A PROJECT REPORT

ON

LAND INFORMATION SYSTEM, URBAN ESTATE, OPPOSITE GOVERNMENT CEMENTERY AREA ALONG OKE-OYI ROAD, OKE OSE, ILORIN EAST LOCAL GOVERNMENT AREA ILORIN, KWARA STATE

BY

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HND/23/SGI/FT/0073

SUBMITTED TO

DEPARTMENT OF SURVEYING AND GEO-INFORMATICS, INSTITUTE OF ENVIRONMENTAL STUDIES (I.E.S), KWARA STATE POLYTECHNIC, ILORIN.

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE HIGHER NATIONAL DIPLOMA (HND) IN SURVEYING AND GEO-INFORMATICS.

JULY, 2025

DECLARATION

I hereby conclude that I ABOLADE BISOLA OPEYEMI with matriculation number HND/23/SGI/FT/0073 fully participated in this project and acquired more experience about Land information System Urban Estate opposite Government Cementery Area Along Oke-oyi Road, Oke-Ose, Ilorin, East Local Government area, Ilorin, Kwara State.

NAME OF STUDENT: I ABOLADE BISOLA OPEYEMI

STUDENT SIGNATURE:________________________________

DATE:____

CERTIFICATION

I hereby certify that this project was carried out by I ABOLADE BISOLA OPEYEMI with Matriculation number HND/23/SGI/FT/0073 under my supervision with departmental rules and regulation.

___________________________ __________________
SURV. AKINYEDE ADEBANJI DATE
PROJECT SUPERVISOR

_________________________ __________________
SURV. AWOLEYE .R.S DATE
PROJECT COODINATOR

__________________________ __________________
MR. ABIMBOLA ISAU DATE
HEAD OF DEPARTMENT

_________________________ _______________
EXTERNAL SUPERVISOR DATE

DEDICATION

This project is dedicated to Almighty God for His goodness endures forever, for His wisdom, knowledge and understanding which guide me through the completion of the project.

ACKOWLEDGEMENT

I give thanks and glory to my Creator for the privilege bestowed on me that resulted in the accomplishment of this project work and also a big thanks to the management of Kwara State Polytechnic for the privilege and opportunity given to me to study in their great institution.

A project of such scope as this could not have been done without the assistance of proven professionals, consultancies, advisors, well wishers, family and friends.

My sincere gratitude goes to my Supervisor; SURV.AKINYEDE ADEBANJI for being there for me from the beginning of this project and all his support academically, morally, I really appreciate you sir.

My profound gratitude also goes to my (H.O.D) MR. ABIMBOLA ISAU and other lecturers at the Department of Surveying Geo-informatics (SURV. A.G AREMU, SUR. R.S ASONIBARE, SURV. R.O AWOLEYE, SURV. AYUBA, SURV. DIRAN, SURV. KAZEEM, SUR. KABIRU), for nurturing me in my academic activities. May Almighty God continue to bless you all abundantly.

I'm deeply grateful to my parents; MR And MRS ABOLADE for their unconditional love, support, and wisdom. Their encouragement and sacrifices have been the driving force behind my endeavors. Thank you, Mom and Dad, for being my pillars of strength and inspiration. I dedicate this project to you, with love and appreciation.

Special thanks to my friends for your unwavering love, care, and dedication that has shaped me into the person I am today. Your selfless love and your influence and values have guided me throughout this project, and I'm forever grateful for your presence in my life.

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ABSTRACT

This project focuses on the development and implementation of a Land Information System (LIS) for an urban estate located opposite the Government Cemetery along Oke-Oyi Road, Oke-Ose, in Ilorin East Local Government Area, Kwara State. Land Information Systems play a critical role in modern urban planning and management by providing a structured digital platform for capturing, storing, analyzing, and managing land-related data. The study aims to digitize land parcel information, including ownership, usage, topography, and cadastral boundaries, within the defined urban estate. Through the use of Geographic Information Systems (GIS) and remote sensing technologies, spatial data were collected and analyzed to provide a reliable decision-support tool for land administration. The LIS developed enhances transparency, reduces land disputes, supports infrastructure development, and improves service delivery by local government authorities. This work also addresses challenges such as irregular land acquisition, overlapping land claims, and inefficient record keeping that are prevalent in the area. The results demonstrate the benefits of an integrated digital land management system in promoting sustainable urban development, effective land use planning, and increased investor confidence in land transactions.

CHAPTER ONE

1.0 INTRODUCTION

A Land Information System (LIS) is essentially a systematic way to manage and access information about land. Think of it as a comprehensive digital record-keeping system for everything related to land parcels. At its core, a LIS integrates spatial data (where things are located geographically) with attribute data (what those things are like). This means it can link maps and geographical features with detailed information about them. information from various sources like surveys, satellite imagery, legal documents, and administrative records. This data can include property boundaries, ownership details, land use, soil types, infrastructure, and more. Data Storage and Management: Organizing and storing this vast amount of data in a structured and efficient manner, often using databases and Geographic Information Systems (GIS).

Data Analysis and Processing: Using the stored data to perform analyses, generate reports, create maps, and identify spatial relationships. For instance, an LIS can be used to analyze land suitability for different types of development or to track changes in land cover over time. Information Dissemination: Providing access to this land-related information to various users, including government agencies, businesses, and the public. This can be through web portals, mobile applications, or traditional reports.

1.1 BACKGROUND TO THE STUDY

Land is a vital and finite resource that plays a central role in economic development, environmental sustainability, and social stability. Efficient management and utilization of land resources are crucial for sustainable development, especially in the face of rapid urbanization, population growth, and increasing demand for land. To manage land effectively, accurate, up-to-date, and easily accessible information is essential. This need has given rise to the development and implementation of Land Information Systems (LIS). A Land Information System (LIS) is a geographic information system (GIS)-based tool that provides a framework for gathering, storing, analyzing, and managing data related to land ownership, value, use, and development. It integrates spatial and non-spatial data to support land administration functions such as land registration, cadastre, property valuation, planning, and taxation. Historically, land records were maintained manually, leading to inefficiencies, inaccuracies, and limited accessibility. The traditional paper-based systems were prone to loss, damage, and manipulation, which hindered effective land governance. With the advent of digital technology and GIS, LIS emerged as a powerful solution to overcome these challenges. It enhances transparency, reduces disputes over land ownership, supports better land use planning, and facilitates investment by providing secure land tenure information.

The implementation of LIS has become increasingly important in both developed and developing countries. In developing nations, in particular, LIS plays a critical role in formalizing land ownership, promoting social equity, and improving revenue collection through property taxes. International organizations such as the World Bank and the United Nations have also recognized the importance of LIS in promoting good land governance.

Therefore, studying Land Information Systems is essential to understand how modern technology can transform land management practices, improve decision-making, and contribute to economic and social development. The background of LIS sets the stage for exploring its components, benefits, challenges, and the strategies required for effective implementation in various contexts. Land is one of the most valuable natural resources, forming the basis for shelter, agriculture, industry, and infrastructure. Its proper management is essential for social stability, economic growth, and environmental sustainability. However, land is a limited resource and often subject to competing uses, disputes, and pressures resulting from urbanization, population expansion, and climate change. As such, reliable, comprehensive, and accessible land information is necessary to guide planning, policy-making, and investment decisions. This has led to the development and growing reliance on Land Information Systems (LIS).

A Land Information System is a specialized, computer-based system designed for capturing, storing, managing, and analyzing data related to land. It combines both spatial data (maps, boundaries, geographic features) and attribute data (ownership, land value, land use, legal status) to support various land administration and management functions. LIS is often integrated with Geographic Information Systems (GIS), Global Positioning Systems (GPS), and remote sensing technologies to provide accurate and real-time land-related data.

Historically, land records were maintained in fragmented, paper-based formats by various government departments or local authorities. These manual systems were characterized by inefficiencies such as duplication of records, lack of standardization, inaccessibility, and vulnerability to tampering or loss. These weaknesses often led to land disputes, encroachments, poor tax collection, and misinformed land use planning. The transition to LIS addresses these issues by digitizing land records, centralizing land information, and making it accessible to stakeholders such as government agencies, developers, landowners, and researchers.

The importance of LIS is particularly pronounced in developing countries where insecure land tenure, informal settlements, and weak institutional capacity often prevail. LIS provides a foundation for land reform, supports tenure security, and enables efficient land markets by ensuring that land rights are clear, recorded, and enforceable. Moreover, by integrating LIS into national development frameworks, governments can enhance land-related revenue collection, improve urban planning, and facilitate infrastructure development. International development agencies such as the World Bank, FAO, and UN-Habitat have promoted the adoption of LIS as a tool for good land governance. These systems are also aligned with the Sustainable Development Goals (SDGs), particularly Goal 11 (Sustainable Cities and Communities) and Goal 15 (Life on Land), which emphasize secure land tenure, sustainable land use, and access to land information.

Technological advances have also made LIS more robust, user-friendly, and cost-effective. Cloud computing, mobile data collection, open-source GIS software, and blockchain technology are increasingly being applied to enhance LIS functionalities, security, and transparency. These innovations open up new possibilities for participatory mapping, real-time monitoring of land use, and decentralized land record management. In light of the above, the study of Land Information Systems is timely and relevant. It provides critical insights into how technology can be leveraged to address complex land management challenges, enhance service delivery, and support sustainable development. Understanding the historical evolution, current trends, and implementation challenges of LIS is vital for policymakers, planners, surveyors, IT professionals, and development practitioners aiming to improve land governance in their respective contexts.

1.2 STATEMENT OF PROBLEM

Due to the challenges faced in land management and administration, particularly in Nigeria, land administration faces significant challenges such as inefficiency, lack of accurate data, inadequate accessibility to land records, and poor management of land resources. The absence of an integrated and automated system to store, update, and retrieve land data often leads to confusion, land disputes, and ineffective policy implementation. The complexity of managing land ownership, boundaries, transactions, and land use further exacerbates issues like corruption, encroachment, and the illegal allocation of land.

This situation results in substantial economic losses, delays in infrastructure development, and an overall lack of transparency and accountability in land management processes. Traditional land management systems are outdated, paper-based, and prone to human error, making it difficult for land stakeholders, including government agencies, developers, and the general public, to efficiently access and manage land-related information.

The absence of a comprehensive and digitized Land Information System (LIS) impedes sustainable development and poses a significant barrier to effective urban planning, investment, and governance in land-related matters.

This problem statement addresses key issues like inefficiency, poor data management, disputes, and outdated systems that can be alleviated with the implementation of a comprehensive Land Information System.

1.3 AIM AND OBJECTIVES OF THE PRACTICAL

1.3.1 AIM OF THE PROJECT

The aim of this project is to provide an integrated platform for managing, storing, and analyzing land-related data to support efficient land administration, planning, and decision-making.

1.3.2 OBJECTIVES OF THE PROJECT

The following objectives were considered in order to accomplish the above aim

- Project planning
- Monumentation
- Data downloading and data processing
- Data analysis and information presentation
- Query
- Report writing

1.4 SCOPE OF THE PROJECT

The scope of the work involves detailed procedures for the development of Land Information System of Urban Estate Layout. It however entails the creation of functional Database of the present situation of the research Area and to display digital Information and to display Information such as Ownership details, Parcel information, Plot type, Land use, Status was developed and other attribute information. All these entities and attributes will form the base for database creation.

Base and significance of this project, the scope includes;

- Project planning: which include office planning and field reconnaissance
- Monumentation: (At least 5 hectares of land according to Higher National Diploma)
- Data acquisition (geometric data with total station, social survey through oral interview for the purpose of query and building name and colors
- Data processing: This includes downloading and processing of data using appropriate software (GIS software)
- Information presentation: It involved plotting of survey data on both soft copy and hard copy showing correct location of a points.

1.5 PERSONNEL

The following are the personnel who participated in the execution of the project.

