THE USE OF AUTOCAD IN ASSESSING THE ACCURACY OF INTELLIGENT MAP IN MINISTRY OF LANDS AND SURVEY, MAKURDI

BY

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(PGD/SV/09/0145)

AUGUST, 2012.

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A PROJECT REPORT SUBMITTED TO THEDEPARTMENT OE SURVEYING AND GEOINEORMATIC, MODIBBO ADAMA UNIVERSITY OF TECHNOLOGY, YOLA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF POSTGRADUATE DEPLOMA {PGD} OF THE DEPARTMENT OF SURVEYING AND GEOINFORMATICS.SCHOOL OF ENVIRONMENTAL SCIENCE.

AUGUST, 2012.

DECLARATION

I hereby declare that this project report was written by me and it is a record of my own research work. It has not been presented before in any previous application for a higher degree. All references cited have been duly acknowledged.

Sign……

Date…….

Alexander Agbo

(PGD/SV/09/0145)

DEDICATION

This piece of work is dedicated firstly to God Almighty,

my late parent, my lovely wife and children.

APPROVAL PAGE

This project report entitled; The use of AutoCAD in assessing the accuracy of intelligent map in Ministry of Lands and Survey Makurdi, meets the regulations governing the award of PGD of the Modibbo Adama Federal of Technology, Yola and is approved for its contribution to knowledge and literary presentation.

_____ _____

DR. A. A. Musa Date
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Internal Examiner (name and signature) Date

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External Examiner (name and signature) Date

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DR. A. A. Musa Date
{The Head of Department}

AKNOWLEDGMENT

I hear by express my profound gratitude to God Almighty for the gift of life, knowledge and opportunity granted me. Also, to Dr. Musa A.A my supervisor for his patience, guidance and understanding, God will surely reward him. God bless Dr Idowu for leading use through the program..

My lovely wife, Mrs. Alice Agbo, who is also, remembered for her moral support and always on her bended knees in supplication to God almighty on my behalf and also my beautiful children Michael, Rebecca, Tony and Joseph.

A mention of Dr. Kingsley U. Orisakwe send relief to the boredom of academic pursuit in far Yola he was there for me all the time I needed assistance and I also owe a lot to the Hon. Commissioner of Lands and Survey Makurdi, Benue state who facilitated my quick release and the Surveyor General who by all means removing bureaucratic bottle neck in administrative processes leading to the release.

My colleague in the Ministry, Deputy Surveyor General Ave, Joshua Ashy, Emmanuel Nongo who provided good orientation of Yola environment.

ABSTRACT

Intelligent map is summed up to mean maps which aid cartographers to chart information about land parcels got from field data. It provides information about the size of plot, locality, land ownership, density and identification number. This research work sets out to achieve a cartographically plotted township cadastre scanned and Geo-referenced; then a digital plotted AutoCAD map using co-ordinates of same cadastre. To test the accuracy of manually plotted intelligent map deposited for land administration in Ministry of lands and survey, Makurdi; Using AutoCAD plotting technique as a check. The two maps were overlaid, there was a uniform shift in area of plotted parcel and digitized parcel. However there was no significant difference from the hypothesis set. The inherent limitation in the area, such as mutilation of maps due to constant usage, weather changes are some of the several factors that results in low accuracy of the intelligent map.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Intelligent map is defined by several authors, according to Veld (2006) intelligent map is the exploitation and analysis of geospatial information to describe assesses and visually depicts physical features and geographically referenced activities on the earth. According to him, intelligent map can be created from memory, terrestrial measurements, global positioning system (GPS) technology, surveying equipment or through the scanning, digitizing and or copying techniques.

Intelligent maps can exist as drawing on rocks, stones, papers and wood any type of surface available to the early man was employed for depicting geospatial information. These drawing materials as used in the early days graduated into refined tracing films, paper mounted on cloths. These stages were aimed at achieving desired accuracy.

Intelligent map therefore, can be summed up to mean maps which aids cartographer to chart land parcels got from field data. It also helps in discovering double allocation when two or more parcels overlap during plotting, it means one of the plot has been processed, hence the later parcels will be rejected.

The Intelligent map used in the Ministry of Land and Survey Makurdi is made of mounted cloth. The material used is a deliberate attempt to preserve and maintain the accuracy desired. While the intelligent map record the spatial data, the office files kept in filling cabinets which records the attribute data of each parcel of land. An officer who wants to make enquiry of a particular piece of land, will check the intelligent map and extract the file number from the map with the knowledge of this file number; he will now open the necessary file cabinet and bring the file connected to the land in question.

The entire Makurdi is subdivided into several intelligent maps, one of them is known as logo 1 which also is the study area of this project.

The intelligent map is meant to provide information about the size of plot, locality land ownership, density (i.e. low, medium and high) and an identification number. Since the creation of Benue state out of Benue Plateau in 1976, this kind of intelligent map has always been used for plotting parcels of land.

Since the past ten years, due to increasing population and the increasing value of land the importance of government recognition to title of land has become apparent. This has brought a lot of pressure on the state ministry.

It is now becoming obvious, that the present method of charting, map update, query storage and retrieval can not cope with the present challenges facing the ministry. The ultimate is the creation of a comprehensive data base for the state ministry. However, for the purpose of this research work a spatial data base creation shall suffice

1.2 Aim and Objectives

The aim of study is to understand the dynamics involved as inherent in analogue limitation. Identify the factors leading to inaccuracy of intelligent maps in view of introducing application of computer and suggesting ways of improving man power needs in such areas.

The objectives of this research among others.

i. To produce a Geo-referenced digital map of Logo 1(TPS184) out of the present analogue map.

ii. To plot another map of Logo 1(TPS184) using the coordinates from OCX office, with AutoCAD software package.

iii. To overlay the digitized parcel and the plotted parcel using ArcViewGIS3.2a

iv. To compare between area of parcels within i and ii above if there exist any departure from the plotted, they shall be subjected to analysis

1.3 Statement of Problem

The present analogue system of storing title to land for all practical purposes has been okay. This is probably the reason why it had remained for decades. However, it still has much to

be desired. The time it takes to make an enquiry, for instance, can be improved upon. Presently, the spatial (i.e. the map) is kept separately, while the attribute data is on its own, one has to locate the particular parcel before tracing the file in the filing cabinet ,with many application on the queue, this could cause a lot of delay and waist of man hours.

The analogue system is not flexible, queries can only be made in one direction, the direction in which queries are made are in the order in which files are stored. Also in analogue form, to query the size of a parcel of land, the use of scale rule is brought to play, dimensions deduced from the intelligent map is subject to factors like; mutilation of the base map, reading the scale rule placed against two points to be scaled, inaccurate plotting of points on intelligent map by unskillful cartographer. All these increase the inaccuracy of the intelligent map.

1.4 Justification of Study

The accuracy of a computerized recording system cannot be compared to the analogue system .this improved accuracy will go a long way to improve the activities of the ministry.

The time taken to search for specific land parcels will be greatly reduced since it is just a click of button. This will enable less people work at the cartographic unit, releasing a lot of workers to do other pressing jobs.

Since the computerized data base can be queried using any of the fields a new kind of flexibility and freedom in the kind of data searched will be available to the land officer.

1.5 Scope and Study Area

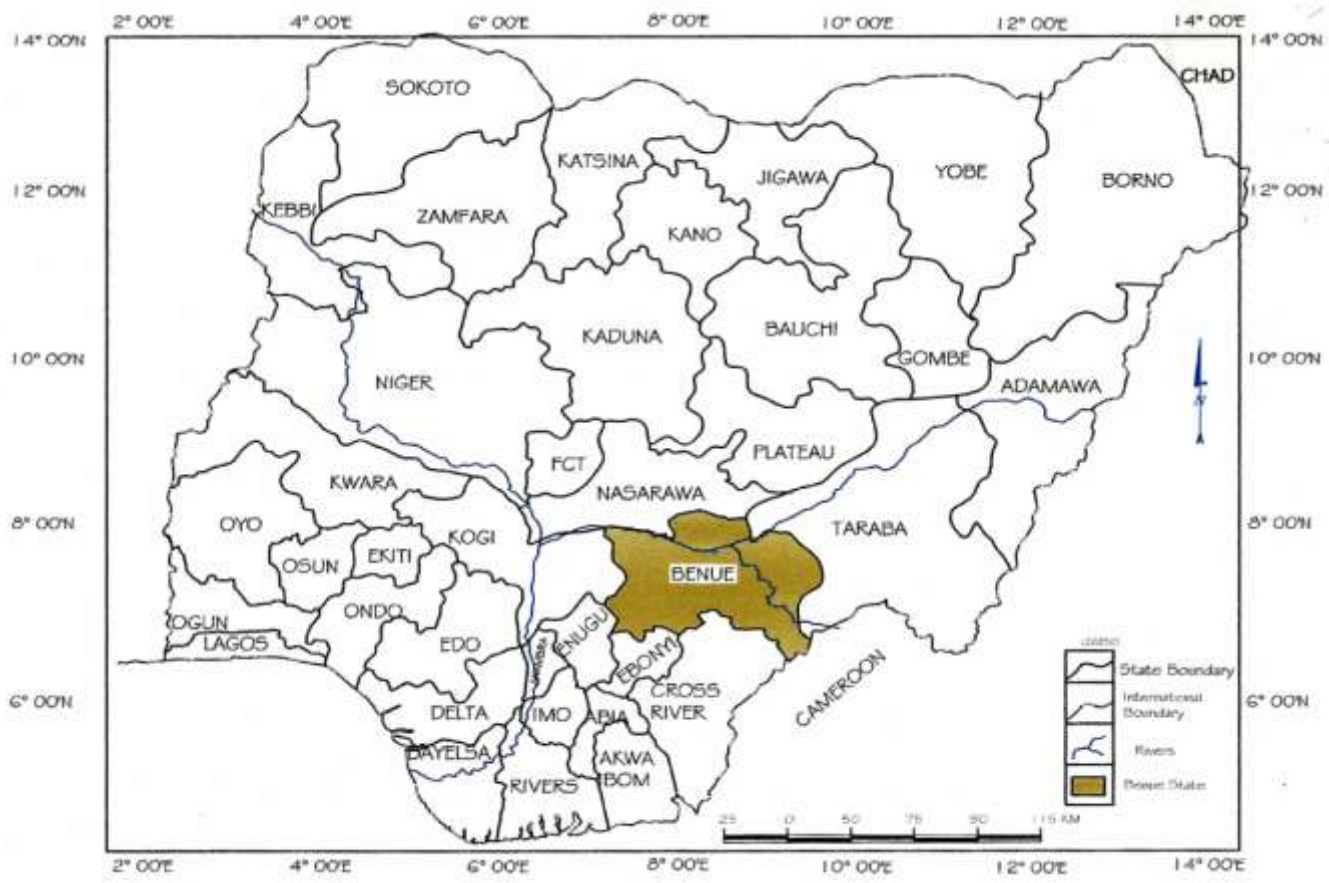


Fig 1.1, Map of Nigeria showing Benue State

Source: Ministry of Land and Survey Makurdi, (2012)

