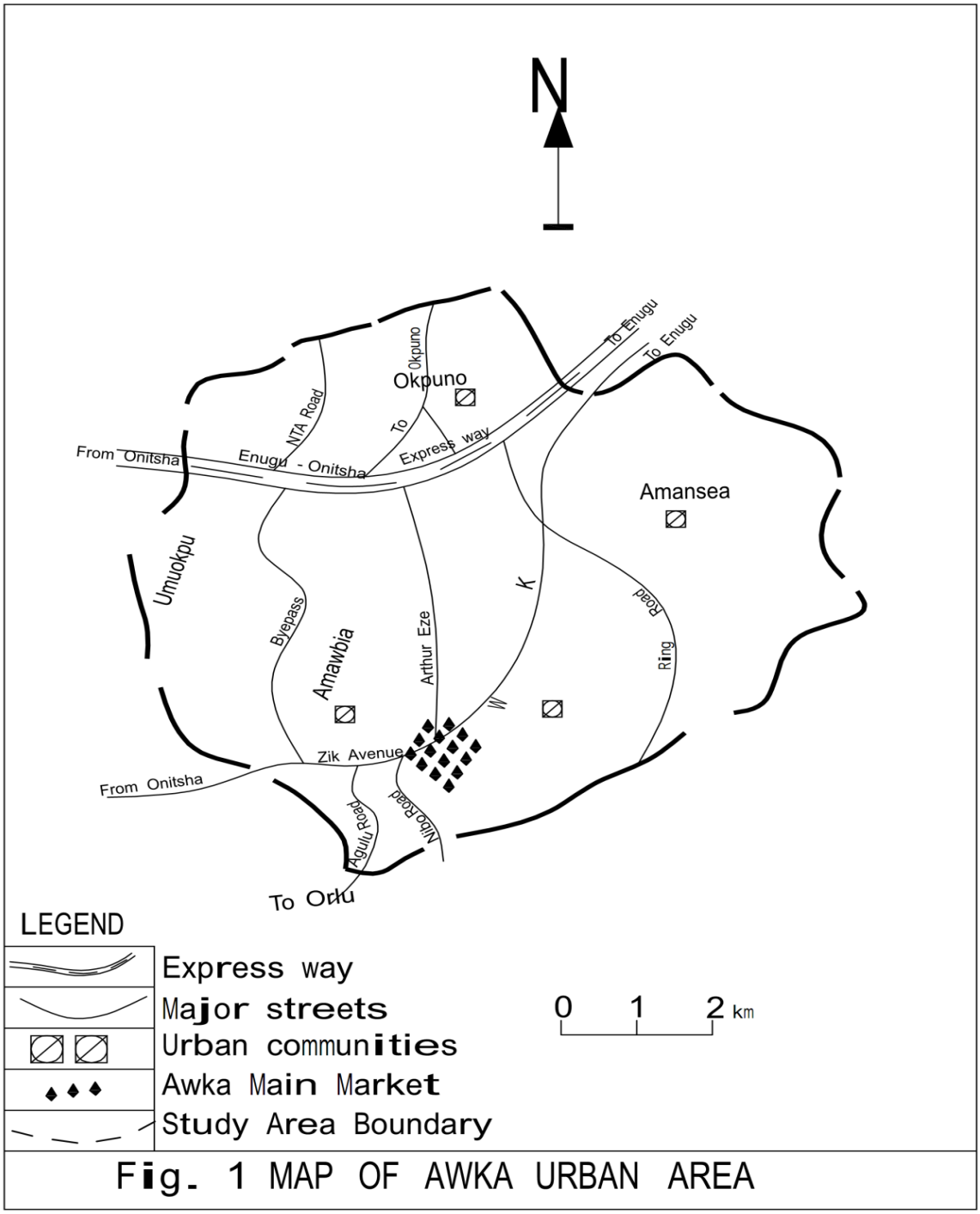


Fig. 1 MAP OF AWKA URBAN AREA

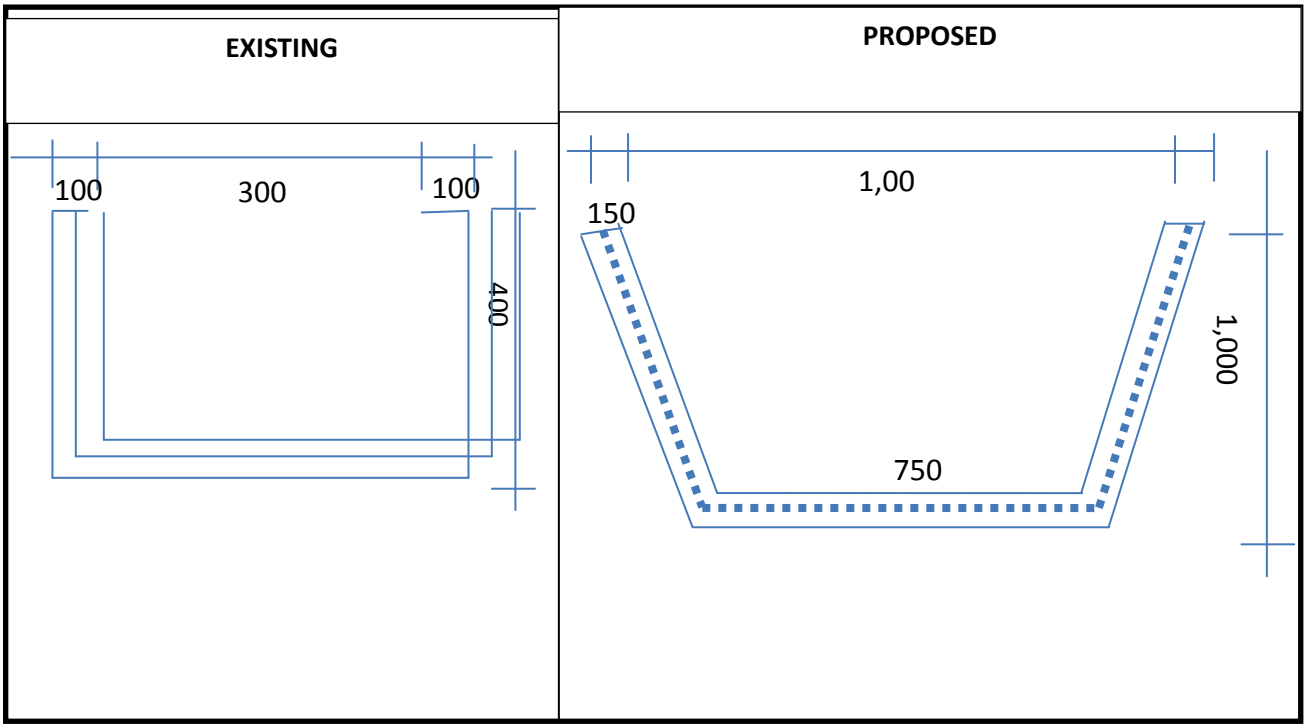
The study are covers 144.5 hectares with a 2006 population of 116,206 persons (NPC, 2006). This includes such outlying communities as Amawbia, Okpuno and Amansea which are fastly being annexed to the town by urbanization. The town's topography presents a nigged relief as it lies completely on Awka-Orlu upland. Generally, the average height of the town range from 91m in the western parts of the town to 160.2m in the eastern zone, although there are local variations within the town which are drained by a number of streams. The climate is the tropical wet and dry type according to the Koppen's classification system with a clear cycle of season. The mean daily maximum temperature is usually 27°C all over the year although it could reach 34°C in March and lowest during the hamattan months of December and January. The mean annual rainfall according to the local

meteorological station which has maintained climatological records since 1978, reveal a mean rainfall of about 1,600mm with a relative humidity of 80% at dawn (Aguolu, 2012).