NAME	REMARKS
1. ABOLADE BISOLA OPEYEMI	AUTHOR
2. AKEEM HAMID AJAGBE	MEMBER
3. AYODELE TAIYE OPEYEMI	MEMBER
4. ABDULFATAI ABDULAFEEZ O.	MEMBER
5. AFOLAYAN IFEOLUWA MARY	MEMBER
6. AYEGBOYIN QUDUS A.	MEMBER
7. ABDULQUADRI ABUBAKR S.	MEMBER
8. ADEKUNLE FLORENCE A.	MEMBER

1.6 STUDY AREA

Urban estate opposite Government cemetery area along OKE-OYI ROAD OKE-OSE ILORIN, KWARA STATE, ILORIN East local government area. (683903E, 946221N). The project site is geographically defined by these parameters; Latitude 8° 33' 23.443"N and Longitude 4° 40' 15.384"E

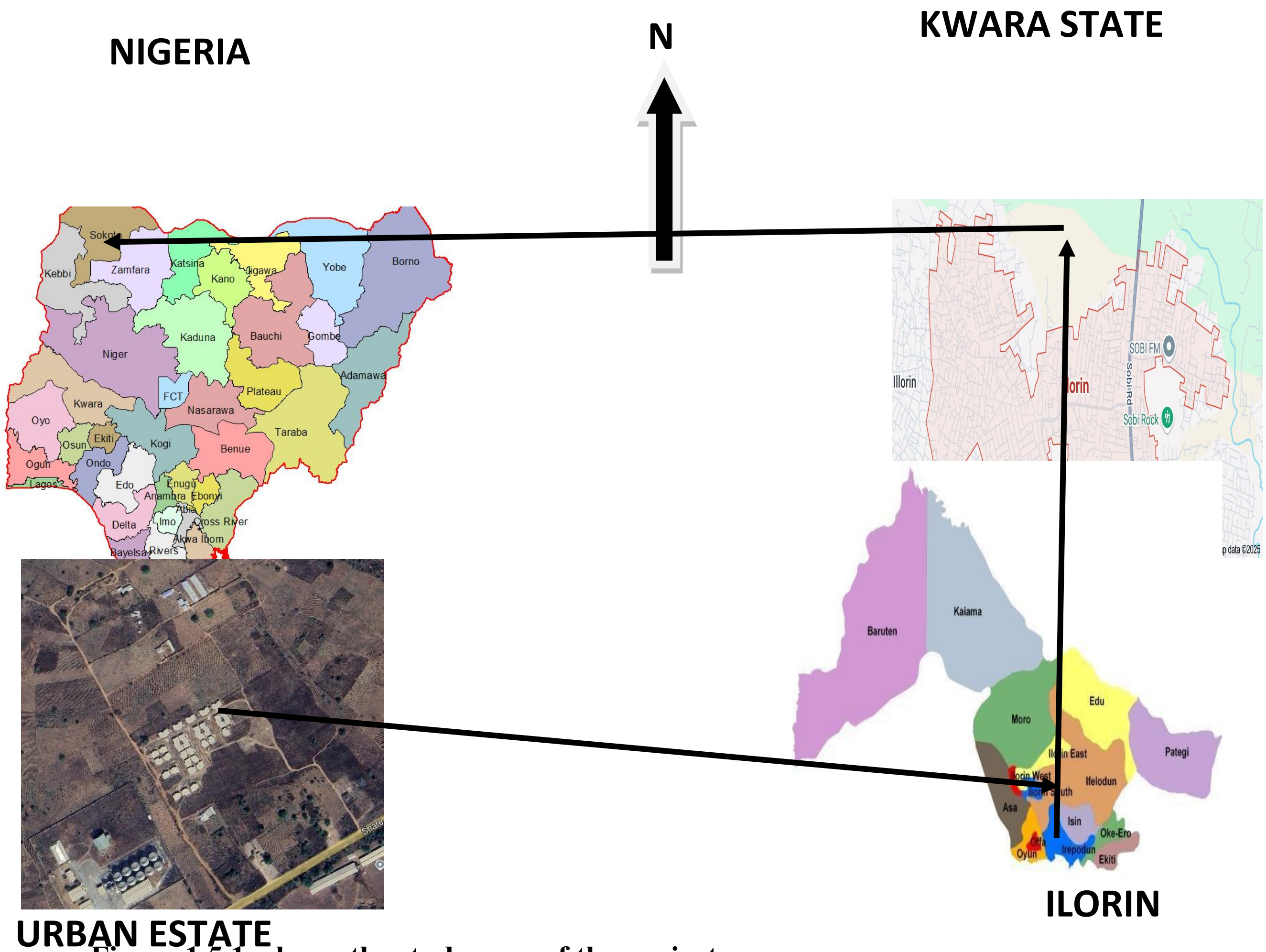


Figure 1.5.1: shows the study area of the project

1.7 SPECIFICATIONS

The project speciation's were referenced to the speciation for land information system using total station which was sources from the Higher National Diploma. The specification includes the following:

I. Total station

II. Minimum number of datum control required- three (3)

III. Traverse should run between secondary or higher order control point.

CHAPTER TWO

2.0 LITERATURE REVIEW

(LIS) is essentially a systematic way to manage and access information about land. Think of it as a comprehensive digital record-keeping system for everything related to land parcels. At its core, a LIS integrates spatial data (where things are located geographically) with attribute data (what those things are like). This means it can link maps and geographical features with detailed information about them.

Data Collection: Gathering information from various sources like surveys, satellite imagery, legal documents, and administrative records. This data can include property boundaries, ownership details, land use, soil types, infrastructure, and more. Organizing and storing this vast amount of data in a structured and efficient manner, often using databases and Geographic Information Systems (GIS). Using the stored data to perform analyses, generate reports, create maps, and identify spatial relationships. For instance, an LIS can be used to analyze land suitability for different types of development or to track changes in land cover over time.

Providing access to this land-related information to various users, including government agencies, businesses, and the public. This can be through web portals, mobile applications, or traditional reports. A Land Information System The International Federation of Surveyors defines Land Information System (LIS) “as a tool for legal, administrative and economic decision making and an aid for planning and development which consist of procedure and techniques for the systematic collection, updating, processing and distribution of spatial data” .Shard and More (1989).

According to DP Goyal (2014), an Information system may be formally defined as a combination of human and technical resources, together with a set of organizing procedures that produces information in support of some managerial requirement. Data relating to land may be acquired and held in alphanumeric form, graphically or digitally. To become information, the raw data must be processed so that they can be understood by a decision maker. A land information system gives support to land management by providing information about the land, the resources upon it and the improvement made on it.

Land Information systems cover such a wide variety of applications and contain such diverse data that they are difficult to categorize. The terms Geographical Information ' System (GIS) and Land Information System (LIS) are often used interchangeably. At a meeting in Montreux in 1981 the FIG defined an LIS as A tool for legal, administrative and economic decision making and an aid for planning and development which consists on the one hand of a data base containing spatially-referenced land-related data for a defined area, and on the other hand, of procedures and techniques for the systematic collection, updating, processing and distribution of the data. The base of a land information system is a uniform spatial reference system for the data in the system, which also facilitates the linking of data within the system with other land-related data.

This definition covers systems which are called 'land information'(LIS) systems (GIS). In and those called 'geographic information' fact though, the terminology is usually discipline-based. As a generalization it may be said that a GIS is usually concerned with natural resources, environmental, or demographic data which is presented at small scale and is analyzed on a grid cell basis. LIS, on the other hand, is usually concerned with large scale land administration data and is based on polygon's which represent land parcels. This distinction is by no means rigid. In the 'multi-purpose' cadastre natural resources, environmental, and demographic data are linked to a parcel-based system; some administrative systems environmental systems may be use raster graphics, while polygon-based. Part of the problem of classification is that no two systems are ·the 1 Hamilton A c and Williamson I P, A critique of the F.I.G. definition of "Land Information System", F.I.G. International Symposium on LIS, Edmonton, 1984

Land Information Systems (LIS) have emerged as a critical component in land administration and spatial data infrastructure, combining geographic information systems (GIS), remote sensing, and land administration databases to support land-related decision-making processes. According to Williamson et al. (2010), LIS can be defined as "a tool for legal, administrative, and economic decision-making and an aid for planning and development which consists of a database containing spatially referenced land-related data for a defined area." This integrated approach ensures that data on land ownership, use, value, and development potential is accessible, reliable, and up to date. LIS has evolved in response to growing demands for better land governance, driven by urbanization, environmental concerns, and the need for efficient service delivery. Researchers agree that LIS is central to supporting the three pillars of land administration: land tenure, land value, and land use (Enemark, 2005).

Evolution of LIS: From Cadastre to Digital Land Governance

Historically, land records were managed through cadastral systems focused on mapping property boundaries and ownership. While early cadastral systems were primarily manual and paper-based, they laid the foundation for the development of LIS. Over the past few decades, there has been a significant shift toward digital, multi-layered LIS platforms that incorporate not just legal ownership but also land use, natural resources, infrastructure, and environmental data. Scholars such as Dale and McLaughlin (1999) trace the evolution of LIS through three main phases: manual land records, computer-assisted mapping, and fully integrated LIS platforms. The integration of GIS into LIS significantly enhanced the system's analytical capacity, allowing for spatial analysis, predictive modeling, and multi-criteria decision-making.

2.1 LIS and Land Tenure Security

One of the most widely studied areas in LIS literature is its role in enhancing land tenure security. Insecure tenure is a major challenge in many developing countries, leading to land disputes, evictions, and underutilization of land. Numerous case studies—including those from Rwanda, Ethiopia, and India—demonstrate that LIS contributes to securing land rights by making ownership records accessible and verifiable (Deininger et al., 2012; Lemmen et al., 2015).

According to UN-Habitat (2016), LIS supports the formalization of land holdings and helps to bridge the gap between statutory and customary land systems. However, critics caution that LIS implementation must be sensitive to local contexts and inclusive of marginalized groups, including women and indigenous communities (Barry & Fourie, 2002).

2.2 LIS and Urban Planning

Urban planners increasingly rely on LIS to guide infrastructure development, zoning, and housing policy. Studies by Karanja et al. (2020) show how LIS data can be used to manage informal settlements, improve urban service delivery, and ensure orderly urban expansion. In cities like Nairobi and Accra, LIS has supported slum upgrading initiatives by mapping informal land tenure and facilitating property registration.

Furthermore, Williamson et al. (2010) argue that LIS forms the "backbone of smart city planning," enabling authorities to integrate spatial data with demographic, environmental, and economic indicators.

2.3 Technological Advancements in LIS

Recent literature has focused on emerging technologies enhancing LIS capabilities. These include:

- **Remote Sensing:** Used to monitor land use changes and environmental degradation (e.g., Roy et al., 2017).
- **Blockchain:** Applied to create secure, transparent land registries (e.g., Lemmen et al., 2018).
- **Mobile GIS:** Empowers communities to participate in land mapping (e.g., McCall & Minang, 2005).

- **Artificial Intelligence (AI):** Used to automate land valuation and predictive modeling (e.g., Kombe & Kreibich, 2021).

While these technologies offer significant benefits, they also raise concerns about data privacy, interoperability, and affordability in low-resource settings.

2.4 Challenges and Limitations in LIS Implementation

The literature highlights several challenges in implementing LIS:

- **Institutional Fragmentation:** Multiple agencies managing overlapping land datasets with little coordination (Zevenbergen et al., 2013).
- **Legal and Regulatory Barriers:** Outdated land laws that do not support digital land transactions (Augustinus & Barry, 2006).
- **Technical and Human Capacity Gaps:** Lack of trained personnel and sustainable financing mechanisms (FAO, 2017).
- **Social Resistance:** Distrust of government systems or lack of awareness, especially in informal or customary land tenure systems (Fourie, 2001).

These challenges underscore the importance of designing LIS within a fit-for-purpose land administration framework that prioritizes flexibility, inclusivity, and scalability (Enemark et al., 2014).

2.5 LIS in Sustainable Development

There is growing scholarly consensus that LIS plays a crucial role in achieving the Sustainable Development Goals (SDGs). In particular:

- **SDG 1.4:** Ensuring access to land and property rights.
- **SDG 11:** Supporting inclusive, safe, and resilient urban development.
- **SDG 15:** Managing land sustainably to combat desertification and protect biodiversity.