1.5.1 *Area Location.*

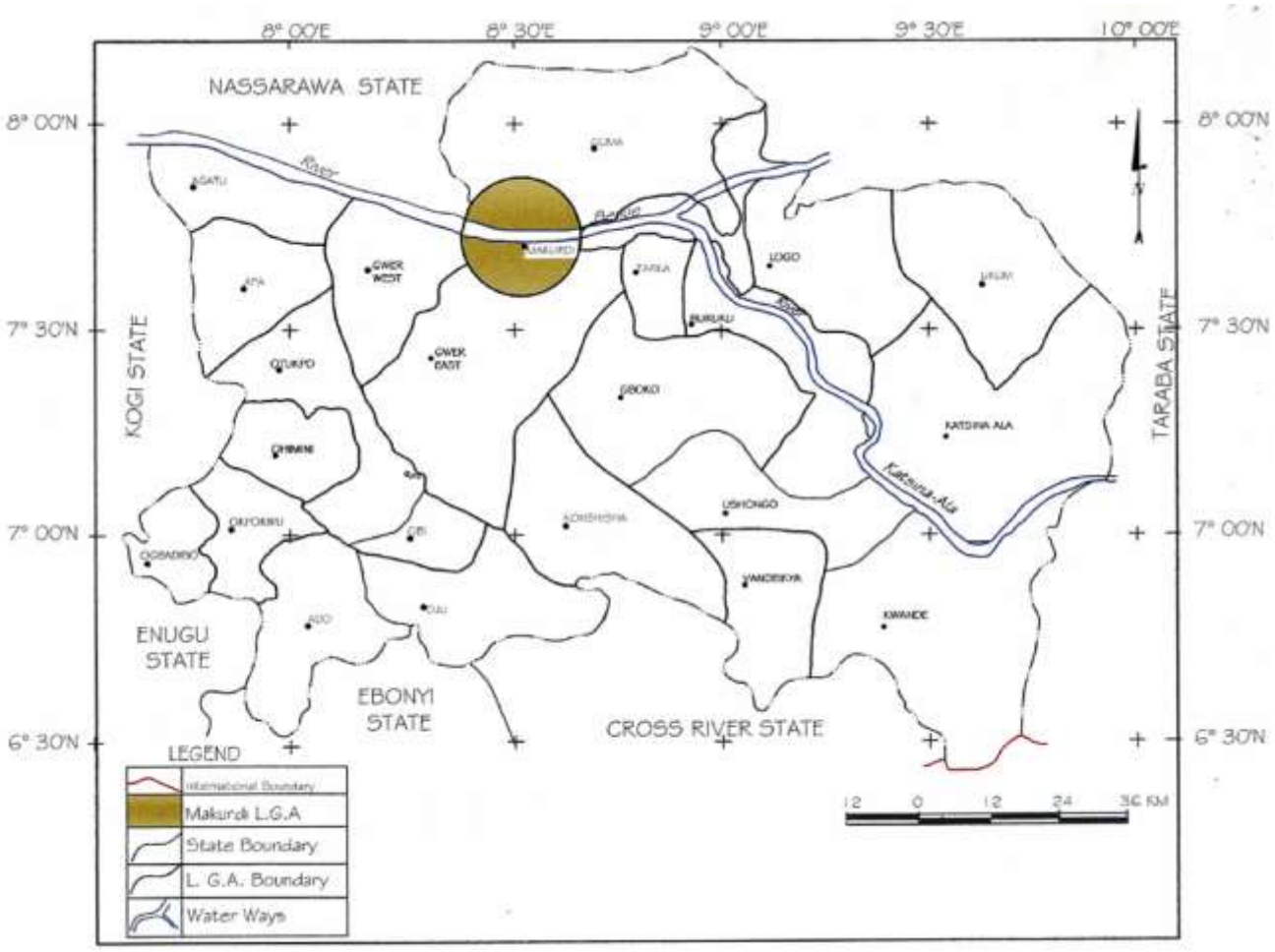


Fig 1.2: Map of Benue State Showing Makurdi ocal Govt. Atea

Source: Ministry of Lands and Survey makurdi, (2012)

Makurdi is the state capital of Benue state, it falls between latitude 07^0 37 10"N, 08^0 30 ' 00" N and longitude 08^0 32'00"E and 09^0 00' 00"E. Makurdi covers both north and south of river Benue lying below 250 meters above sea level. Makurdi local government area is bounded by five areas to include, four local governments and one state boundary namely, Guma, Gwer-west, Gwer east, Tarka and Nassarawa state.

1.5.*2* *Extent of Study Area*

The area under study is called logo 1, it is one of the several layouts which made up the present Makurdi urban area, also referred to as Town Planning Sheet 184(TPS184) Logo comprises plots of over 500 and it is a high density layout. For the purpose of this study a sample size of 150 plots shall be considered.

This study covers the Makurdi Urban area of Benue State intelligent map, south of River Benue called Logo settlement area.

This study is limited to intelligent map of logo I used by the Ministry of Lands and Survey Makurdi.

The quality of the result (e g accuracy of the resulting plan/map) is a measure of how accurate the intelligent map used in the Ministry of Lands and Survey Makurdi.

1.6 Glossary

Spatial Data: Refers to all geographic referenced data to the earth.

Geographic Information System: Is a computer tool for capturing analyzing and displaying of spatial data with reference to the earth. It uses spatial reference and digital data base, with appropriate application software.

Geographic Information: Is referred to as any data that relates to specific location on the earth surface. It includes data on natural resources, Land use, location of rivers, mountains etc.

Attribute Data: Those are relevant information of every spatial object or point relevant to plots, access roads, park and garden.

Geo-spatial Relationship: This refers to relative position of points on the surface of the earth with reference to the Globe.

Geo-spatial information: These are direct or indirect spatial information, spatially referenced to locations on the earth surface such as the attribute of objects above or beneath the earth surface.

Geo-reference: Means to attribute spatial coordinates to each point of the land. The object in this way is geo-referenced and it is possible to relate them spatially and correlate phenomena.

OCX; Office in-Charge of Examination, all spatial data collected from the field and processed are checked for error before sending to cartographic unit for intelligent map up-date.

Intelligent map: Standard drawing sheet of which contain spatial/ attribute information (date base) for land holding in Ministry of Lands and Survey Makurdi

AutoCAD ; Automated Computer Aided Design/Drafting

CHAPTER TWO: LITERATURE REVIEW

2.0 Review of Related Literature

Today's intelligent maps don't just represent spatial relationships; they reveal conditions in the city that were previously hidden in spreadsheets and databases. And it's not just a new representation of the city that emerges out of this data; it’s a new hybrid city, part physical texture and part data-driven map. (Vernelis, 2008.) As maps have become more complex, they have become our native medium for analyzing environments and societies, essential parts of the decision-making process in policy making. Climatologists, biologists, epidemiologists, transportation engineers, urban planners, community groups, and many others rely on geographic information systems (GIS) software (such as ESRI'sArcGIS) to understand data and to make arguments. The greater percentages of information required is contained in the spatial component.

2.1 GIS Potential in Spatial Analysis

Duggal (2006) opined that, GIS today has become indispensable tool for surveying land and natural recourses

i Support decision-making based on spatial data for example, an engineering geologist may evaluate slope stability conditions

ii Through GIS deciding the best new route.

iii Support general research, collect, manipulate and use spatial data in database management. Produce standardized and customized cartographic resources, monitoring of the environment, formulate economic and community development strategies, enforce law and order and deliver social services.

Attempt has been made over the years to develop and utilize database of mountains, water bodies. Network of roads, parcel of land and other important features. Therefore, the quality of data is enhanced by its availability and completeness. Thompson (2000) agreed to this assertion stressing that most of the GIS operations are based on database acquisition and integration. GIS is therefore a tool for spatial data analysis, which allows for the collection, storage analysis or manipulation and display of such data.

The concept of GIS according to Duggal (2006) brought about a dramatic philosophical and technological resolution in the development of GIS. Geographic Information System (GIS) is now a gateway for assessing and integrating geographical data from different sources located locally and globally, increasingly used for interactive visualization of scenarios resulting from different business decisions as well as for the communication of spatial knowledge and intelligence among people all over the world.

Geographic Information System (GIS) has been of tremendous use in Land surveying and Management. This has revised the practice where records concerning land were kept on paper (analogue) which is cumber some to manage and are easy to destroy.

The digital interaction of computers has been operating in about three (3) decades (from 1980s to date). It employs the use of mathematics to represent information and features (Onosemuodu, 2008).

Geographic information System GIS according to Ndukwe (1997) as defined in standard committee of UK Association of Geographic Information System (AGIS) is a system for acquiring and handling of data which are directly or indirectly referenced to the earth GIS is a tool for spatial analysis, it allows collection, storage analysis manipulation display or management of such data. To Dale (1976) GIS started with Computer Aided Drafting System used to manipulate CAD, map features, electronics data tables that could be hung onto map entities, but the concept of relational and topological analysis were for practical applications in a municipal planning and management role. The National Center for Geographic Information Analysis (NCGIA) defined GIS as a computerized database management for capturing retrieved, analysis and display of spatial (locally defined) data. They also stressed that, GIS is the best technique for a decision support system involving the integration of spatially referenced

data for environment problem solving it is clear therefore, that data model play a role in GIS result since it is the combined effort of various disciplines as a guide.

Duggal (2006) stipulates that, GIS exist in variety of forms and are named differently as e.g. Land Information System (LIS), Cadastral Information System (CIS) National Resources Information System (NRIS). All forms of data models are developed in accordance with the operational principal of GIS.

Data model is an abstraction of the real world it must be simple and able to satisfy the Information needs of the application. Bola (1998) defined GIS as a computer system that records, stores, analyze information about the features that make up the earth surface. A GIS can generate two or three dimensional images of an area, showing natural features, such as landscape, landform, roads, rivers etc. Ginger (1993) stated that GIS is sophisticated digital mapping management system that embodies an object data structure for storing and management of computer data relationship inherent in the numerous information sources from which data are constructed. Ndukwe (2001) also opined that GIS is a computerized information system for capturing, storing, integrating, manipulation, analyzing, checking and displaying data which are spatially referenced to the earth, capable of handling both positional and attribute data.

Kavanagh B F (2007) opines that GIS is any data which relate to specific locations on the earth surface. It includes data on natural resources, land use, utility distribution, urban structure, waste disposal and pollutants etc. He further stressed that GIS is computerized database of land related information through geographic identifiers. GIS is specifically organized computer software, hardware geographical data personnel design to effectively capture, update manipulate, analyze and display all forms of geographical referenced information.