4. DESIGN OF URBAN STORM DRAINAGE

The first step in the design of storm water drainage work is the determination of the quantities of water that must be accommodated in the system in most cases only an estimate of the peak flow is required which is about 56mm/hr in Awka urban area. Awka urban area should be designed to dispose enough quantities of flow from frequent storm occurrence. The view to redesign this urban city is to prevent flood for all time in the future (Amahwa, 2010).

The hydraulic design of the drainage works include the basic principles of fluid flow particularly those relating to open channel usually for assumed uniformed flow the basic relationship are commonly expressed in the Rational formula Q = CiA, where Q = discharge, C = runoff coefficient, i = intensity of rainfall, A = drainage area (Oglesby, 1975).



Drainage System

Q = CiA
Q = discharge (M^3/s)
C = Runoff coefficient
i = intensity
A = drainage area.

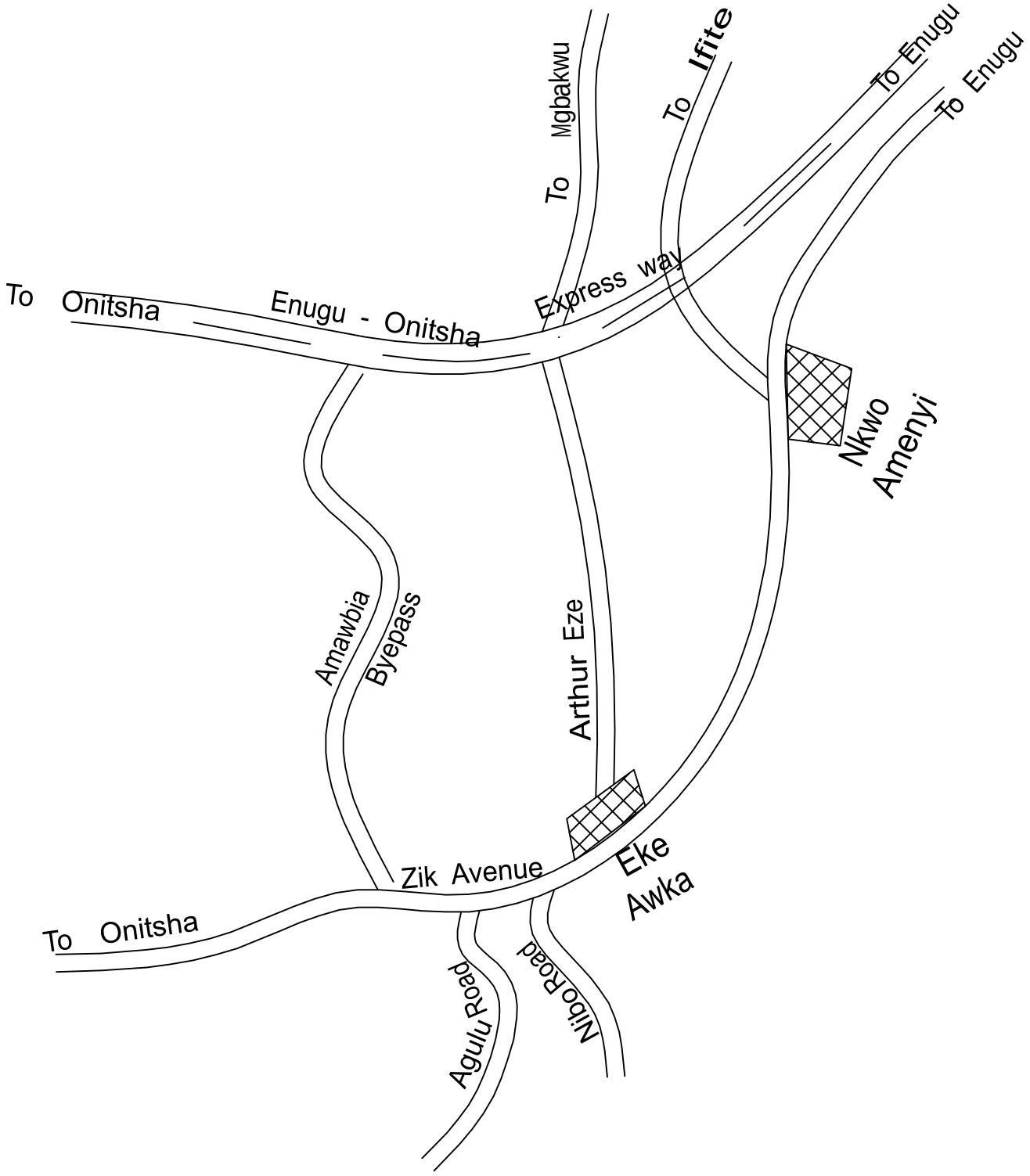
Runoff Coefficient and Catchment Area

Urban Area	-	0.3 – 0.5
Forest Area	-	0.05 – 0.2
Commercial & Industrial Area	-	0.9
Parts, Farm, Pastures Areas	-	0.05 – 0.3
Asphalt or Concrete pavement	-	0.85

Q = CiA

$Q = 0.85 \times 1.600 \times 0.95 = 1.292 m^3/s$

PROPOSED NEW DRAINAGE NETWORK IN AWKA URBAN AREA



Proposed Drainage Network

5. ENVIRONMENTAL EFFECT OF DRAINAGE AND FLOOD IN AWKA

The problem of inadequate drainage facilities such a large and continuous drain (gutter), offshoots, turnout, sizeable culverts, detention basins etc. has created a lot of environmental problems in the study area. Added to these are the problems of high concretizing of the urban land leading to high rate of flood generation without adequate control facilities (FRN, 1975). These environmental problems can be summarized as follows:

- Since several residents of the capital city dump refuse into drainage channels during rainfall, flood water usually litters the refuse along the major streets and gate ways of the urban area.

- The improperly disposed refuse which comprises discarded plastic, foot-wears, clothes etc. equally block the drains especially at their narrow ends or points. This equally results to overspill or overflow of the storm water in the drains leading to flooding that can burst into people's homes and farms destroying household property and crops.