Authors like Enemark (2017) argue that LIS is a key enabler of sustainable land governance, especially in the context of climate change, food security, and population pressure.

2.6 Gaps in the Literature

While the body of literature on LIS is robust, several gaps remain:

Empirical evidence from the Global South is still limited, especially on long-term impacts of LIS on poverty reduction and gender equity.

Comparative studies examining LIS performance across countries are rare, making it difficult to identify global best practices. Integration of indigenous knowledge systems with LIS remains under-researched. There is limited exploration of ethical implications, such as surveillance, data misuse, and exclusion.

Future research should address these areas to develop more inclusive, context-sensitive LIS models that can be effectively implemented worldwide. Here is an extended Literature Review on Land Information Systems (LIS) that dives even deeper into sector-specific applications, regional implementation cases, theoretical frameworks, policy integration, and critical perspectives—ideal for a postgraduate or PhD-level research work.

2.7 Sector-Specific Applications of LIS

A. Agriculture and Rural Development

Land Information Systems have revolutionized agricultural development, especially in large-scale and precision farming. By integrating satellite imagery, soil data, and land tenure information, LIS allows for better land use planning, crop monitoring, irrigation management, and yield forecasting. According to Byerlee et al. (2014), LIS enables landowners and governments to make evidence-based decisions on land allocation and agribusiness investment. LIS has also been instrumental in rural land reform programs. For instance, Tanzania's MKURABITA program (Property and Business Formalization Program) used LIS to register rural land parcels and issue customary rights of occupancy, empowering farmers with legal land claims.

B. Environmental and Natural Resource Management

2.8 Summary of Key Themes

Theme	Key Insights
Tenure Security	LIS secures land rights and reduces conflict.
Urban Planning	Enables zoning, service delivery, and informal settlement

	upgrading
Environmental Management	Supports monitoring, planning, and conservation.
Revenue Generation	Enhances property valuation and tax collection
Challenges	Include legal, institutional, technological, and social barriers.
Theoretical Models	Emphasize systems integration, flexibility, and participatory design.
Global Best Practices	Found in Europe and selected programs in Asia, Africa, and Latin America.

2.9 Governance and Institutional Dimensions of LIS

A. Governance Structures in LIS Implementation, The literature highlights the multi-level governance nature of LIS, involving local, regional, and national authorities. Effective LIS deployment often requires strong inter-agency coordination, as land data is typically held by multiple institutions—e.g., land registries, survey departments, and local governments. According to Palmer et al. (2009), fragmented governance structures often lead to overlapping mandates, duplicated efforts, and conflicting data sets.

2.10 Summary of Emerging Themes

Emerging Theme	Research Focus
Blockchain LIS	Transparency and fraud prevention
AI Integration	Parcel mapping, land use classification
Data Ethics	Privacy, consent, sovereignty
Financing	PPPs, sustainability strategies
Capacity Gaps	Training, retention, gender inclusion
Global Aid	Donor influence, aid alignment with governance
Future Trends	Smart land systems, climate-linked LIS

2.11 Conclusion

The literature on Land Information Systems underscores their transformative potential in improving land governance, planning, and development outcomes. From securing land tenure to enabling smart cities, LIS is increasingly seen as a cornerstone of modern public administration. However, the success of LIS depends on appropriate technology adoption, legal reform, institutional capacity, and stakeholder engagement. A well-designed LIS can bridge the gap between policy and practice, ultimately promoting sustainable, inclusive, and data-driven land management systems.

CHAPTER THREE

3.0 METHODOLOGY

This stage involves the methods and procedure used in planning, data acquisition, data processing, and creation of database, creation of database management system and information presentation. These operations were logically structured and carried out in stages involving database design. It is normally considered to involve a spatially referenced and structured digital database and appropriate application software for geospatial analysis. This basically describes the techniques and principles adopted in carrying out the project. Geographic information system methods were adopted in accomplishing the desired results.

3.1 DATABASE DESIGN

The design of any database involves three stages

namely;

i Conceptual design

ii Logical design

iii Physical design

3.1.1 VIEW OF REALITY

In database design, there is need for reality which is referred to as the phenomenon that actually exists, including all aspects which may or may not be perceived by individuals. The view of reality however, is the mental abstraction of the reality for a particular application or group of applications.

For this application, the view of reality is made of the topography of the project. Since it isnot possible to represent the real world, the only option is to conceptualize and model it in a specified manner to represent the real world. The area of interest to us in this project Includes; Green Reserve, Roads, Electric poles, Trees, Water Facilities, Buildings, Footballpitch, Streams.

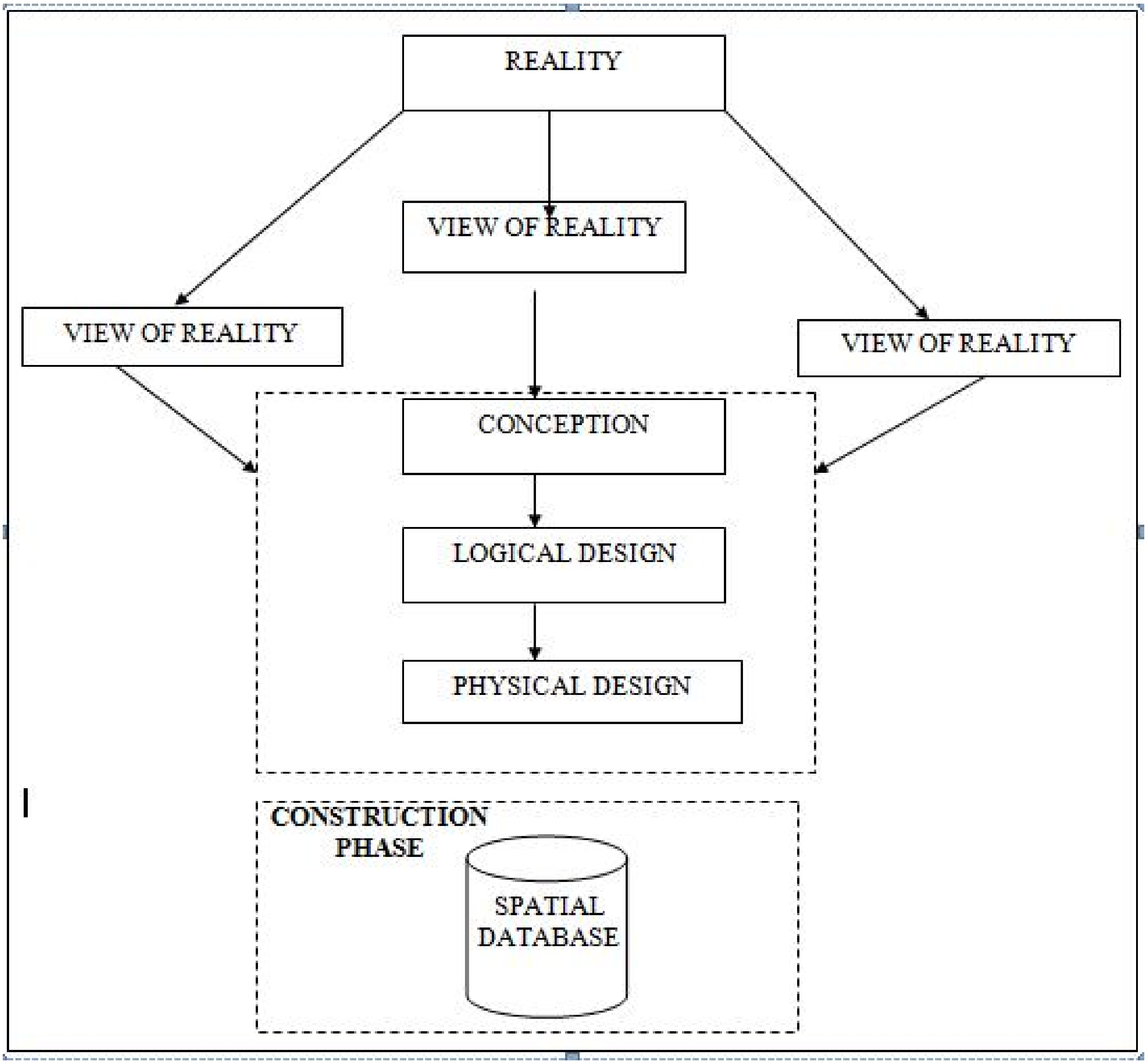


Fig. 3.1 Design and Construction Phases in Spatial Database

3.1.2 CONCEPTUAL DESIGN

Vector data model is the data type adopted for this project, which is represented, by points,lines and polygon. The identified entities are:-

a. Vegetation area (polygon)

b. Roads (line)

c. Trees (point)

d. Boundary line (polygon)

e. Buildings(polygon)

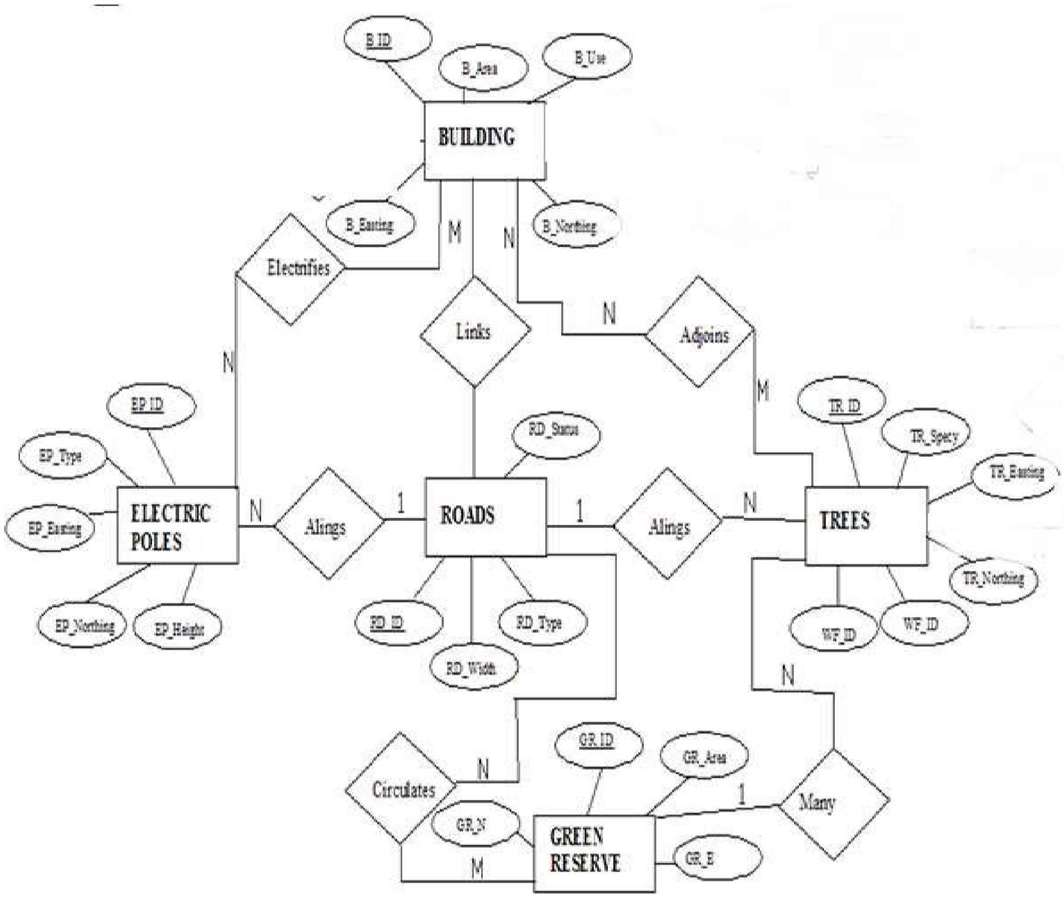


Fig. 3.2.: E-R Diagram (Entity relationship diagram)