From the foregoing, a successful development of spatial information of the features in the countries has been largely due to data availability. Also as a result of the political will and financial backing to acquire data set brought about the development recorded in geo-spatial information.

Assessing the Accuracy of intelligent map shall bring about effective delivery of land administration.GIS IT compliant, a global way of life shall assess and rectify the authenticity of

the intelligent map for the goal of producing a reliable and functional building block for a sustainable cadastral framework.

2.2 Differential Global Positioning System (DGPS).

The Radio Technical Commission for Maritime Services (RTCM), a Non profit scientific and educational organization that serves all aspects of maritime radio communications, radio navigation, and related technologies, defined the differential data protocol for relaying GPS correction messages from a base station to a field user. Its Special Committee 104 (RTCM SC-104) format recommendations define the correction message format. Each correction message includes data about the station position and health, satellite constellation health, and the correction to be applied. Using real-time differential corrections allows navigation to within one to two meters of any location depending on the service and the GPS receiver. Reference stations collect the base station GPS data and relay this data in RTCM SC-104 format to a Network Control Center, which sends the information to a geostationary satellite for verification. The verified information is sent to the roving GPS receiver to ensure it obtains GPS positions in Real time (Karen, S. 2007).

2.2.1 *Reprocessing Real-Time Data*

Some GPS manufacturers provide software that can correct GPS data that was collected in real time. This is important for GIS data integrity. When collecting real-time data, the line of sight to the satellites can be blocked or a satellite can be so low on the horizon that it provides only a weak signal, which causes spikes in the data. Reprocessing real-time data removes these spikes and allows real-time data that has been used in the field for navigation or viewing purposes to be made more reliable before it is added to a GIS.

Post processing Correction according to Vernelis (2008) differentially correcting GPS data by post processing uses a base GPS receiver that logs positions at a known location and a rover GPS receiver that collects positions in the field. The files from the base and rover are transferred to the office processing software, which computes corrected positions for the rover's file. This resulting corrected file can be viewed in or exported to a GIS.

There are many permanent GPS base stations currently operating throughout the World that provide the data necessary for differentially correcting GPS. Depending on the technology preferred by the base station owner, this data can be downloaded from the Internet or via a bulletin board system (BBS).

2.2.2 Accuracy Attainable

To attain accuracy levels on the order of one to 10 centimeter, differential correction is essential. The three main methods currently used for ensuring data accuracy are real-time differential correction, reprocessing real-time data, and post processing. Each method will achieve similar levels of accuracy Karen S. (2007) so the decision regarding which technique is appropriate will depend on factors such as project specifications, the end use of the data, and the sources available for differential correction.

2.3 How Does a GIS Work

The powers of a GIS come from the ability to relate different information in a Spatial context and to reach a conclusion about this relationship. Most of the information we have about our world contain a location reference, placing that information at some point on the globe. When parcel or land information is collected, it is important to know where the plot is located and its topology. This is done by using a location reference system, such as longitude and latitude, and perhaps elevation. comparing the parcel information with other information's, such as the location of roads in a vicinity, may show the strategies location to assist the easy conveyance of building materials to the site, and this inference can help us make the most appropriate decisions about how busy the road might be during physical development. AGIS, therefore, can reveal important new information that leads to better decision making. (Ojigi,2011)

2.4 Auto CAD

AutoCAD is application software also referred to as Computer aided design/Computer aided drafting, Engineers use CAD to create two and three dimensional drawings, such as those for the automobile and airplane parts, floor plans, and maps. While it may be faster for an Engineer or Surveyor to create an initial drawing by hand, it is much more efficient to change and distribute drawings by computer.

In the design stage, drafting and computer graphic techniques are combined to produce models of objects. Designers manipulate and test these models on video display screens until they incorporate the best balance of feature, including ease of production and cost. The CAD information's is then combined with CAM procedures through shared databases. Today, it is possible to perform the six step art-to-part process with a computer.

The first two steps in this process are the use of sketching software to capture the initial design ideas and to produce accurate Engineering/Surveying drawings. The third step is rendering an accurate image of what the part will look like next, Engineers analysis software to ensure that the part is strong enough. Step five is the production of a proto type or model. In the trial steps the CAM software controls the machine that produces the part. (Harley S, 2012).

The history of AUTOCAD, according to him dates 1961 when an American Ivan southern land invented CAD he described a computerized sketchpad in a doctoral thesis while attending the Massachusetts institute of technology (MIT)in Cambridge, Massachusetts.

He designed CAD to replace the traditional drafting board and other tools drafters use, such as the ink pen, plastic stencil and electric eraser.

Earlier CAD software ran on large, expensive computers. Today, Engineers can run CAD software on personal computers or UNIX work stations.

CHAPTER THREE: METHODOLOGY

3.1 Overview

This is the determinant of the possible ways and procedural steps for conducting this research work. The relevant data acquisition from OCX / Cartographic units both primary and secondary data are of utmost importance for this research work.

The cartographically plotted township cadastre was scanned and geo referenced. The cadastral parcels were then digitalized. The beacon coordinates, got from the field survey of the cadastre were collected from OCX and used to plot the layout. Thus two maps of the same data and layout were derived one from the beacon coordinates while the other from the cartographic plots. These two maps were overlaid digitally to extract departure from plotted parcels.ArcViewGIS3.2a used as analysis tool. Areas of plotted parcels and their perimeters were derived, areas of digitized parcels and their perimeters were also deduced. The area of plotted parcels formed one data and the area of digitized parcels the other. Test of Hypothesis on the mean, (Two Populations) carried out, to check for variations in area which is proportional to shift in boundary points. The resultant variation, is a consequence of inaccurate intelligent map.

3.2 Materials and Equipments

The materials used for the actualization of this work includes,

i HARDWARE

Leica TRC 402 Total Station and its reflector

Hardware such as scanner-AO, computer and its accessories, i.e. key board, hard drive, mouse, monitor, printers, Laptop, were used.

ii SOFTWARE

The application packages for the actualization of this work includes

- AutoCAD 3D
- AutoCAD 2009
- Arc View GIS3.2a

iii. PERSONNEL

A corper surveyor, two chainmen, and three field attendants were engaged with me on the field.

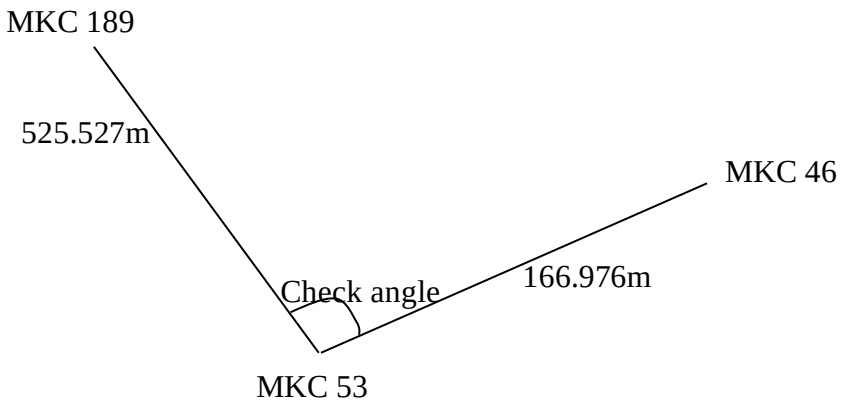
Data acquisition

Reconnaissance.

The corper surveyor, the head chaiman and myself used three days to carry out a reconnaissance of the entire logo 1, we discovered three controls, Mkc 46, Mkc 53 and Mkc 184.

Data capture. Digital data acquisition was possible with the aid of Leica TCR 402 Total and its reflector.

MKc 46, MKc 53 and MKc 184 were the controls used for the survey. However before the survey commenced a check survey to determine whether the controls were insitu.



The co-ordinates of the controls were extracted and from calculation the bearing and distances were determine and the subtended angel obtained. Captured data's on traversing the three controls comparing there was a liner difference in millimeter and angular in less than five seconds. Therefore, the controls were proved to be instu.

From the controls, six stations were traversed been the external perimeter points of the layout. The established co-ordinate therefore was used as co-ordinate values as a ground thru-thing requirement for the Geo-referencing of the scanned logo map.

3.3 Plotting By Coordinates of Boundaries

Township co-ordinates of study areas logo 1 (TPS 184) collected from office in charge of examination (OCX) form the raw data for plotting using AutoCAD software. AutoCAD 2009 environment is launched, from Microsoft window, note pad is selected and opened.

Commands such as shift (—) is activated and pline typed then an enter key. The town ship co-ordinates are then entered into the system using the numeric keys of the board. The co-ordinates are entered first with the eastern and then the northing co-ordinates a closed loop, or polygons is created as the individual beacon co-ordinates bounding the parcel are entered, representing a parcel of land. Many polygons could be entered provided the forms adjoining sides to each other. The written co-ordinates is saved with a name in form of a script.

The script is run in an auto card environment. The points are automatically and digitally plotted in a regenerated Aut0CAD model screen. This process is repeated for all the plots contained in the study area. This plotting is saved as drawing 2. Drawing 1 or logo I TPSI84 is the raw Rasta image, scanned from analogue intelligent map.

3.4 Collection of Data

The source data were collected from Ministry of Lands and Survey Makurdi Benue state, they include, analogue map of logo 1 (TPS184). Computation jacket of logo 1 (TPS184) was requested from office of examination (OCX) of the Ministry.

3.5 Converting the Intelligent Map to Digital Form

Data Preparation

- Analogue map of logo 1 was scanned with A O.

- With Auto-Cad 3D Map, the scanned Map was Georeferenced.
- On the Georeferenced Map the respective plots within the study area was digitized.

3.5.1. *Geo-Reference*

The scanned map was Inserted from the image menu bar then Click on map menu on the menu bar then From the pull down menu, select tools then Click on tools and then pick rubber sheet then Click on the point you want to geo reference. The system will prompt you to enter base point 1. Coordinates entered by typing in the Easting coordinate value first then followed by typing in the Northing coordinate value i.e. Easting, Northing. Repeat the same operation for all the points to be geo referenced.

Having finished entering all the points, press enter twice. Then pick select by typing S in the command window. After that, select the map in the drawing window and press enter. The map will disappear. Type in Z press enter, type in E press enter and the map will then appear geo referenced.