- The littered refuse constitutes a serious threat to the health of residents since it can lead to the outbreak of epidemic and disease.

- Flood water especially when flowing at a rapid rate or velocity has the capability of displacing objects such as parked and broken down vehicles and can even drown human beings especially children.

- The storm water upturn or uproot underlaid water pipe lines, electric poles and underground cables.

This paper is proposing a new drainage network for Awka urban area which will enhance the smooth flow of storm water see (fig. 3).

a. Amaenyi Awka via Umuzocha/ Umudioka down to Okika Stream

b. Aroma Junction through Express way down to the back of Legislator's Quarters.

c. Aroma Junction through the back of Government House down to Ifite Awka.

6. CONCLUSION

Drainage works are very vital instruments in combating flood which is a great nuisance to the developing countries like Nigeria, especially the south eastern parts of the country. This part of the country characterized by loose soils (laterite soil) has been devastated by flood and erosion. As a result of these environmental effects or impacts if not well manage will render most residents uncomfortable (Obi, 1982). Care should also be taken to avoid a situation whereby residents may be rendered homeless as in the case of Nanka and Agulu which are erosion prone communities. The failed and deterioration drainage system have impacted negatively on the environment and the health of people around the State capital and should be corrected.

Moreover,the development of a country does not only lie on building construction but, includes infrastructural development and provision of social, health and other amenities (Abdulmumin and Chukwurah, 1999) .

RECOMMENDATION

- Regular inspection or monitoring of the drainage system to take note and take care of any breakage, sedimentation and littering of the system.

- Removal of all vegetation, for example, tree whose rooting system tend to or are likely to distort, break or undermine the drainage system.

- The lining of existing drainage channel outlet should be out rightly changed.

- The desilting and proper aligning of the immediate downstream culverts, to ensure effective runoff discharge and hence effective self-cleaning of the drainage systems.

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