3.1.3 LOGICAL DESIGN

This is the design aspect of the database refers to the process of creating a conceptual framework or model that represents the structure and organization of spatial data within the system. It involves defining the data element, their relationship, and the rules for data manipulation and analysis. In this phase, the entities, their attributes and their relationships are represented in a single uniform manner in form of relation in such a way that would be noinformation loss and at the same time no unnecessary duplication of data. In this study, the logical database design is employed to generate a geo-relation database structure. Each entity has unique identifier in bold type. An attribute type or combination of attribute types that serves to identify an entity type is termed an identifier.

i Building(B_ID, B_Area, B_Name, B_Easting, B_Northing)

ii Roads (R_ID, R_Width, R_Type, R-Condition, R_Easting, R_Northing)

iii Vegetation (V_ID,GR_Area,)

iv Tree (TR_ID, TR_spp, TR_Importance, TR_Easting, TR_Northing)

v Electric Pole (EP_No, EP_Type, EP_Height,EP_Easting, EP_Northing)

vi Water Facility (WF_ID, WF_Depth,WF_Type, WF_Easting, WF_Northing)

vii Football Pitch (FP_ID , FP_Area, FP_Status)

viii Stream(S_ID, Length, Width)

3.1.4 PHYSICAL DESIGN

Table 3.1: Building and its attribute

ENTITY	DESCRIPTION
B_ID	Building Identification
B_name	Building Name
B_Area	Building Area
B_Easting	Building Easting
B_Northing	Building Northings

Table 3.2: Road and its attributes

ENTITY	DESCRIPTION
R_ID	Road Identifier
R_Length	Road Length
R_Width	Road Width
R_Type	Road Type
R_Condition	Road Condition

Table 3.3: Trees and its attributes

ENTITY	DESCRIPTION
TR_ID	Tree Identifier
TR_Spp	Tree specy

TR_E	Tree_Easting
TR_N	Tree Northing

Table 3.4.: Vegetation and its Attributes

ENTITY	DESCRIPTION
V_ID	Vegetation Identifier
V_Area	Vegetation Area
V_E	Vegetation Easting
V_N	Vegetation Northing

3.2 RECONNAISSANCE

This is the preparatory stage before the execution of this project; it involves collection ofavailable information about the project area.

The necessary step taken for the successful execution of the project involves two stages,which are:-

1. Office Planning
2. Field reconnaissance

3.2.1 OFFICE PLANNING

This involves the collection of information about the study area, testing the instrument to be used in execution of the project and itemizing the numbers of equipment needed, number of days to be use, how each activity is to be carried out, delegation of works to each team members based on supervisor's guide/instructions.

Table. 3.5 Coordinates of Controls

Station	Northing (m)	Easting (m)	Height (m)
KPT 120X	945235.040	682280.278	211.976
KWCS102	945738.095	683583.702	201.532
SC/KWEAS5072	945974.041	684070.314	200.087

Source: Surveying and Geo-informatics department Kwara state polytechnic.

3.2.2 FIELD RECONNAISSANCE

The field reconnaissance is the first visitation to the project site to get intimated with theenvironment.

i. Boundary points was selected

ii. The distribution of features was studied

iii. Controls to be used were located

iv. Method and type of instrument to be uses was determined

v. Subsidiary point for Ground control Points were picked and define using nail andbottle cock

vi. A diagram of the study area was drawn.

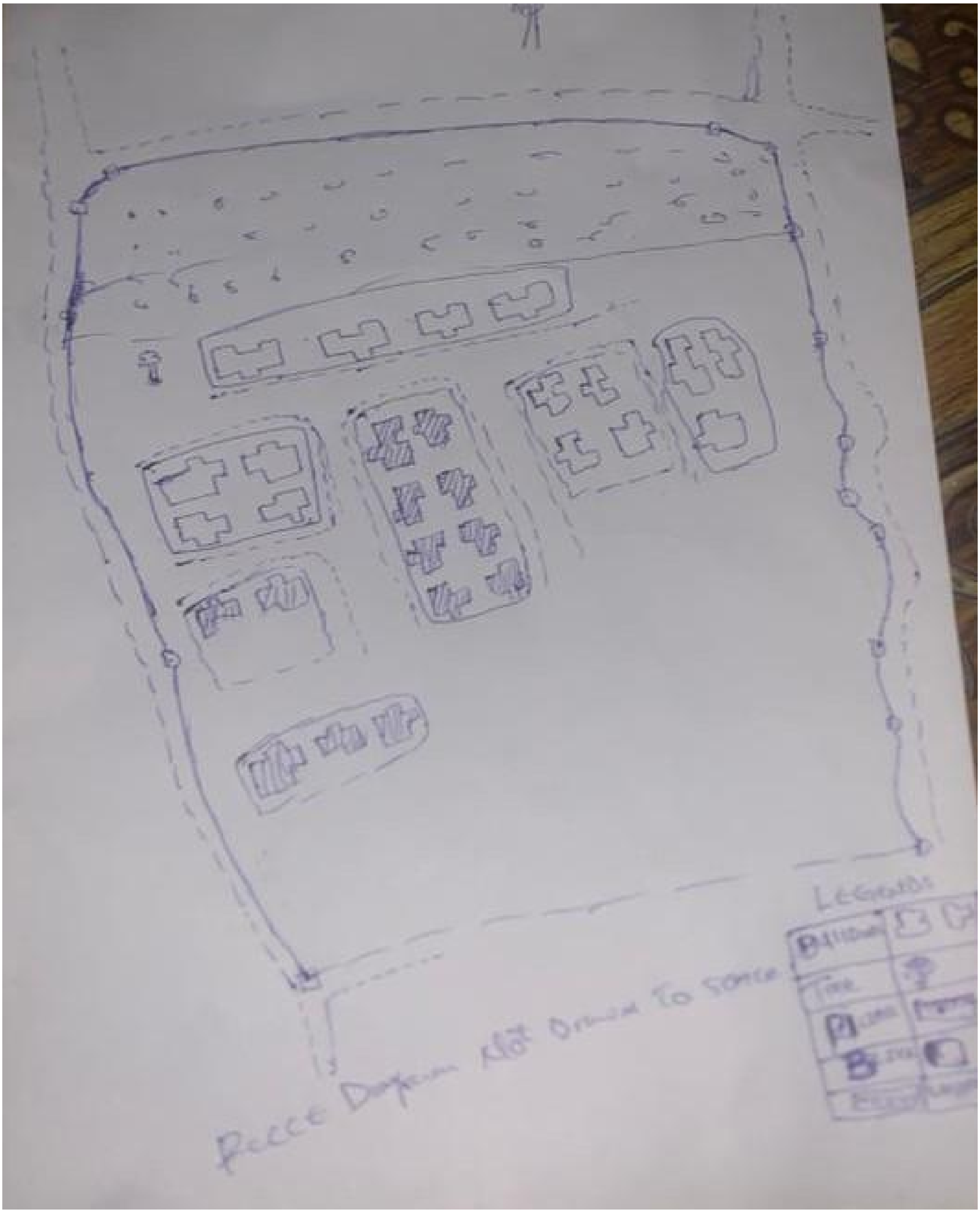


Fig. 3.3: Recce diagram of the study area (not drawn to scale)

3.3 EQUIPMENT USED/ SYSTEM SELECTION AND SOFTWARE

3.3.1 HARDWARE USED

i. Total station

ii. 1 reflector with a tracking rod.

iii. 1 Tripod

iv. One (1) 50m tape

v. One (1) umbrella

vi. 1 cutlass

vii. Hand held GPS

viii. Hammer

ix. Nails and bottle cover

x. Field book and writing materials

xi. 1-No of Personal Computer HP655 and its accessories

xii. 1-No of HP DeskJet K7100 A3 printer

xiii. 1-No of HP DeskJet 1110 A4 printer

3.3.2 SOFTWARE COMPONENT

i. Notepad.

ii. Microsoft Excel.

iii. AutoCAD 2007

iv. ArcGIS 10.2

v. Microsoft Word.

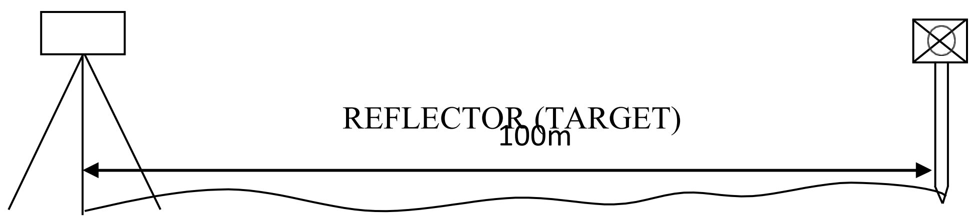
3.4 INSTRUMENT TEST

To ensure data quality, the Total Station used for this project was tested for both vertical index and horizontal collimation errors. It was also to ascertain the efficiency and reliability of the instrument. The procedure used is described below.

3.4.1 HORIZONTAL COLLIMATION TEST

This test was conducted to ensure that the line of sight was perpendicular to the trunnion axis.The Total Station was positioned over a specific point, and initial adjustments were made to ensure proper alignment, leveling, and focus (to eliminate parallax in the telescope). A vertical target was placed at a distance of 100 meters from the Total Station. To access the configuration menu of the Total Station, the menu key was pressed and held for approximately 2 seconds. From the main menu, the calibration sub-menu was selected, and within that, the horizontal collimation test option was chosen. The target was then observed and divided into two halves, with horizontal readings recorded for Face left and Face right. The readings are shown in Table 3.4.1 below.

Total Station



Fairly Level Ground

STATION B

STATION A

Fig 3.4; Horizontal Collimation and Vertical Index error test.

Table 3.6: Horizontal Collimation Data

Station	Target	Face	Hz Reading	Difference	Error
A	B	L	38˚42"32"		
		R	218˚42"35"	180˚00"03"	03"

Source field work

3.4.2 VERTICAL INDEX ERROR TEST

This test was conducted to verify the accuracy of the vertical reading when the line of sight ishorizontal. The desired measurement for this test is exactly ninety degrees (90˚), any deviation from this value is referred to as the vertical index error.

The Total Station was positioned over a specific point, and necessary temporary adjustments were made to ensure proper alignment and functionality. A target was placed approximately 100 meters away from the Total Station, and the instrument was aimed at the target. The target was bisected by aligning the instrument on the face left, and the corresponding reading was recorded. Similarly, the target was then bisected on the face right, and the respective reading was also recorded. The recorded readings are provided below:

Table 3.7: Vertical Index Data

Instrument Station	Target Station	Face	Vertical	Sum	Error
A	B	L	90˚00"00"		

		R	270˚00‟02”	360˚00‟02”	02”

Source field work

3.4.3 ANALYSIS OF COLLIMATION AND VERTICAL INDEX DATA

The reading obtain during calibration were reduced to obtain new collimation and verticalerrors.

Horizontal collimation = {(FR – FL) – 180}/2 = {(00˚00‟03”}/2 = 1.5”

Vertical collimation = {(FL + FR) – 360} = (90˚00‟00” + 270˚00‟02”) - 360}

= 02”The result shows that the instrument is still in good working condition.

3.5 CONTROL CHECK

Three control beacons (**KPT 120X**, **KWCS102** and **SC/KWEAS5072**) were used. In order to ascertain the in-situ of the control beacons, a check was carried out on them by observing the angle between them and comparing the result obtained with the computed angles from the giving coordinates.

The total station instrument was set on the control beacon **KWCS102**. After performing all the necessary temporary adjustment, the reflector was placed on the control beacon **KPT 120X** which served as the back station. The horizontal angular reading was taken and recorded while the instrument was on face left. The reflector was then taken to the control beacon **SC/KWEAS5072** which serves as the forward station, the horizontal angle reading was then taken and recorded on both face left and face right. The reflector was taken back to the back station, the horizontal angle was then recorded on face right.