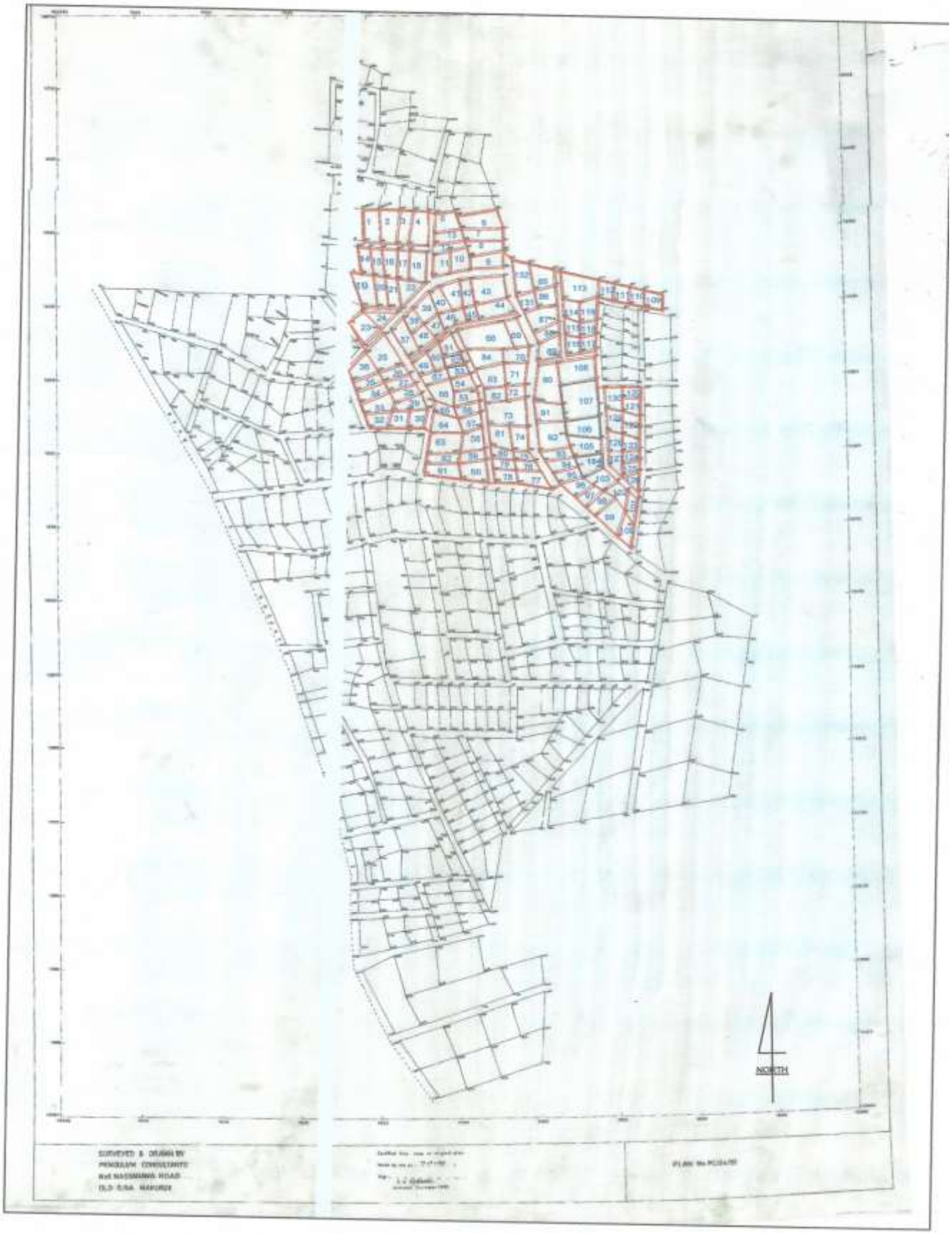


Fig 3.5: Geo reference Layout Map of Logo, Makurdi

Source: Ministry of Lands and Survey Makurdi, (2009)

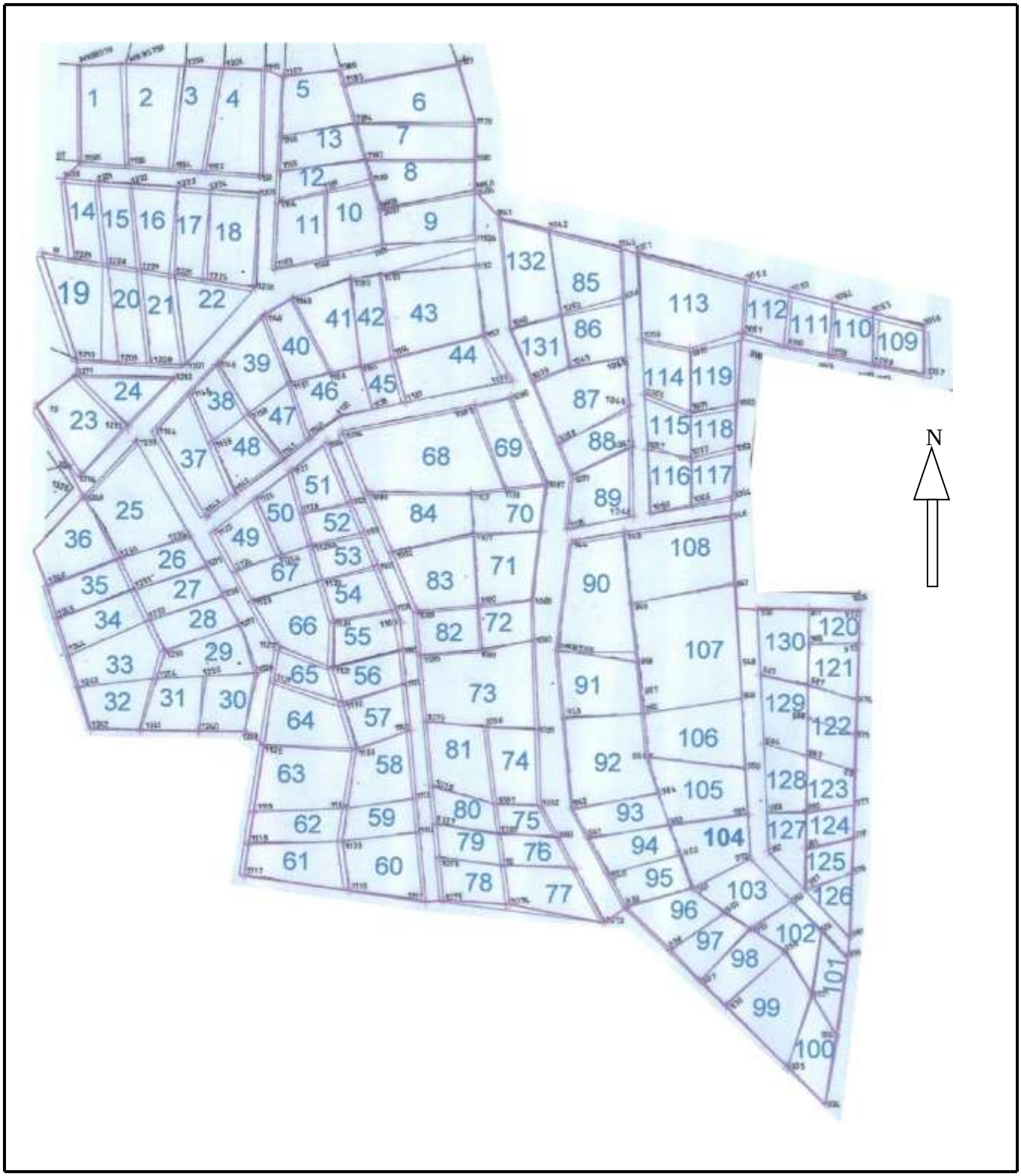


Fig 3.6: Layout Map of Logo 1 showing plot Beacon Numbers

3.5.2 Digitizing the Geo-reference Map

There are two types of digitization i.e. manual and on-screen method of digitizing

In this project, on screen method was used. The following steps were followed to digitized logo1scanned map.

AutoCAD 2009, was employed for the digitization

Firstly AutoCAD 2009 environment was launched

Layer icon was picked and opened with a single click

Layers were created for parcel of plot with red color lines

Layers were also created for Beacons with pink color, a point style of cross and a circle stamped at the center was applied.

Another layer was created for access roads in Arc View GIS 3.2 environment.

In digitizing the parcel, poly line was picked from the side menu bar

The mouse was employed to zoom at the intersection points of the plotted points on the scanned map opened and imported

At the clearly zoomed points of intersection I right clicked, clock wisely on each point forming a parcel of land within the study area.

Through this comparative analysis, accuracy of the intelligent map could be deduced. Hence for a significant difference the need to apply GIS Capabilities in capturing/input spatial/attribute data, data manipulating/ processing and presentation/reporting is the only option for effective and efficient land administration in Makurdi lands and survey ministry.

3.6 Study Area

The study areas logo 1 settlement area of Makurdi urban area of Benue State.

Logo 1 is covered with un digitized map comprising plots, roads; market square, farm land with other infrastructures

3.7 Sampling Technique

A simple random technique with the use of balloting administered on generated data table 1. A sample size of thirty five was used for this research work.

3.8 Statistical Analysis

The area deduced from plotted parcel and area deduced from digitized parcel the departure from the plotted parcel shall be analysis using standard deviation and using

$$.z^2 = \frac{x_1 - x}{n_1 - 1}$$ to analysis.

The test at 95% confidence level if there is any significant difference then the intelligent map of Logo 1 needs GIS capabilities to serve its purpose of intelligent map.