Table 3.8: Table showing the back computation of the control coordinates

From STN	Bearing	Dist (m)	ΔN	ΔE	Northing (m)	Easting (m)	To STN
					945235.040	682280.278	KPT 120X
KPT 120X	68°53'46"	1397.130	503.050	1303.424	945738.095	683583.702	KWCS102
KWCS102	64°07'57"	540.797	235.946	486.612	945974.041	684070.314	SC/KWEAS5072

Source: office of surveyor general kwara state

Table 3.9 : Table showing the distance observation result of the control check

FROM	OBSERVED DISTANCE (m)	COMPUTED DISTANCE (m)	TO
KPT 120X	1397.029	1397.130	KWCS102
KWCS102	540.694	540.797	SC/KWEAS5072

Table 3.1 0 : Table showing the observation result of the control check

STN	SIGHT	FACE	OBSERVED HZ ANGLE	REDUCED HZ ANGLE	MEAN

	KPT 120X	L1	357° 08' 47"		
KWCS102	KPT 120X	L2	288° 14' 07"	68° 54' 40"	
	SC/KWEAS5072	R2	108° 52' 13"	68° 54' 46"	
	SC/KWEAS5072	R1	177° 46' 59"		68° 54' 43"

Difference in angle (observed - computed) =68° 54' 43"-68° 54' 40"

= 00° 00' 03"

Since the allowable accuracy (angular) of third order traverse of one station is 00° 00' 30" and the result obtained from the control check (00° 00' 03") is less than allowable error. Therefore, the controls were angularly intact.

3.6 MONUMENTATION

The boundary of the area carved out was demarcated with the precast concrete beacons, after clearing the required line of sights. The identified points of changes in directions were dug and beacons were buried on it, leaving about 15cm part of the beacon above the ground level. The beacons were buried at convenient distances as dictated by the nature of the boundary.

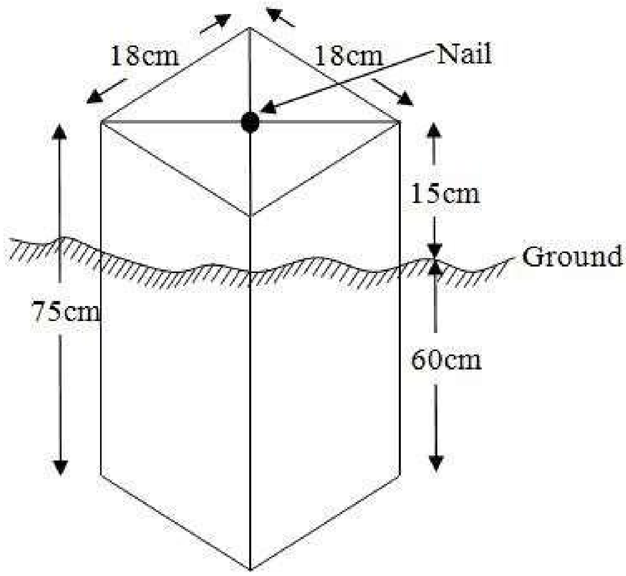


Fig. 3.5: Pillar Description

3.7 DATA ACQUISITION

It's fundamental to digital mapping. Data acquisition here implies security coordinate data of map features in a computer compatible from there exist several topographical data collection techniques the choice of a particular technique depends on the source of data available hardware / software, envisage revel of accuracy, man power etc. apart from field and laboratory data acquisition data may be obtained from social survey, in this project, data acquisition it refers the ways and method through which the data used were obtained. There was divided in to two viz; geometric data and attribute data

PRIMARY DATA SOURCE

Field observation was the primary source of data for this project. Ground based method was used in acquiring data with the use of Total Station Instrument, which involved the collection of X, Y, Z data through coordinated Ground control Points (GCP) established at conspicuouspoints within the study area

SECONDARY DATA SOURCE

An imagery of the area was acquired through Updated Google earth; this was used to ascertain the extent of coverage of the project area.

3.7.1 GEOMETRIC DATA ACQUISITION

The total station instrument was set carefully on control point; **KWCS102** back sight taken to **KPT 120X** after necessary station adjustments has been carried out on it. The adjustments includes; centering, leveling and focusing. The following procedures were then followed to determine the position of the next point **SC/KWEAS5072** and the same procedure were repeated until all we come close to the site. The method used in acquiring data on site was radiation method where two or more points are coordinated from one point.

i. Having set up the instrument and temporary adjustment carried out, the instrument was powered „on" and a job was created under job menu in the internal memory of the instrument. The job created was named GRP5B

ii. On the job, the coordinates of the three (3) control points were keyed in to the memory of the instrument and some codes were also saved. The codes include „RD" for road, „SP" for spot height, „BD for buildings, etc.

iii. The height of the instrument was measured and saved on the memory of the instrument as well as the reflector height.

iv. On coordinate menu, orientation was set by inputting the coordinates of the instrument station and back sight. The reflector at the back station was perfectly bisected before the orientation was confirmed by clicking „yes‟.

Having done the orientation, the reflector at the next nail; was bisected and „obs‟(observe) option was clicked. The three dimensional coordinate of the point N, H) were displayed on the display unit of the instrument and „rec‟ (record) wasclicked to save the data into the memory of the instrument. For subsequentobservation after this, „all‟ option was used instead of pressing „obs‟ and pressing „Record‟ later.

v. It was ensured that the center of the prism of the reflector was bisected and that itwas set perfectly on the tripod in order to minimize the error on height determination.

vi. The instrument is been shifted to another nail after all details, spot height and boundary point visible from the instrument station have been picked, set over it and temporary adjustments carried out.

Nonetheless, the above operations were repeated until all the boundary points with heights were coordinated.

In this project all spot height are not in grid intervals but randomly acquired. Three edges (3) of building were picked. At the end of data acquisition process all details were acquired and properly recorded to be shown in their respective positions on the plan.

3.7.2 TTRIBUTES DATA ACQUISITION

Attribute data is information about spatial features. They provide the characteristics, description and nomenclature about spatial objects. Thus the attributes data acquired includes names of buildings and their uses such as classrooms, roads, water facilities and prominent natural features likes river and trees found and vegetation were properly identified within andaround the study area.

3.8 DATA DOWNLOADING AND PROCESSING

3.8.1 DATA DOWNLOADING AND EDITING

This is stage whereby all data acquired which were automatically stored in the Total Station were downloaded into personal computer. This was done with the aid of downloading cable connected to the computer and some associated complementing software installed on the System.

3.8.2 DATA PROCESSING AND DATA EDITING

The geometric data downloaded were further processed in order to convert it to a useful format and to enhance its accuracy. The output coordinates, were edited and exported in *.txt, *.xls and *.pdf format. Thereafter, they were imported into Arc GIS 10.3 for further operations and to carry out spatial analysis.

3.8.3 DATA PROCESSING IN AUTOCAD

The AutoCAD is tool that can be used for design and drawings, the software was built to general drawing standard hence the difficulty that comes with localizing this standard to various discipline.

Plotting in AutoCAD can be achieved using coordinate geometry (COGO)by either running script file (.scr) or using the command line (i.e. inputting the values using keyboard). In this project plotting was achieved by using command line in AutoCAD environment. The layout plan was produced as shown in figure below.

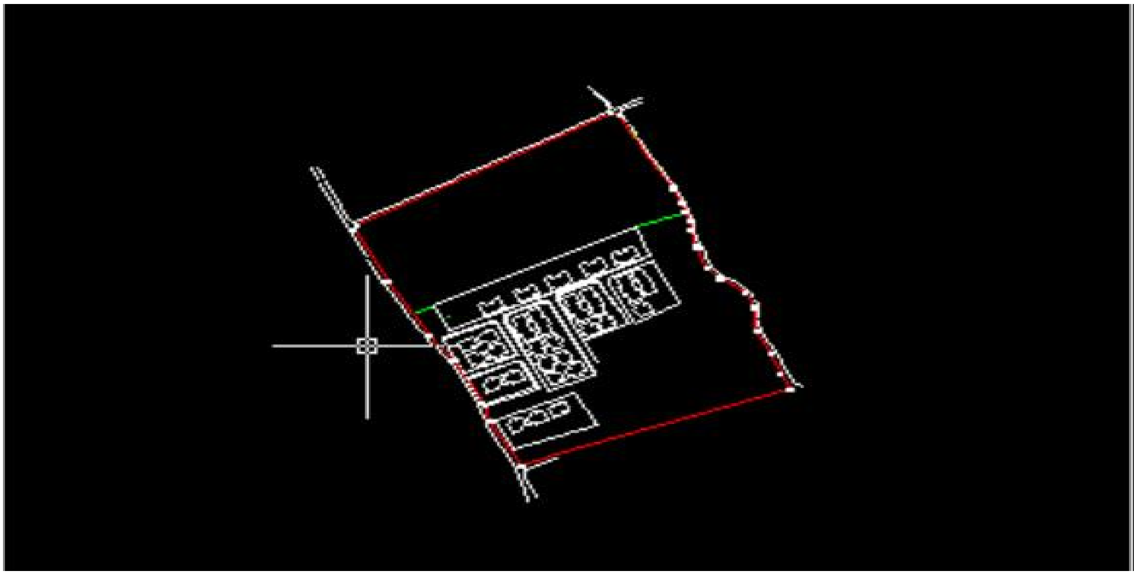


Figure 3.6 shows the layout plan in AutoCAD

Exporting to ArcView, cad file can be exported to GIs software environmental for final cartographic production. This requires that the graphic data can be in a standard exchange format. A standard graphic data exchange format AutoCAD dxf (data exchange format).

3.8.4 DATA PROCESSING USING ARCGIS 10.3 SOFTWARE

Is one of the contemporary software that is easy and facilitate geographic system operation design, map production, analysis and result computation possibility in any spatial project. ArcView was lunched by double clicking on the desktop shortcut icon. See the attribute table in table 3.1

Table

BLD

OBJECTID *	SHAPE *	SHAPE_Length	SHAPE_Area	BLD_COND	BLD__YEAR	BLD_NAME
1	Polygon	66.109612	188.639047	GOOD	2024/2025	MR ALIRU IBRAHEEM
2	Polygon	60.581841	156.903823	GOOD	2024/2025	MR FAWAS HASSAN
3	Polygon	64.998052	182.261182	GOOD	2024/2025	MRS SULAIMAN MUSA
4	Polygon	63.612702	174.081686	GOOD	2024/2025	MR OGUNDEGBO
5	Polygon	63.669847	187.086143	GOOD	2024/2025	MR ASHEER
6	Polygon	79.14498	268.60093	GOOD	2024/2025	MRS AKEEM SEMIAT
7	Polygon	76.521803	232.452935	GOOD	2024/2025	MRS ELIZABETH O.
8	Polygon	50.346939	138.085159	GOOD	2024/2025	MR MURITALA MUSA
9	Polygon	76.347123	244.80315	GOOD	2024/2025	MR HAMED TOYYIB
10	Polygon	80.375451	258.836124	GOOD	2024/2025	MR AWONIYI FIYIN
11	Polygon	50.026159	134.681929	GOOD	2024/2025	MR LEKAN SALAMI
12	Polygon	48.248453	125.263314	GOOD	2024/2025	MR SIKIRU AFEES
13	Polygon	79.108336	258.044627	GOOD	2024/2025	MR QUDUS WAISU
14	Polygon	79.623041	253.855207	GOOD	2024/2025	MR ALIU SHEU
15	Polygon	51.177929	138.283597	GOOD	2024/2025	MRS ALIU RAFAT
16	Polygon	49.745097	125.461477	GOOD	2024/2025	MRS ROFIAT AKEEM
17	Polygon	52.046513	136.459776	GOOD	2024/2025	MR KAFI ALIU
18	Polygon	49.568075	131.721162	GOOD	2024/2025	MR SOLIU
19	Polygon	48.126995	125.903441	GOOD	2024/2025	MR FATAI WALIU
20	Polygon	50.003073	133.809415	GOOD	2024/2025	MR SEMIU AKANO
21	Polygon	49.002194	127.382158	GOOD	2024/2025	MRS BARAKAT LUKMAN
22	Polygon	50.868973	137.488206	GOOD	2024/2025	MRS MUSAH ABEEB
23	Polygon	47.676939	115.937421	GOOD	2024/2025	MRS HAMID MAKANJU
24	Polygon	50.517576	135.529881	GOOD	2024/2025	MR ABDUL WALIU
25	Polygon	48.478043	121.518568	GOOD	2024/2025	MR SIKIRUDEEN MUHEEZ
26	Polygon	50.227298	133.213764	GOOD	2024/2025	MR LAWAL ABDUL
27	Polygon	50.642426	130.068298	GOOD	2024/2025	MR KAZEEM MUIZ
28	Polygon	48.156818	126.304516	GOOD	2024/2025	MRS SULIAT HAMID
29	Polygon	50.330841	129.997333	GOOD	2024/2025	MR DAUD ISSAH