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF RESULTS

4.1 Result Presentation

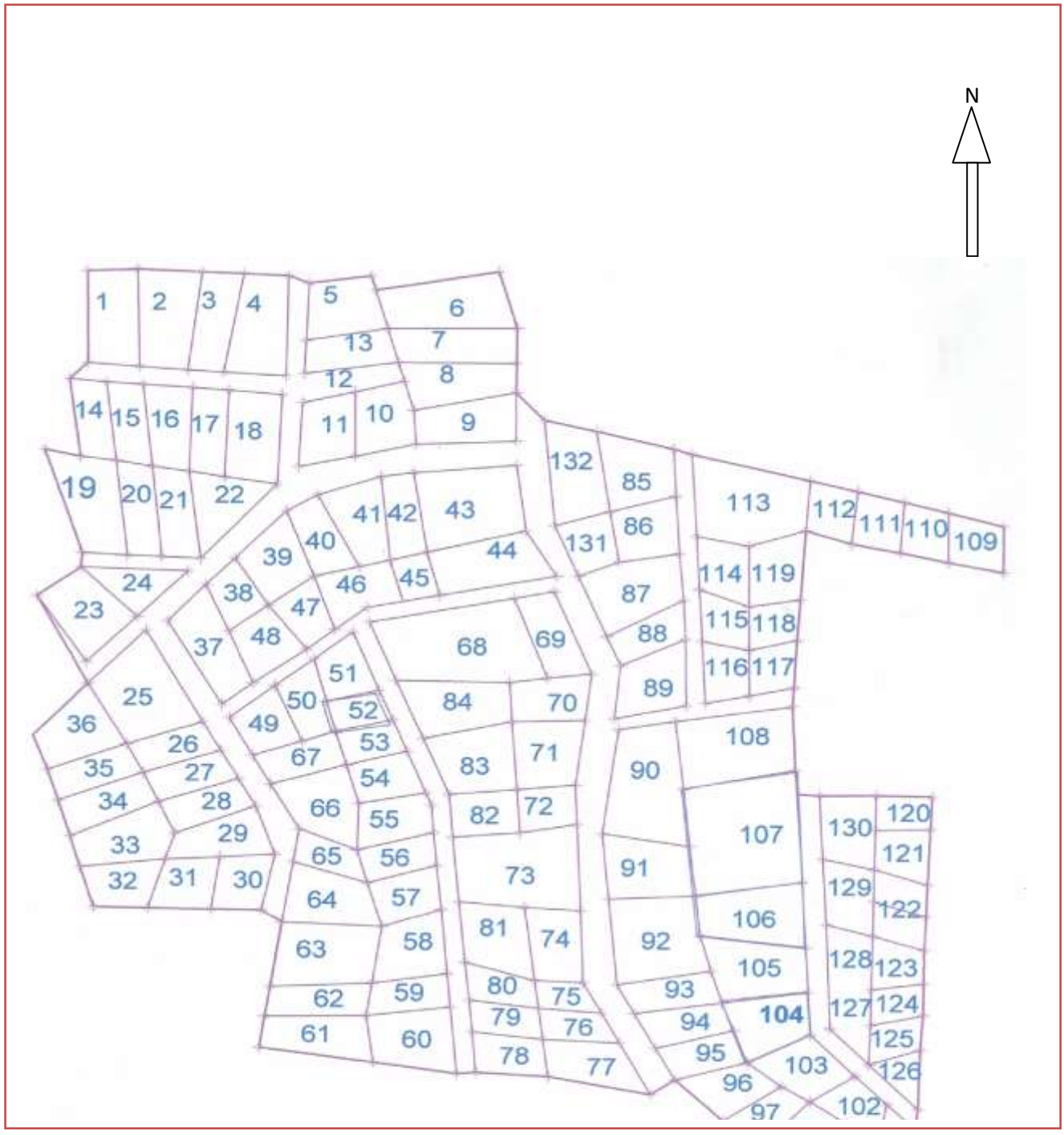


Fig 4.1: Plotted Map of Logo 1

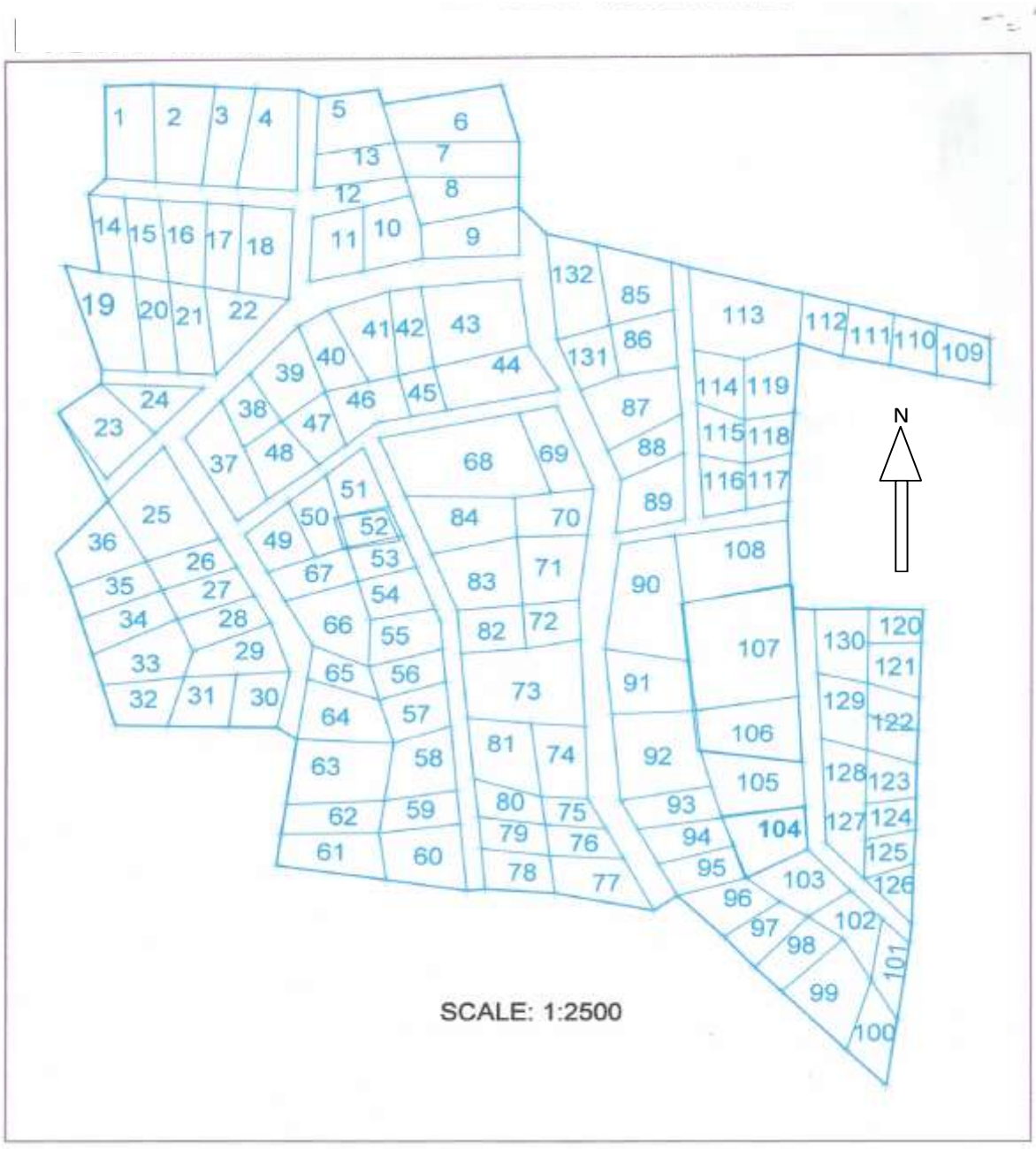


Fig 4.2: Digitized Map of Logo 1

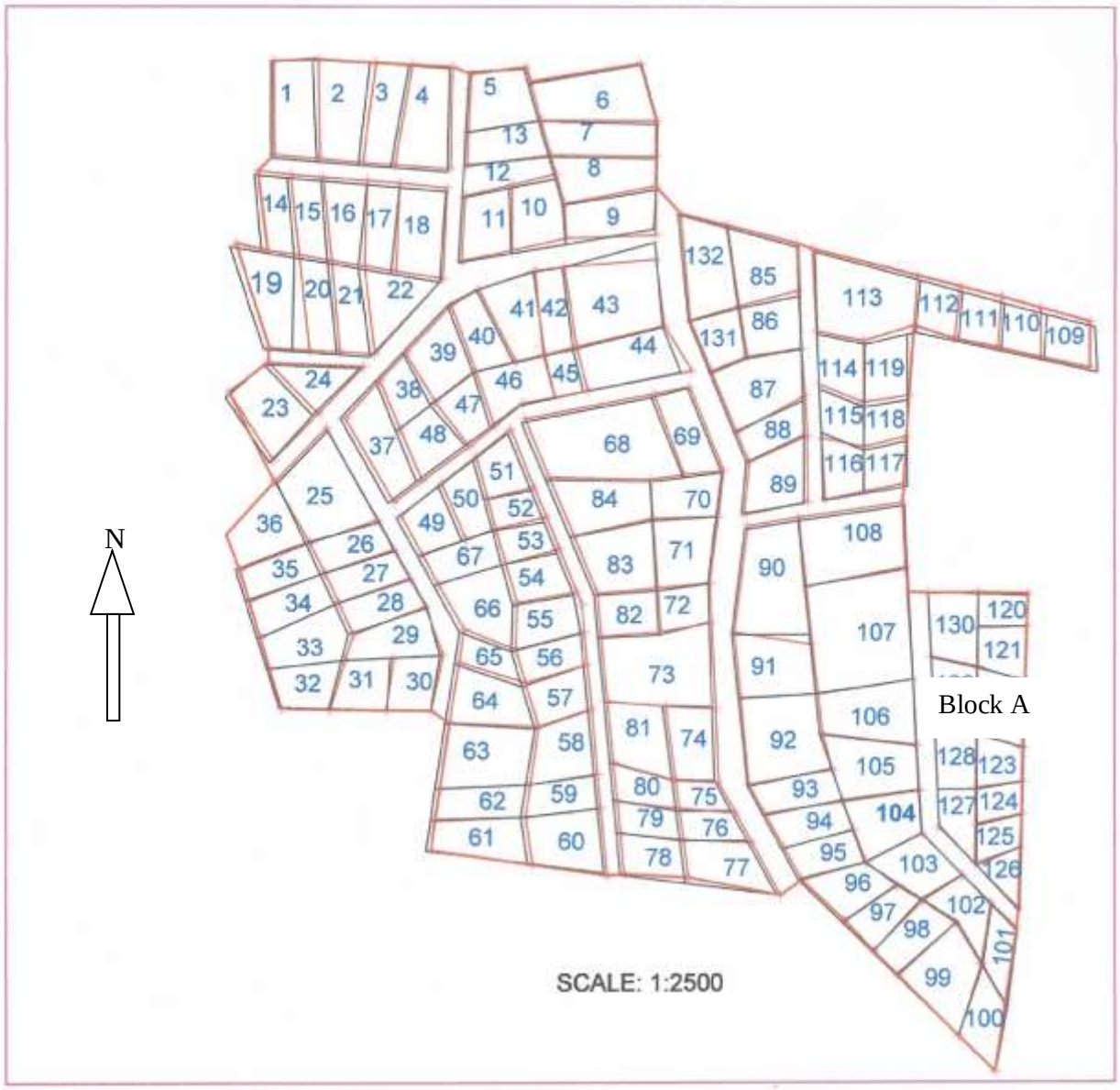


Fig 4.3: Overlaid Map of Logo 1

4.2 Analysis of Result

Fig 4.3: the over laid map of logo 1. It is observed as follows

- Block A is a complete overlay between plotted and digitized parcel.
- The other blocks have fairly constant displacement this is seen from the overlaid map overleaf..
- However the excite abnormality in the overlay they are as a result of distortion in the lay out.

- Statistical calculation at 95% confident interval null hypothesis was accepted in deviance to my proposal.

However, there occurred a gross aberration in shape of plotted parcel id No 9 and 43, (fig 4.1) it appears the owner of this plot has shifted his boundary beacon into the road to increase the size of his plot. The shifted beacons were coordinated and also reflected on the coordinate records this was after the initial survey traverse leading to the production of the intelligent map. Hence the overlay of the plotted parcel and the digitized parcel showed constriction of the access road.