Figure 3.7 shows the attribute table

It demonstrates capability of carrying out a wide range of spatial analysis that may required in land administration. The land information system (LIS) was robust enoughto produce (spatial and non spatial). It was subjected to as show in figure 2 below;

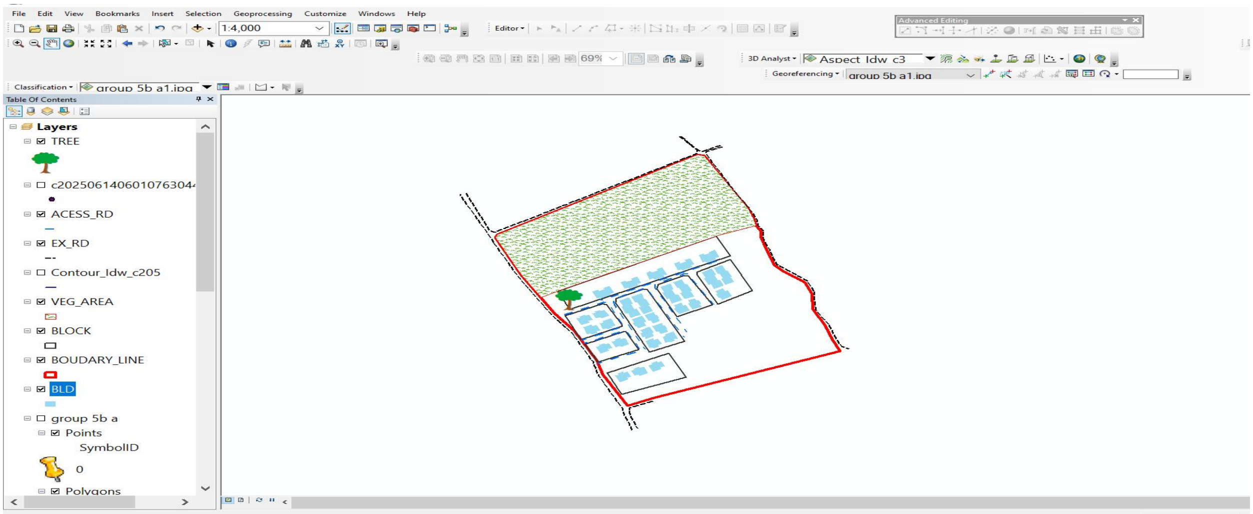


Figure 3.8 shows lay out view in ArcView windows

3.9 DATABASE IMPLEMENTATION

This is the database creation phase. Having completed the three stages of design phase (i.e. Reality, Conceptual and Logical design), the database was created using ArcGIS 10.2 software. It involves the combination and storage of acquired graphic data and attributes data in creating the database for the purpose of spatial analysis and query.

Database is an organized integrated collection of data stored so as to be capable of use by revenant application with data being accessed by different logical part. After the Attribute table was populated via the keyboard, some attributes such as areas of settlements were automatically displayed by special command in the ArcGIS 10.3 version. The ArcGIS software was used to link the graphic data and table for query generation.

3.9.1 DATABASE MANAGEMENT SYSTEMS

Database management is a collection of software for creating, storing, manipulating, updating, organizing and querying of information in a database (Kufoniyi, 1998). It is a software package whose function is to manipulate a database on behalf of the user.

A good DBMS must provide the following functions:

- Storage and retrieval of data.
- Access to by several users at a time.
- A standardized interface between database and application programmed.
- Standardized access to data and separation of data storage and retrieval functions fromthe program using the data.
- Maintenance of data security and integrity.

3.9.2 DATABASE MAINTENANCE

Having created the database, proper maintenance practice was made to meet its stated objectives. The ability to include more data and remove irrelevant data was possible by wayof maintenance. There is every need for the data to be updated regularly because of the physical changes that may occur on the landscape with time. Both security and integrity were also exercised to ensure maintenance and to meet its stated objectives.

Proper observance, updating and management of database ensure its currency and quality to stand a profound chance in Spatial Decision Support System (SDSS). The quality of any database depends on the currency and fitness for use as a decision support system (SDSS). The quality of database depends on its ability to generally fit and use as a decision system (DSS). The storage media should be from time to time justified if otherwise could necessitate data inaccessibility or physical deterioration of the storage media. Also care must be taken during populating any database system, as a database is only good as the data supplied. In archiving stable media should be used. Examples of these are

- Computer compatible tape reader
- Magnetic tape
- Optical disc and compact disc

3.9.3 BACK COMPUTATION

Table 3.11: Back Computation

STATION	BEARING	DISTANCE	Δ N	Δ E	X	Y
PLI					683783.92	946362.91
PL2	29.3204759	5.024	4.38	2.46	683786.38	946367.29
PL3	60.1999543	5.024	107.56	187.81	683974.19	946474.85
PL4	80.2050939	216.430	-1.06	6.14	683980.33	946473.79
PL5	29.0826063	6.231	-43.42	24.15	684004.48	946430.37
PL6	31.0277537	49.684	-27.63	16.62	684021.1	946402.74
PL7	22.4875944	32.243	-14.47	5.99	684027.09	946388.27
PL8	12.3717585	15.661	-8.89	1.95	684029.04	946379.38
PL9	30.6880943	9.101	-7.97	4.73	684033.77	946371.41
PL10	2.1210964	9.268	-9.45	0.35	684034.12	946361.96
PL11	16.5707862	9.456	-15.56	4.63	684038.75	946346.4
PL12	18.9152817	16.234	-20.34	6.97	684045.72	946326.06
PL13	45.9066824	21.501	-9.95	10.27	684055.99	946316.11
PL14	53.0182916	14.299	-14.18	18.83	684074.82	946301.93
PL15	24.0882347	23.572	-14.36	6.42	684081.24	946287.57
PL16	3.58605376	15.730	-22.02	1.38	684082.62	946265.55
PL17	27.1949902	22.063	-22.07	11.34	684093.96	946243.48
PL18	19.8029979	24.813	-19.69	7.09	684101.05	946223.79
PL19	24.910475	20.928	-14.75	6.85	684107.9	946209.04
PL20	70.0543082	16.263	-62.93	-173.41	683934.49	946146.11
PL21	66.1235099	184.476	-11.5	-25.98	683908.51	946134.61

	A	B	C	D	E	F	G	H
22	PL21	66.1235099	184.476	-11.5	-25.98	683908.51	946134.61	
23	PL22	28.6170141	28.411	42.87	-23.39	683885.12	946177.48	
24	PL23	17.7033955	48.836	18.64	-5.95	683879.17	946196.12	
25	PL24	26.8588441	19.567	40.46	-20.49	683858.68	946236.58	
26	PL25	38.7557659	45.353	23.27	-18.68	683840	946259.85	
27	PL26	30.6827093	29.840	52.92	-31.4	683808.6	946312.77	
28	pl1	26.2074157	61.534	50.14	-24.68	683783.92	946362.91	

3.9.4 AREA COMPUTATION

Table 3.12: Area Computation

STN	X	Y	P	Q
PT1	683783.92	946362.91		
PT2	683786.38	946367.29	647110735315.977	647110068395.166
PT3	683974.19	946474.85	647186611442.543	647290800620.245
PT4	683980.33	946473.79	647363643871.480	647370180239.700
PT5	684004.48	946430.37	647339756794.622	647392312562.579
PT6	684021.1	946402.74	647343714044.275	647378342760.807
PT7	684027.09	946388.27	647349545472.497	647365112210.227
PT8	684029.04	946379.38	647349133337.404	647357059795.361
PT9	684033.77	946371.41	647345527065.746	647355455151.663
PT10	684034.12	946361.96	647343539283.389	647350334632.509
PT11	684038.75	946346.4	647333226939.168	647348252165.950
PT12	684045.72	946326.06	647323695174.825	647344204557.408
PT13	684055.99	946316.11	647323484812.549	647340009836.099
PT14	684074.82	946301.93	647323503565.061	647351022611.350
PT15	684081.24	946287.57	647331499115.987	647347397688.793
PT16	684082.62	946265.55	647322510813.282	647338880159.033
PT17	684093.96	946243.48	647308718956.318	647334547311.078
PT18	684101.05	946223.79	647305979547.308	647326158223.654
PT19	684107.9	946209.04	647302597783.492	647319169906.941
PT20	683934.49	946146.11	647266028405.269	647144997205.790
PT21	683908.51	946134.61	647094091961.699	647077376332.396
PT22	683885.12	946177.48	647098830542.355	647047381296.003
PT23	683879.17	946196.12	647089447069.734	647071069695.092
PT24	683858.68	946236.58	647111486954.039	647064429644.322
PT25	683840	946259.85	647108011957.998	647074422867.200
PT26	683808.6	946312.77	647126524636.800	647060623264.710
PT27	683783.92	946362.91	647131096579.026	647073455416.658
PT1	683783.92	946362.91	647107740342.407	647107740342.407
			17475740681785.300	17475740804893.100
			2A	123107.891
			AREA	61553.945
			HECTARES	6.155

CHAPTER FOUR

4.0 SPATIAL ANALYSES AND PRESENTATION

GIS is distinct among other information system because of its spatial analytical capability; especially overlay operation, buffering, spatial search, topographic operation, and neighborhood and connectivity operations. GIS uses this spatial analytical capability to answer fundamental generic question of location, condition, trend, routing, pattern and modeling by the manipulation and analysis of input data. The major analyses performed in this project were overlay operations, topographic operations and spatial search.

4.1 TESTING OF DATABASE

This is the test carried out to determine whether there exists a relationship between data modeled about entities in a spatial database as well as putting into test its retrieval capabilities. This was done by designing a sample query with certain conditions attached andthe query will be ran to see if desired result is achieved.

Analysis of Result

Data captured were full to ensure standardization of task. Coordinated point were used in oreder to produce information required (LIS) and lastly to decision making and produce the output in digital form, while the attribute presented in tabular form. In most GIS operation package including arcview these include measurement techniques, query analysis and geometric operation in this project include questions such as:-

- Residential land use

- Vegetation area
- Developed area
- Slope aspect
- Building that does not have C of O
- Building that have C of O
- Building that have R of O