The entire overlay as seen from the Western side of the layout, there is a fairly uniform and constant shift of the digitized to the Eastern side of the layout which is evident of inaccurate intelligent map.

The area deduced from scanned map is often used to calculate the area occupied by applicants for purposes of computing their C. of 0 fees and also survey fees. The applicants involved are usually cheated as wrong areas are usually scaled.

The constant usage of the analogue map leads to wear and tears a lot of features on the map are usually worn out due to this action.

Changes is attributable to periodic weather variation as it adversely affect queries made during changes in weather condition, this result is seen during the raining season as the base material absorbs moisture from the atmosphere resulting in swell of such materials; and again in dry season, moisture is absorbed from base material of map resulting in shrinkages. Hence the whole drawing is subjected to proportional shrinkage.

Shortage procedure and condition affects the base map too. If they are stored in heap, pressure over time could change the base map consequently affecting the accuracy of the drawing.

The same scenario could lead to a lost of confidence in the operation of surveyor who goes to settle land dispute case who again relies on scaled parameters from the inaccurate intelligent

map, at the end of his exercise a wrong boundary points are established, The parties will certainly not feel satisfied as the exercise did not reveal the actual position on ground.

4.3 Statistical Analysis

Form table iii the area of plotted and digitized parcel can be computed as follows;

$\sum X_1$ (plotted parcel area) = 25166.530

X_1 (sample mean plotted) = 719.044

Sample size $n_1 = n_2$ = 35

$\sum X_2$ (Digitized parcel area) = 24819.951

X_2 (sample mean digitized) = 709.141

$$S_1^2 = \frac{(25166.530 - 719.0444)^2}{34}$$

$$= 17578810.93$$

S1 = 4192.709m^2 – (standard deviatipon)

Also

$$S^2_2 = \frac{(24819.952 - 709.141)^2}{34}$$

$$= 170976.68$$

S_2 = 4134.970m^2 (Standard deviation)

Test Statistics

$$Z = \frac{X_1 - X_2}{\frac{S_1}{n_1} + \frac{S_2}{n_2}} = \frac{719.004 - 709.141}{\sqrt{\frac{8258169.072}{35} + \frac{8093062.232}{35}}} = \frac{9.903}{163.387}$$

$$= 0.055$$

At 95% confidence interval – 1.96 < Z< 1.96

But Z = 0.055 is within the confidence interval hence we accept the null hypothesis which says $\mu_1 = \mu_2$ which is not in support of my research work.

CHAPTER FIVE: SUMMARY CONCLUSION AND RECOMMENDATION

5.1 SUMMARY

At the end of this research work I was able to sum up my findings that the analogue map which was plotted using free hand by the cartographer, had no significant difference from the digital application, using Auto cad. But for the limitations caused by lack of steady weather conditions, wears and tears of the map, human error as cartographers plot using free hand are some of the serial short comings of the analogue maps.

5.2 CONCLUSION

In conclusion, there is a clear difference between storing recorded coordinate of a cadastre and storing the plotted parcels of the cadastre. As can be seen, after a period of fifteen years (15 yrs) the discrepancy between the stored plotted parcels and the stored coordinate can be unacceptably large. This is seen in displacement of 5.52m between a boundary point of plotted parcel in a black ink and digitized parcel in red ID No 44. See fig 4.1

5.3 RECOMMENDATION

It is therefore, recommended that coordinate should be stored and only plotted for the purpose of visual comparison, field reconnaissance and direction guide by analogue method while for land administration leading to issuance of certificate of occupancy and other precise assignments digital plotting technique should be adapted.

Table I: **Data generated from and vectorized parcel**

S/NO	PLOT ID	VECTORISED PARCEL (m2)	VECTORIZED PERIMETER(m)	PLOT ID	PLOTED PARCEL (m2)	PLOTED PERIMETER(m)	DEPARTURE FROM PLOTED AREA (m2)	DEPATURE FROM PLOTTED PERIMITER(m)
1	138	918.978	130.365	1	919.344	132.122	0.366	1.754
2	63	497.947	90.608	96	1069.949	140.162	572.002	49.559
3	95	732.867	124.866	3	776.242	127.933	43.375	33.027
4	94	1025.461	137.727	4	1062.251	140.119	36.79	2.392
5	144	891.636	125.697	18	900.346	125.831	8.71	0.134
6	93	582.195	108.956	17	588.483	108.514	6.288	-0.442
7	92	677.915	112.922	16	667.197	111.755	-10.718	-1.67
8	90	545.338	105.082	15	561.868	105.376	16.65	0.294
9	91	532.1	103.357	14	529.739	102.302	-2.361	-1.055
10	86	1059.259	143.361	19	941.817	136.216	-117.442	-7.145
11	84	609.991	115.632	20	753.834	121.397	143.843	5.765
12	85	632.202	114.34	21	604.035	113.366	-28.167	0.974
13	145	712.167	123.968	22	740.973	125.65	28.806	1.682
14	83	489.355	106.273	24	490.731	106.463	1.376	0.19
15	82	898.186	121.792	23	887.795	120.858	-10.391	-0.936
16	134	1315.605	148.129	25	1595.705	147.187	-19.9	-0.542
17	130	493.231	96.193	70	537.447	101.834	44.216	5.641

18	131	501.855	97.658	72	535.221	102.634	33.386	4.976
19	132	526.764	100.15	74	547.792	104.446	21.028	4.296
20	133	686.537	116.295	75	699.916	118.251	17.379	1956
21	124	543.269	94.574	78	532.867	93.107	10.402	-1.467
22	125	567.799	96.806	77	574.858	96.833	7.059	0.027
23	126	589.468	100.442	76	572.194	98.868	-17.274	-1.574
24	127	820.225	117.499	73	782.564	114.886	-37.661	-2.613
25	128	613.624	108.538	71	617.784	108.019	4.16	-0.519
26	129	532.68	101.341	69	546.266	101.681	13.586	0.34
27	4	762.578	111.41	5	765.411	111.655	2.833	0.245
28	5	1165.817	149.632	6	1208.564	153.389	42.747	3.757
29	156	815.599	133.797	7	838.451	136.995	22.852	3.198
30	80	818.704	127.399	9	844.529	129.905	25.825	2.506
31	79	791.395	121.676	11	749.649	120.385	-14.746	-1.293
32	77	702.76	106.035	12	721.455	107.12	18.695	1.085
33	76	662.423	105.545	13	678.453	106.1	16.037	0.555
34	157	450.65	103.528	10	115.67	108.024	65.02	4.496
35	18	574.751	104.541	8	577.817	105.058	3.066	0.517
36	75	1418.727	151.684	13	1654.839	1654.839	236.112	13.155
37	146	984.134	135.022	37	919.548	130.02	-64.586	-4.995

38	149	315.417	71.784	36	261.607	66.095	-53.81	-5.689
39	1	664.407	110.009	35	701.837	113.096	37.43	3.087
40	2	480.543	90.079	34	478.025	89.642	-2.518	-0.437
41	3	602.759	99.033	33	577.468	97.016	-25.591	-2.017
42	81	889.05	134.396	26	893.288	134.522	4.238	0.126
43	70	449.695	87.233	27	464.892	89.548	15.197	2.315
44	71	740.643	111.934	28	773.739	114.637	33.096	2.703
45	72	577.533	103.407	29	596.009	104.912	18.476	1.505
46	74	752.747	116.587	30	796.901	119.077	44.154	2.49
47	148	553.943	105.526	31	516.006	104.194	-37.937	-1.332
48	112	505.352	91.668	60	485.787	89.785	-19.565	-8.883
49	111	335.031	75.336	61	347.886	76.717	12.855	-1.381
50	109	397.254	81.786	65	385.182	81.086	-12.072	-0.7
51	108	522.314	92.86	67	529.271	93.698	6.957	0.838
52	107	602.539	100.248	68	584.253	100.052	-18.286	-0.196
53	106	475.042	92.699	81	498.181	94.749	23.139	2.05
54	151	573.771	97.11	82	568.823	97.102	-4.948	-0.008
55	101	764.977	112.991	84	760.802	112.802	-4.175	-0.189
56	100	488.015	95.817	85	488.407	96.668	0.392	0.851
57	97	902.238	122.18	86	887.697	121.589	-14.541	-0.591

58	102	799.857	125.137	88	767.693	123.587	-32.164	-1.55
59	98	590.405	111.84	87	605.104	112.578	14.699	0.738
60	103	1156.974	139.237	83	1136.036	138.277	20.938	-0.96
61	104	864.892	122.863	80	846.961	122.427	-17.931	-0.436
62	105	402.517	88.7	76	411.966	90.025	9.389	1.325
63	142	871.431	121.254	66	888.019	121.983	16.588	0.729
64	141	531.706	93.44	64	527.79	99.496	-3.916	6.029
65	140	534.297	93.395	63	532.527	93.049	-1.77	-0.346
66	110	522.5	97.313	62	512.416	95.885	-10.084	-1.429
67	150	549.334	95.02	91	555.539	95.767	6.205	0.747
68	122	954.865	124.737	89	993.128	127.45	38.263	2.713
69	123	950.522	130.625	59	980.539	133.55	30,017	2.925
70	133	2067.198	190.731	56	2063.089	791.754	-4.109	1.023
71	114	84	115.965	57	690.008	116.082	1.315	0.117
72	139	728.12	103.442	58	596.855	101.002	-31.265	-2.38
73	121	828.921	115.963	90	824.623	115.978	-4.298	0.015
74	143	451.515	85.686	92	441.813	85.254	-9.702	-0.432
75	152	1744.399	171.364	93	1685.141	170.293		-1.071
76	154	716.007	110.461	95	715.24	110.345		-0.116
77	155	296.258	74.478	97	308.77	74.434		-0.044

78	12	393.025	87.648	99	386.374	85.646		-2.002
79	14	725.921	119.115	101	783.915	120.78		1.665
80	15	522.707	94.895	100	567.681	98.627		3.732
81	17	411.243	86.768	98	408.486	87.318		0.55
82	11	415.748	88.438	96	428.723	89.601		1.116
83	153	841.913	119.253	94	839.857	118.911		-0.342
84	174	499.261	90.116	41	504.574	90.705		0.589
85	191	949.8	132.383	38	973.402	133.803		1.42
86	20	863.893	120.171	39	909.547	123.147		2.972
87	21	660.426	103.244	40	653.394	102.809	-7.032	-0.435
88	22	1045.1	130609	53	1047.769	130.752	2.669	0.143
89	23	508.914	97.752	54	469.136	94.613	-39,778	-3.139
90	24	756.951	114.105	55	752.287	113.769	-4.664	-0.336
91	25	1569.975	166.761	102	1486.619	160.222	-83.356	-6.539
92	158	941.219	125.09	105	1017.035	128.421	75.816	3.331
93	31	1378.672	150.317	107	1370.753	150.586	-7.919	0.269
94	32	543.404	105.031	109	553.826	105.974	10.422	0.943
95	33	538.711	101377	111	559.565	103.14	20.854	1.763
96	34	511.46	96.232	112	509.234	96.958	-2.226	0.726
97	35	602.879	104.392	113	645.322	109.163	42.443	4.771

98	36	483.587	93.554	114	505.563	96.365	21.976	2.811
99	37	571.364	101.878	117	592.848	104.407	21.214	2.529
100	38	979.756	130.973	118	1027.85	133.56	48.044	2.587
101	39	569.118	110.197	120	584.79	110.085	15.672	110.085
102	47	431.357	101.834	119	424.618	101.941	-6.741	0.107
103	46	554.459	109.043	116	553.418	111.406	-1.041	2.363
104	45	701.943	108.784	115	680.017	109.04	-21.926	0.256
105	44	775.855	113.934	110	795.76	115.121	19.905	1.187
106	43	1010.303	131.706	108	977.561	130.95	-32.742	-0.756
107	42	1066.39	136.694	106	1106.735	139.4	40.345	2.706
108	41	2282.818	191.551	104	2320.349	193.216	37.531	1.665
109	40	1437.482	155.592	103	1419.45	155.669	-18.032	0.077
110	64	658.273	105.614	48	569.985	98.384	-88.288	-7.23
111	65	393.9	80.464	49	379.19	78.67	-14.71	-7.794
112	66	40.543	81.378	52	413.434	82.081	12.891	0.703
113	67	459.219	87.44	51	484.114	91.188	24.895	3.748
114	68	436.459	86.142	50	387.913	82.718	48.546	-3.424
115	69	541.732	96.197	47	568.711	98.372	26.979	2.175
116	59	1547.732	157.246	42	1569.688	158.607	21.956	1.361
117	60	462.283	87.22	43	467.226	87.298	4.943	0.078

118	61	471.21	87.606	44	444.652	82.943	-26.558	-2.557
119	62	437.298	84.973	45	423.315	82.943	-13.983	-2.03
120	63	497.947	90.608	46	482.691	89.252	-15.256	-1.356
121	55	350.873	76.322	122	330.608		-20.265	
122	54	485.095	89.052	123	493.634	89.539	8.539	0.487
123	52	344.669	76.885	125	683.804	107.839	344.669	30.954
124	51	425.563	83.659	127	427.658	83.656	2.096	0.333
125	50	359.344	74.232	128	329.356	74.382	0.012	0.15
126	89	359.047	78.177	130	343.879	77.168	-14.228	-1.009
127	48	288.5	78.916	131	304.176	78.914	15.616	2.346
128	160	438.527	92.669	129	446.009	94.465	7.482	1.796
129	159	509.157	93.183	126	520.636	94.191	11.479	1.796
130	616.18	130.221			102.921	-1.3		1.008

Table II: **Sampling Technique-Simple Random Sampling (Balloting) Technique**

Sample size of n = 35 plots.

S/N	Plot 1D	Area of plotted (m^2)	Area of Digitized(m^2)	Departure (m^2)
1	1	919.344	918.978	0.366
2.	4	1062.251	1025.461	36.790
3.	7	838.451	815.599	22.852
4.	10	515.670	450.650	65.020
5.	15	561.688	545.338	16.650
6.	13	678.453	662.423	16.037
7.	26	893.288	889.050	4.238
8.	28	773.739	740.643	33.096
9.	29	596.009	577.533	18.476
10.	33	577.468	602.759	-25.291
11.	35	701.837	664.407	37.430
12.	38	973.402	973.402	23.602
13.	41	504.574	499.261	05.313
14.	50	387.913	436.459	48.546
15.	57	690.008	688.693	01.315
16.	59	980.539	950.522	30.017
17.	70	537.447	493.231	44.216
18.	78	532.867	543.269	10.402
19.	88	767.693	799.857	-32.164
20.	90	824.623	828.921	-4.298
21.	96	428.723	415.748	-12.975

22.	98		408.485			411.243	-2.758
23.	100		567.681			522.707	44.974
24.	104		2320.349			2282.818	37.531
25.	107		1370.753			1378.672	-7.919
26.	109		553.826			543.404	10.422
27.	111		559.565			538.711	20.854
28.	115		680.017			701.943	-21.926
29.	118		1027.800			979.756	48.044
30.	119		424.618			431.359	-6.741
31.	121		698.838			694.487	-20.265
32.	124		614.880			616.1	8.539
33.	126		520.636			509.157	11.479
34.	128		329.356			329.344	0.012
35.	130		343.819			358.047	-14.228
	X_1	=	25166.530	X_2	=	24819.952	X=447.656
	X_1	=	719.044	X_2	=	709.141	

Table III: **Statistical calculation**

X	(X_1-X)	$(X_1-X)^2$	X	(X_1-X)	$(X_1-X)^2$
919.344	200.3	40120.09	918.978	209.837	44031.567
1063.251	343.207	117791.045	1025.599	316.32	100058.342
838.451	343.207	14258.032	815.599	106.458	11333.306
515.67	-203.374	41360.984	450.65	-258.491	66817.597
561.688	-152.356	23212.352	545.338	-163.803	26831.423
678.453	-40.591	1647.629	662.423	-46.718	2182.572
893.288	174.244	30360.972	889.05	179.909	32367.248
773.729	54.695	2992.543	740.643	31.502	992.376
592.009	-123.035	15137.611	577.533	-131.608	17320.666
577.468	-141.576	20043.764	602.759	-106.382	11317.13
701.837	-17.207	296.081	664.407	-44.734	2001.131
973.402	254.358	64697.992	973.402	264.261	69833.876
504.574	-214.47	45997.380	499.261	-209.88	74355.473
690.08	-29.036	843.089	688.693	-20.448	418.121
980.539	261.495	68379.635	950.522	241.381	58264.787
537.447	-181.597	32977.47	493.231	-215.91	46617.128
532.867	-186.177	34661.875	543.269	-165.872	27513.52
767.693	48.649	2366.725	799.857	90.716	8229.393
824.623	105.579	11146.925	828.921	119.78	14347.248
428.723	-290.321	84286.283	415.748	-293.393	86079.452
408.485	-310.559	96446.892	411.243	-297.898	88743.218
567.681	-151.363	22910.758	522.707	-186.434	34757.636

2320.349	1601.305	2564177.703	2282.818	1573.677	2476459.3
1370.753	651.709	424724.621	1378.672	669.531	448721.76
553.826	-165.218	27296.988	543.404	-165.737	27468.753
559.565	-159.479	25433.551	538.711	-170.43	29046.385
680.017	-39.027	1523.07	701.943	-7.198	51.811
1027.8	48.044	3903847.835	979.756	270.615	3849760.833
424.618	-294.426	86686.669	431.359	-277.782	77162.84
698.838	-20.206	408.282	694.487	-14.654	214.74
614.88	-104.076	10831.814	616.1	-93.041	8656.628
520.636	-198.408	39365.734	509.157	-199.984	39993.6
329.356	-389.225	151496.101	329.344	-379.797	144245.761
343.819	-375.225	140793.801	358.047	-351.094	123.267
$\sum (X_1-X)^2$ =		8258169.072	$\sum (X_2-X)^2$ =		8093062.232

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APPENDIX

PENDULUM CONSULTANT CO-ORDINATE REGISTER

ORIGIN OF SURVEY MNCR4 TOWNSHIP

PLOT ID	BEACON NO	CO-ORDINATES NORTING(M)	EASTING(M0
1	MKB 5378	13530.949	17589.884
	MKB 5759	13532.206	17608.988
	PC 1195	13484.76	17610.831
	PC 1196	13486.392	17589.957
2	PC1204	13530.392	17635.194
	PC1194	13483.28	17629.761
	PC1195	13484.76	17610.831
	MKB5759	13532.206	17608.988
3	PC 1206	13529.157	17653.038
	PC 1193	1382.124	17644.544
	PC 1194	13483.28	17629.761
	PC 1204	13530.392	17635.194
4	PC 1191	13527.883	17671.451
	PC 1192	13480.099	17670.432
	PC 1193	13482.124	17644.544
	PC 1203	13529.157	17653.038
5	PC 1167	13526.148	17680.64
	PC 1186	13527.441	17705.617
	PC 1185	13520.574	17707.553
	PC 1184	13503.517	17712.364
	PC 1166	13,498	17678.991
6	PC 1185	13520.574	17707.583
	PC1178		
	PC 1184	13503.517	17712.364
7	PC 1179	13502.07	17766.91
	PC1180	13486.233	17766.445
	PC 1182	13487	17717.018
	PC 1184	13503.517	17712.364
8	PC 1180	13486.233	17766.445
	PKA 2406	13471.996	17766.026
	MKB 2406	13465.008	17723.222
	PC 1183	13476.891	17712.364
9	MKA2406	13471.996	17766.026
	PC 1152A	13447.95	17765.475
	PC 1161	13447.031	17724.618
	MKB 2401	13465.008	17723.222
10	PC 1182	13487.008	17717.018
	PC 1161	13447.031	17724.618
	PC 1162	13442.747	17699.629
	PC 1181	13472.681	17698.842
11	PC 1181	13472.681	17698.842
	PC 1162	13442.747	17699.629

	PC 1163	13438.627	17675.607
	PC 1164	13468.316	17677.229
12	PC 1182	13487.008	17717.018
	PC 1183	13476.891	17717.871
	PC 1164	13468.316	17677.229
	PC 1165	13483.212	17678.108
13	PC 1184	13503.517	17712.364
	PC 1182	13487.008	17717.018
	PC1165	13483.212	17678.108
	PC 1166	13498.203	17678.991
14	PC 1220	13478.591	17582.242
	PC 1229	13443.272	17585.685
	PC 1228	13440.756	17600.544
	PC 1221	13477.321	17597.217
15	PC 1221	13477.321	17597.217
	PC 1222	13476.012	17612.652
	PC 1227	13438.296	17615.078
	PC 1229	13443.272	17585.685
16	PC 1222	13476.012	17612.652
	PC 1223	13474.242	17633.526
	PC 1227	13438.296	17615.078
	PC 1228	13440.756	17600.544
17	PC 1223	13474.242	17633.526
	PC 1224	13472.97	17648.522
	PC 1226	13435.802	17629.809
	PC 1227	13438.296	17615.078
18	PC 1224	13472.97	17648.522
	PC 1205	13471.16	17669.864
	PC 1206	13429.498	17667.053
	PC 1225	13433.302	17644.58
19	PC 1229	13443.272	17585.685
	PC1228	13440.756	17600.544
	PC 1209	13397.097	17605.163
	PC1210	13398.336	17586.767
20	PC 1228	13440.756	17600.544
	PC 1227	13438.296	17615.078
	PC 1208	13396.096	17620.027
	PC1209	13397.097	17605.163
21	PC1227	13438.296	17615.078
	PC 1226	13435.802	17629.809
	PC1207	13395.057	17635.451
	PC 1208	13396.096	17620.027
22	PC 1225	13433.302	17644.58
	PC 1206	13429.498	17667.053
	PC 1207	13395.057	17635.451
23	PC 1211	13391.339	17586.864
	PC 1212	13368.144	17609.092
	PC 1216	13416.787	17541.529
	PC 15		
24	PC 1211	13391.339	17586.864