The above listed queries are shown in blue

BLD

OBJECTID *	SHAPE *	SHAPE_Length	SHAPE_Area	BLD_COND	BLD__YEAR	BLD_NAME	DOCUMENT
1	Polygon	66.109612	188.639047	GOOD	2024/2025	MR ALIRU IBRAHEEM	R OF O
2	Polygon	60.581841	156.903823	GOOD	2024/2025	MR FAWAS HASSAN	R OF O
3	Polygon	64.998052	182.261182	GOOD	2024/2025	MRS SULAIMAN MUSA	R OF O
4	Polygon	63.612702	174.081686	GOOD	2024/2025	MR OGUNDEGBO	R OF O
5	Polygon	63.669847	187.086143	GOOD	2024/2025	MR ASHEER	R OF O
6	Polygon	79.14498	268.60093	GOOD	2024/2025	MRS AKEEM SEMIAT	C OF O
7	Polygon	76.521803	232.452935	GOOD	2024/2025	MRS ELIZABETH O.	R OF O
8	Polygon	50.346939	138.085159	GOOD	2024/2025	MR MURITALA MUSA	C OF O
9	Polygon	76.347123	244.80315	GOOD	2024/2025	MR HAMED TOYYIB	<Null>
10	Polygon	80.375451	258.836124	GOOD	2024/2025	MR AWONIYI FIYIN	<Null>
11	Polygon	50.026159	134.681929	GOOD	2024/2025	MR LEKAN SALAMI	<Null>
12	Polygon	48.248453	125.263314	GOOD	2024/2025	MR SIKIRU AFEES	<Null>
13	Polygon	79.108336	258.044627	GOOD	2024/2025	MR QUDUS WAISU	<Null>
14	Polygon	79.623041	253.855207	GOOD	2024/2025	MR ALIU SHEU	R OF O
15	Polygon	51.177929	138.283597	GOOD	2024/2025	MRS ALIU RAFAT	R OF O
16	Polygon	49.745097	125.461477	GOOD	2024/2025	MRS ROFIAT AKEEM	R OF O
17	Polygon	52.046513	136.459776	GOOD	2024/2025	MR KAFI ALIU	<Null>
18	Polygon	49.568075	131.721162	GOOD	2024/2025	MR SOLIU	<Null>
19	Polygon	48.126995	125.903441	GOOD	2024/2025	MR FATAI WALIU	<Null>
20	Polygon	50.003073	133.809415	GOOD	2024/2025	MR SEMIU AKANO	<Null>
21	Polygon	49.002194	127.382158	GOOD	2024/2025	MRS BARAKAT LUKMAN	<Null>
22	Polygon	50.868973	137.488206	GOOD	2024/2025	MRS MUSAH ABEEB	R OF O
23	Polygon	47.676939	115.937421	GOOD	2024/2025	MRS HAMID MAKANJU	<Null>
24	Polygon	50.517576	135.529881	GOOD	2024/2025	MR ABDUL WALIU	<Null>
25	Polygon	48.478043	121.518568	GOOD	2024/2025	MR SIKIRUDEEN MUHEEZ	C OF O
26	Polygon	50.227298	133.213764	GOOD	2024/2025	MR LAWAL ABDUL	R OF O
27	Polygon	50.642426	130.068298	GOOD	2024/2025	MR KAZEEM MUIZ	R OF O
28	Polygon	48.156818	126.304516	GOOD	2024/2025	MRS SULIAT HAMID	<Null>
29	Polygon	50.330841	129.997333	GOOD	2024/2025	MR DAUD ISSAH	<Null>

Fig 4.1.: shows the building that have C of O

Table

BLD

OBJECTID *	SHAPE *	SHAPE_Length	SHAPE_Area	BLD_COND	BLD__YEAR	BLD_NAME	DOCUMENT
1	Polygon	66.109612	188.639047	GOOD	2024/2025	MR ALIRU IBRAHEEM	R OF O
2	Polygon	60.581841	156.903823	GOOD	2024/2025	MR FAWAS HASSAN	R OF O
3	Polygon	64.998052	182.261182	GOOD	2024/2025	MRS SULAIMAN MUSA	R OF O
4	Polygon	63.612702	174.081686	GOOD	2024/2025	MR OGUNDEGBO	R OF O
5	Polygon	63.669847	187.086143	GOOD	2024/2025	MR ASHEER	R OF O
6	Polygon	79.14498	268.60093	GOOD	2024/2025	MRS AKEEM SEMIAT	C OF O
7	Polygon	76.521803	232.452935	GOOD	2024/2025	MRS ELIZABETH O.	R OF O
8	Polygon	50.346939	138.085159	GOOD	2024/2025	MR MURITALA MUSA	C OF O
9	Polygon	76.347123	244.80315	GOOD	2024/2025	MR HAMED TOYYIB	<Null>
10	Polygon	80.375451	258.836124	GOOD	2024/2025	MR AWONIYI FIYIN	<Null>
11	Polygon	50.026159	134.681929	GOOD	2024/2025	MR LEKAN SALAMI	<Null>
12	Polygon	48.248453	125.263314	GOOD	2024/2025	MR SIKIRU AFEES	<Null>
13	Polygon	79.108336	258.044627	GOOD	2024/2025	MR QUDUS WAISU	<Null>
14	Polygon	79.623041	253.855207	GOOD	2024/2025	MR ALIU SHEU	R OF O
15	Polygon	51.177929	138.283597	GOOD	2024/2025	MRS ALIU RAFAT	R OF O
16	Polygon	49.745097	125.461477	GOOD	2024/2025	MRS ROFIAT AKEEM	R OF O
17	Polygon	52.046513	136.459776	GOOD	2024/2025	MR KAFI ALIU	<Null>
18	Polygon	49.568075	131.721162	GOOD	2024/2025	MR SOLIU	<Null>
19	Polygon	48.126995	125.903441	GOOD	2024/2025	MR FATAI WALIU	<Null>
20	Polygon	50.003073	133.809415	GOOD	2024/2025	MR SEMIU AKANO	<Null>
21	Polygon	49.002194	127.382158	GOOD	2024/2025	MRS BARAKAT LUKMAN	<Null>
22	Polygon	50.868973	137.488206	GOOD	2024/2025	MRS MUSAH ABEEB	R OF O
23	Polygon	47.676939	115.937421	GOOD	2024/2025	MRS HAMID MAKANJU	<Null>
24	Polygon	50.517576	135.529881	GOOD	2024/2025	MR ABDUL WALIU	<Null>
25	Polygon	48.478043	121.518568	GOOD	2024/2025	MR SIKIRUDEEN MUHEEZ	C OF O
26	Polygon	50.227298	133.213764	GOOD	2024/2025	MR LAWAL ABDUL	R OF O
27	Polygon	50.642426	130.068298	GOOD	2024/2025	MR KAZEEM MUIZ	R OF O
28	Polygon	48.156818	126.304516	GOOD	2024/2025	MRS SULIAT HAMID	<Null>
29	Polygon	50.330841	129.997333	GOOD	2024/2025	MR DAUD ISSAH	<Null>

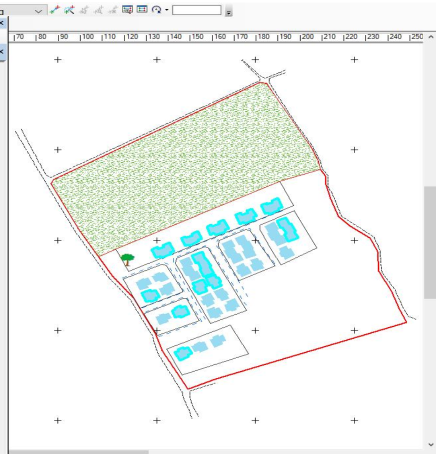


Fig 4.2: shows the building that have R of O

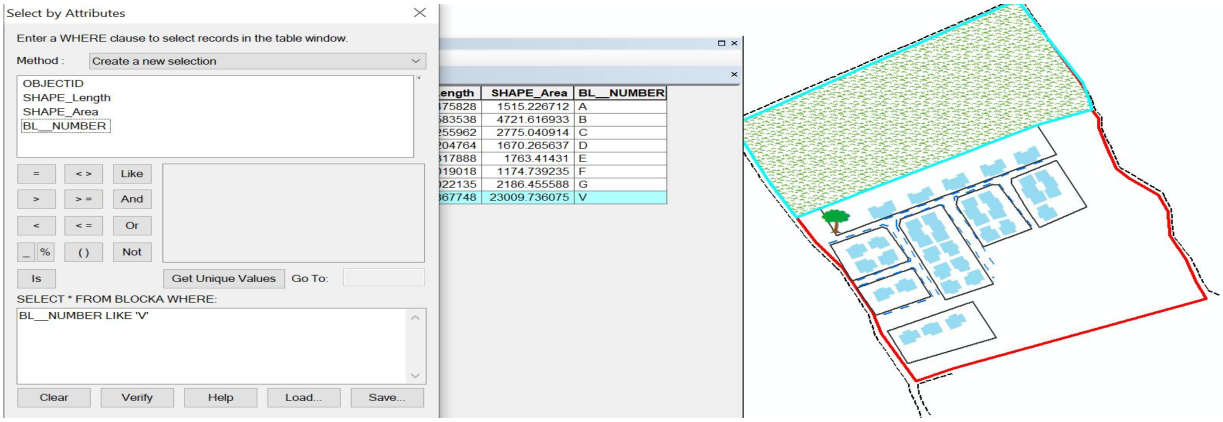


Fig 4.3: show the area use for vegetation

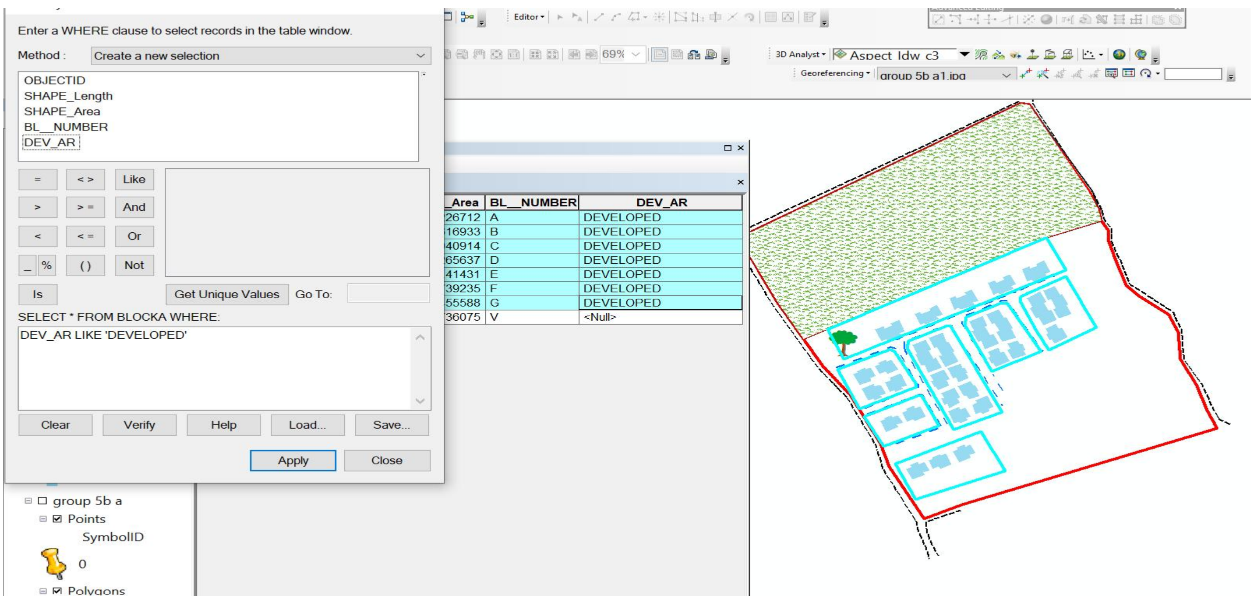


Fig 4.4: show the developed area

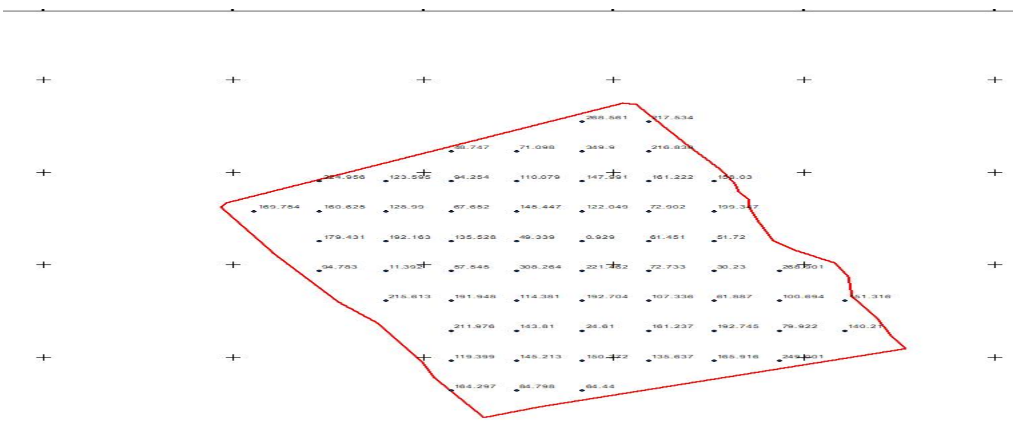


Figure 4.5 shows the spot height

This is the compass direction of that a slope faces and it plays a significant role in environmental and land management decision