	PC 1212	13389.839	17630.615
	PC 1213	13368.144	17609.092
25	PC 1233	13361.205	17616.008
	PC 1234	13318.935	17639.724
	PC 1250	13309.031	17605.924
	PC 1248	13336.761	17592.963
26	PC 1234	13318.935	17639.724
	PC 1235	13305.93	17647.021
	PC 1251	13295.209	17612.751
	PC 1250	13309.031	17605.924
27	PC 1235	13305.93	17647.021
	PC 1236	13293.029	17654.258
	PC 1252	13281.602	17619.195
	PC1251	13295.209	17612.751
28	PC 1236	13293.029	17654.258
	PC 1237	13280.146	17661.487
	PC 1253	13268.111	17628.582
	PC 1252	13281.602	17619.195
29	PC 1237	13280.146	17661.487
	PC 1238	13258.93	17667.493
	PC 1254	13256.061	17622.46
	PC 1253	13268.111	17628.582
30	PC 1238	13258.093	17667.493
	PC 1239	13232.373	17663.255
	PC 1240	13232.813	17643.321
	PC 1255	13257.078	17644.72
31	PC 1255	13257.078	17644.72
	PC 1240	13232.813	17643.321
	PC 1241	13233.405	17616.508
	PC 1254	13256.061	17622.46
32	PC 1254	13256.061	17622.46
	PC 1241	13233.405	17616.508
	PC 1242	13233.9	17594.084
	PC 1243	13251.878	17588.522
33	PC 1243	13257.878	17588.522
	PC 1244	13265.899	17583.963
	PC 1252	13281.602	17619.195
	PC 1254	13256.061	177622.46
34	PC 1244	13265.899	17583.963
	PC 1245	13283.053	17578.465
	PC 1251	13295.209	17612.751
	PC 1252	13281.602	17619.195
35	PC 1245	13283.053	17578.465
	PC 1246	13297.369	17573.876
	PC 1250	13309.631	17605.924
	PC 1251	13295.209	17612.751
36	PC 1246	13297.369	17573.876
	PC 1248	13336.761	17592.963
	PC 1250	13309.631	17605.924
37	PC 1142	13337.855	17656.544

	PC 1143	13327.832	17643.605
	PC 1144	13366.937	17621.728
	PC 1145	13384.048	17637.886
38	PC 1159	13228.833	17530.632
	PC 1145	13384.048	17637.886
	PC 1146	13396.928	17650.048
	PC 1158	13230.858	17555.275
39	PC 1158	13372.957	17662.808
	PC 1146	13396.928	17650.048
	PC 1148	13418.693	17670.6
	PC 1157	13387.48	17682.355
40	PC 1157	13387.48	17682.355
	PC 1148	13418.693	17670.6
	PC 1149	13425.961	17685.809
	PC 1156	13392.217	17700.971
41	PC 1156	13392.217	17700.971
	PC 1149	13425.961	17685.809
	PC 1150	13434.345	17709.849
	PC 1155	13395.075	17713.541
42	PC 1155	13395.075	17713.541
	PC 1150	13434.345	17709.849
	PC 1151	13436.318	17723.194
	PC 1154	13398.381	17728.08
43	PC 1154	13398.318	17728.08
	PC 1151	13436.318	17723.194
	PC 1152	13447.95	17765.475
	PC 1153	13408.643	17769.085
44	PC 1154	13398.381	17728.08
	PC 1153	13408.643	17769.085
	PC 1136	13388.046	17777.488
	PC 1137	13379.003	17732.935
45	PC 1137	13379.003	17732.935
	PC 1138	13375.826	17718.23
	PC 1155	13395.075	17713.541
	PC 1154	13398.381	17728.08
46	PC 1138	13375.826	17718.23
	PC 1155	13395.075	17713.541
	PC 1140	13362.94	17690.301
	PC 1157	13387.98	17682.355
47	PC 1140	13362.94	17690.301
	PC 1141	13354.466	17678.896
	PC 1158	13372.957	17662.808
	PC 1157	13387.98	17682.355
48	PC 1141	13354.466	17678.896
	PC 1142	13337.855	17656.544
	PC 1159	13360.915	17647.14
	PC1158	13372.957	17662.808
49	PC 1125	13320.828	17647.526
	PC 1126	13335.587	17666.663
	PC 1126A	13310.415	17677.512

	PC 1124	13303.311	17667.326
50	PC 1126	13335.587	17666.663
	PC 1127	13347.766	17682.428
	PC 1129A	13315.075	17691.403
	PC 1126A	13310.415	17677.512
51	PC 1128	13329.521	17687.435
	PC 1127	13347.766	17682.428
	PC 1104	13360.049	17698.296
	PC 1105	13333.491	17709.175
52	PC 1128	13329.521	17687.435
	PC 1105	13333.491	17709.175
	PC 1106	13319.021	17715.083
	PC1129A	13315.075	17691.403
53	PC 1129A	13315.075	17691.403
	PC1105	13319.021	17715.083
	PC 1107	13304.893	17720.851
	PC 1129A	13315.075	17691.403
54	PC 1129A	13315.075	17691.403
	PC 1107	13304.893	17720.851
	PC 1108	13285.953	17728.625
	PC 1130	13281.102	17700.728
55	PC 1130	13281.102	17700.728
	PC 1109	13281.228	17730.513
	PC 1110	13268.288	17731.749
	PC 1131	13260.114	17699.988
56	PC 1131	13260.114	17699.988
	PC 1110	13268.288	17731.749
	PC 1111	13253.417	17733.168
	PC 1131	13260.114	17699.988
57	PC 1132	13243.659	17704.995
	PC 1111	13253.417	17733.168
	PC 1112	13232.442	17735.17
	PC 1133	13223.96	17710.989
58	PC 1133	13223.96	17710.989
	PC 1112	13232.442	17735.17
	PC 1113	13202.68	17738.01
	PC 1134	13198.537	17706.774
59	PC 1134	13198.537	17706.774
	PC 1113	13202.68	17738.01
	PC 1114	13187.788	17739.432
	PC 1135	13185.852	17704.339
60	PC 1135	13183.852	17704.339
	PC 1114	13187.788	17739.432
	PC 1115	13158.168	17742.233
	PC 1116	13162.593	17707.48
61	PC 1135	13183.852	17704.339
	PC 1116	13162.593	17707.48
	PC 1117	13168.51	17661.005
	PC 1118	13182.299	17663.063
62	PC 1134	13198.537	17706.774

	PC 1135	13183.852	17704.339
	PC 1118	13182.299	17663.063
	PC 1119	13197.051	17665.34
63	PC 1133	13223.969	17710.989
	PC 1134	13198.537	17706.774
	PC 1119	13197.051	17665.34
	PC 1120	13226.568	17669.891
64	PC 1132	13243.659	17704.995
	PC 1133	13223.96	17710.989
	PC 1120	13226.568	17669.891
	PC 1121	13254.286	17674.165
65	PC 1131	13260.114	17699.988
	PC 1132	13243.659	17704.995
	PC 1121	13254.286	17674.165
	PC 1122	13269.124	17676.452
66	PC 1129	13299.578	17695.656
	PC 1130	13281.102	17700.728
	PC 1131	13260.114	17699.988
	PC 1122	13269.124	17676.652
	PC 1123	13290.264	17664.626
67	PC 1129A	13315.075	17691.403
	PC 1129	13299.578	17695.656
	PC 1123	13290.264	17664.626
	PC 1124	13303.311	17657.326
68	PC 1084		
	PC 1085	13376.468	17764.027
	PC 1103	13339.785	17778.769
	PC 1102	13337.802	17763.565
	PC 1083	13338.711	17715.629
69	PC 1083	13338.711	17715.629
	PC 1086		
	PC 1087	13341.911	17796.311
	PC 1103	13285.953	17728.625
70	PC 1102	13337.802	17763.565
	PC 1187		
	PC 1101	13319.641	17764.571
	PC 1100	13287.742	17766.34
71	PC 1100	13287.742	17766.34
	PC 1089	13290.938	17790.073
	PC 1090	13273.632	17790.663
	PC 1101	13319.641	17764.571
72	PC 1100	13287.742	17766.34
	PC 1089	13290.938	17790.073
	PC 1090	13273.632	12790.663
	PC 1099	13267.733	17767.45
73	PC 1080	13266.347	17739.735
	PC 1090	13273.632	17790.663
	PC 1091	13234.255	17792.007
	PC 1079	13236.876	17742.504
74	PC 1098	13234.756	17769.278

	PC 1091	13234.255	17792.007
	PC 1092	13200.483	17793.16
	PC 1097	13200.773	17773.6
75	PC 1097	13200.773	17773.6
	PC 1092	13200.483	17793.16
	PC 1093	13186.676	17800.569
	PC 1096	13186.887	17775.366
76	PC 1095	13173.03	17777.128
	PC 1093	13186.676	17800.569
	PC 1095	13173.03	17777.128
	PC		
77	PC 1095	13173.03	17777.128
	PC 1073		
	PC 1074	13153.415	17779.563
	PC		
78	PC 1095	13173.03	17777.128
	PC 1074	13153.415	17779.563
	PC 1075	13157.187	17749.939
	PC 1076	13176.863	17748.14
79	PC 1095	13173.03	17777.128
	PC 1076	13176.863	17748.14
	PC 1077	13191.847	17746.732
	PC 1096	13186.886	17775.366
80	PC 1096	13186.886	17775.366
	PC 1077	13191.847	17746.732
	PC 1078	13208.759	17745.144
	PC 1097	13200.773	17773.6
81	PC 1097	13200.773	17773.6
	PC 1078	13208.759	17745.144
	PC 1079	13236.876	17742.504
	PC 1098	13234.756	17769.278
82	PC 1099	13267.733	17767.45
	PC 1080	13266.347	17739.735
	PC 1081	13285.743	17737.914
	PC 1100	13287.742	17766.34
83	PC 1100	13287.742	17766.34
	PC 1081	13285.743	17737.914
	PC 1082	13312.038	17726.851
	PC 1101	13319.641	17764.571
84	PC 1082	13312.038	17726.851
	PC 1083	13338.771	17715.629
	PC 1102	13337.802	17763.565
	PC 1101	13319.641	17764.571
85	PC 1042	13454.685	17798.324
	PC 1050	13417.459	17803.676