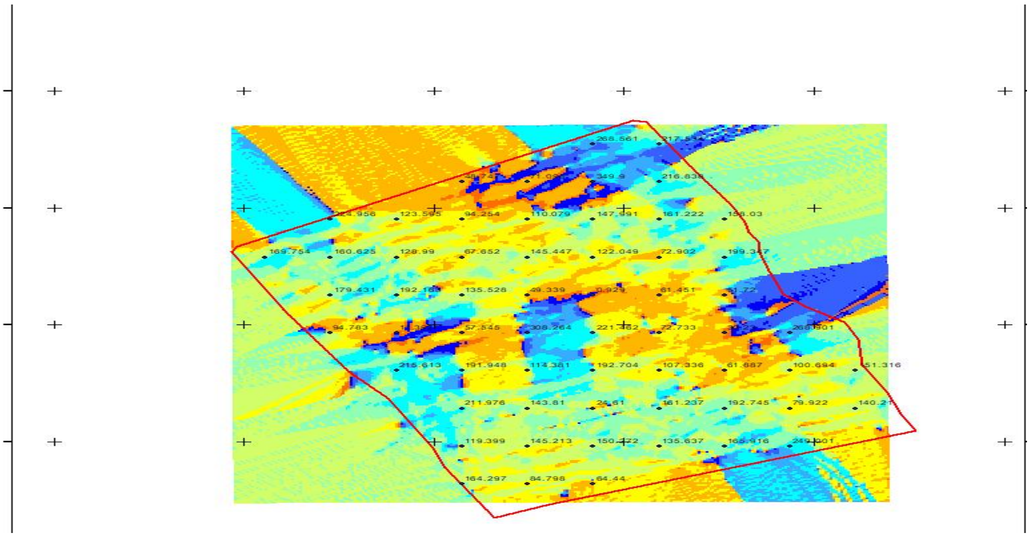


Figure 4.6 shows the slope aspect

The total number of building in the lay out are29 all of them are residential and vegetation area is 1, the table 4.1 below shows the land use percentage

Table 4.1 shows the land use percentage

Residential	0.475266 percent
Vegetationarea	2.292255 percent

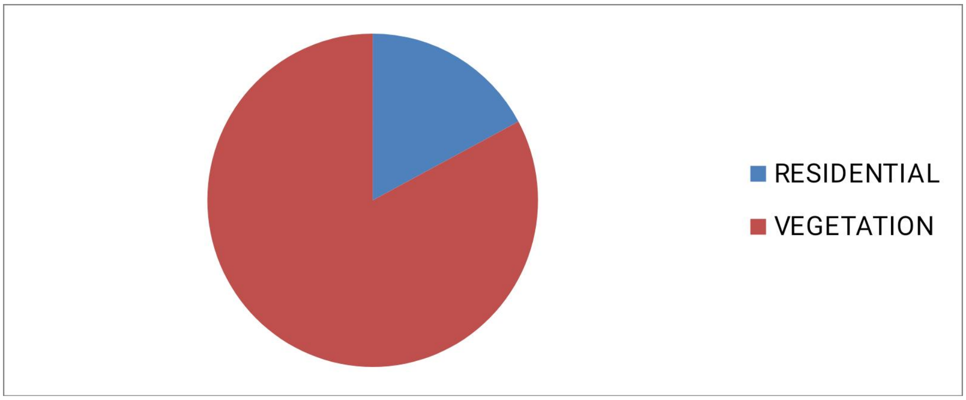


Figure 4.7 shows the pie chart of land use

CHAPTER FIVE

5.0 COST ESTIMATION, SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 COST ESTIMATION

RECCONNAISSANCE

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	Group leader	1	5000	1	5000
2	Ass group leader	1	2500	1	2500
3	Basic equipment	1	25000	1	25000
4	Transportation	1	3000	1	3000

Subtotal = #35,500

Monumentation

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	Group leader	1	5000	1	5000
2	Ass group leader	1	2500	1	2500
3	Skilled labor	3	1500	1	4500
4	Basic equipment	1	25000	1	25000
5	Transportation	1	7500	1	3000

Subtotal = #40,000

Beaconing

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	Group leader	1	5000	1	5000
2	Ass group leader	1	2500	1	2500
3	Basic equipment	1	5000	1	5000
4	Transportation	1	3000	1	3000

Subtotal = #5,500

Beacon

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	Group leader	1	5000	1	5000
2	Ass group leader	1	2500	1	2500
3	Beacon	10	1000	1	10,000
4	Transportation	1	3000	1	3000

Subtotal = #19,500

Traversing

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	supervisor	1	6000	1	6000
2	Group leader	1	5000	1	5000
3	Ass group leader	1	2500	1	2500

4	Skilled labour	6	1500	1	10,000
5	Basic equipment	1	25000	1	5000
6	Transportation	1	10,500	1	10,500

Subtotal = #43,500

Contouring

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	Supervisor	1	6000	2	12,000
2	Group leader	1	5000	**2**	10,000
3	Ass group leader	1	2500	2	5000
4	Skilled labor	6	1500	2	20,000
5	Basic equipment	1	25000	1	5000
6	Transportation	1	10,500	2	21,000

Subtotal = #73,000

Data processing

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	Group leader	1	5000	1	5000
2	Ass group leader	1	2500	1	2500
3	Basic equipment	1	10,000	1	10,000
4	Generator and fuel	1	10,000	1	10,000

Subtotal = #27,500

Technical report

S/N	PERSONNEL	QTY	DAILY RATE	NO OF DAYS	REMARK
1	Group leader	1	5000	1	5000
2	Ass group leader	1	2500	1	2500
3	Basic equipment	1	10,000	1	10,000
4	Generator and fuel	1	10,000	1	10,000

Subtotal = #27,500

Sum total = 271,500.00

Contingency allowance = $\frac{271,500.00 \text{ X } 5}{100}$ = 13,575

VAT = $\frac{271,500.00 \text{ X } 7.5}{100}$ = 20,362.5

ACCOMODATION = $\frac{271,500.00 \text{ X } 1.5}{100}$ = 4,072.5

MOB/DEMB = $\frac{271,500.00 \text{ X } 10}{100}$ = 27,150

GLEARANCE TAX = 65, 159.5

5.2 SUMMARY

The project focuses on developing a **Land Information System (LIS)** for an urban estate located at **Oke Ose, Ilorin**, opposite the Government Cemetery along Sango Oke Oyi Road, Ilorin East Local Government Area, Kwara State.

A **reconnaissance survey** was conducted to create a detailed sketch of the area. Data acquisition was carried out using the **Total Station** survey method in static mode. Pillar descriptions and details were recorded using the Total Station as well. The data processing involved transforming the reduction book data and adjusting the acquired measurements through forward computation.

The survey adhered strictly to specified standards. A total of **thirty-two (32) pillars** were established and buried across the site, with final coordinates (X, Y, Z) obtained for each pillar.

The resulting plan was produced using **AutoCAD** and **GIS software** at an appropriate scale. Data outputs were provided in both **hardcopy and softcopy** formats. Finally, a comprehensive project report detailing the entire methodology and procedures was compiled using **Microsoft Word**.

5.3 PROBLEM ENCOUNTERED

It is rare for any project to start and finish without encountering challenges; however, every problem faced was treated as an opportunity to learn and improve. One significant issue encountered was the poor condition of the survey pole, which negatively impacted the accuracy and ease of measurements. Additionally, communication difficulties between the rover and reference stations posed a serious challenge during data collection. To overcome this, mobile phones were utilized to facilitate effective communication and coordination between team members.

5.4 CONCLUSION

Having successfully completed the project, the objectives of developing the Land Information System were fully achieved. The system now serves as a reliable foundation for future survey operations in the area. Throughout the project, all activities were carried out in strict accordance with the stipulated specifications and under direct supervision, following departmental guidelines.

5.5 RECOMMENDATION

At this juncture, I hereby recommend the following:

i. The school should invest in acquiring more **digital surveying equipment** to enable precise data collection. This will help students gain proficiency with advanced technologies and make their work more efficient.

ii. The school administration should address the **issue of instrument availability** and ensure that project equipment is issued to students promptly. This will help students complete their projects within the specified deadlines.

iii. Finally, the **Land Information System** should be expanded to cover other parts of the town. This effort, carried out by students for both public and private use, will help maintain accurate land records and reduce the occurrence of land disputes in the area.

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APPENDIX

STN	X	Y	H
PT1	683783.92	946362.91	164.297
PT2	683786.38	946367.29	84.798
PT3	683974.19	946474.85	64.44
PT4	683980.33	946473.79	119.399
PT5	684004.48	946430.37	145.213
PT6	684021.1	946402.74	150.272
PT7	684027.09	946388.27	135.637
PT8	684029.04	946379.38	165.916
PT9	684033.77	946371.41	249.001
PT10	684034.12	946361.96	211.976
PT11	684038.75	946346.4	143.81
PT12	684045.72	946326.06	24.61
PT13	684055.99	946316.11	161.237
PT14	684074.82	946301.93	192.745
PT15	684081.24	946287.57	79.922
PT16	684082.62	946265.55	140.21
PT17	684093.96	946243.48	215.613
PT18	684101.05	946223.79	191.948
PT19	684107.9	946209.04	114.381
PT20	683934.49	946146.11	192.704
PT21	683908.51	946134.61	107.336
PT22	683885.12	946177.48	61.887
PT23	683879.17	946196.12	100.694
PT24	683858.68	946236.58	151.316
PT25	683840	946259.85	94.783
PT26	683808.6	946312.77	11.392
PT27	683783.92	946362.91	57.545
PT28	683893.31	946163.83	164.297
PT29	683924.4	946163.83	84.798
PT30	683955.5	946163.83	64.44
PT31	683893.31	946196.18	119.399
PT32	683924.4	946196.18	145.213
PT33	683955.5	946196.18	150.272
PT34	683986.59	946196.18	135.637
PT35	684017.68	946196.18	165.916
PT36	684048.77	946196.18	249.001
PT37	683893.31	946228.52	211.976
PT38	683924.4	946228.52	143.81
PT39	683955.5	946228.52	24.61
PT40	683986.59	946228.52	161.237
PT41	684017.68	946228.52	192.745

PT42	684048.77	946228.52	79.922
PT43	684079.86	946228.52	140.21
PT44	683862.22	946260.87	215.613
PT45	683893.31	946260.87	191.948
PT46	683924.4	946260.87	114.381
PT47	683955.5	946260.87	192.704
PT48	683986.59	946260.87	107.336
PT49	684017.68	946260.87	61.887
PT50	684048.77	946260.87	100.694
PT51	684079.86	946260.87	151.316
PT52	683831.13	946293.21	94.783
PT53	683862.22	946293.21	11.392
PT54	683893.31	946293.21	57.545
PT55	683924.4	946293.21	308.264
PT56	683955.5	946293.21	221.462
PT57	683986.59	946293.21	72.733
PT58	684017.68	946293.21	30.23
PT59	684048.77	946293.21	268.901
PT60	683831.13	946325.56	179.431
PT61	683862.22	946325.56	192.163
PT62	683893.31	946325.56	135.528
PT63	683924.4	946325.56	49.339
PT64	683955.5	946325.56	0.929
PT65	683986.59	946325.56	61.451
PT66	684017.68	946325.56	51.72
PT67	683800.03	946357.91	169.754
PT68	683831.13	946357.91	160.625
PT69	683862.22	946357.91	128.99
PT70	683893.31	946357.91	67.652
PT71	683924.4	946357.91	145.447
PT72	683955.5	946357.91	122.049
PT73	683986.59	946357.91	72.902
PT74	684017.68	946357.91	199.347
PT75	683831.13	946390.25	224.956
PT76	683862.22	946390.25	123.595
PT77	683893.31	946390.25	94.254
PT78	683924.4	946390.25	110.079
PT79	683955.5	946390.25	147.991
PT80	683986.59	946390.25	161.222
PT81	684017.68	946390.25	158.03
PT82	683893.31	946422.6	48.747
PT83	683924.4	946422.6	71.098
PT84	683955.5	946422.6	349.9
PT85	683986.59	946422.6	216.838

PT86	683955.5	946454.95	268.561
PT87	683986.59	946454.95	217.534