PROJECT REPORT

ON

ASBUILT SURVEYING OF PART OF HONEYWELL ESTATE, OFF OKEOSE/OKEOYI ROAD, ILORIN EAST LOCAL GOVERNMENT AREA, ILORIN KWARA STATE

BY

OYEWUMI TOHEEB OLANIYI

HND/23/SGI/FT/0107

PROJECT SUBMITTED TO THE DEPARTMENT OF

SURVEYING AND GEO-INFORMATICSINSTITUTE OF

ENVIRONMENTAL STUDIES

IN PARTIAL FUFILMENT OF THE REQUIRMENT FOR THEAWARD OF HIGHER NATIONAL DIPLOMA (HND) IN SURVEYING AND GEO-INFORMATICS

JUNE, 2025

CERTIFICATE

I hereby certified that all the information given in this project were obtained as a result of observations and measurements made by me and that the survey was carried out in Accordance with Survey Rules, Regulations and Departmental instructions.

SIGNATURE OF STUDENT: ……………………………………

NAME OF STUDENT: OYEWUMI TOHEEB OLANIYI

DATE OF COMPLETION: ……………………………………….

CERTIFICATION

This is to certify that OYEWUMI TOHEEB OLANIYI with Matric No. HND/21/SGI/FT/0107 have satisfactorily carried out the survey duties contained in this project report under our direct supervision.

I hereby declare that he has conducted himself with due diligence, honesty andsobriety on the project.

……………………………… ……………………………..

SURV. AYUBA DATE

PROJECT SUPERVISOR

…………………………….. ………………………

SURV. R.S. AWOLEYE DATE

PROJECT CO-ORDINATOR

…………………………….. ……………………………..

SURV. A.I ISAU DATE

HEAD OF DEPARTMENT

…………………………….. ……………………………

EXTERNAL SUPERVISOR DATE

DEDICATION

This project is dedicated to Almighty God and my lovely parent

ACKNOWLEDGEMENT

I give thanks to almighty Allah, the creator of my life for his protection and guidance over me through and through the completion of my project.

Firstly, I would like to express my sincere gratitude to my supervisor, [SURVEYOR AYUBA], for his guidance and support throughout this project. His expertise and feedback were invaluable in shaping this work.

Secondly, To my HOD, SURVEYOR ISAU A.I, A father figure for real, thank you for your support and guidance throughout my project journey..

I also wish to thank my Colleagues for their contributions to data collection and analysis. Additionally, I appreciate the support provided by [Funding And dedication towards this final projects].

Big appreciation to the teaching and non-teaching staffs of surveying and geo-informatics department for their support and the knowledge they impacted in us, May almighty Allah be with them all.

To my friends, I'm grateful for their motivation and collective support that made this journey more enjoyable.

To my mother, I always appreciate you. THANK YOU…

I would like to thank my parents and siblings for their encouragement. To everyone who contributed to this journey of mine, I sincerely send my genuine appreciation, I'm thankful to the gift of you all, may Allah swt bless you all, be you family, friends or acquaintances,

THANK YOU…

My sincere gratitude goes to my Brother MALIQ for standing by me, for his unending support and understanding throughout this project and education.

Thank you all for your support and contributions. I am grateful for the opportunity to work with such a wonderful team. Thank you for making this project possible. I appreciate everyone's help and guidance throughout this project.

ABSTRACT

This project presents the as-built survey of a section of Honeywell Estate, Ilorin, conducted to determine and document the precise positions and dimensions of existing features within the *estate. The aim of the survey was to verify the conformity of built structures with the original design plans, support effective land administration, and aid in future planning decisions. Observations were processed using appropriate surveying software to generate accurate plans showing buildings, roads, drainage lines, and other physical developments. The resulting as-built plan provides a reliable spatial framework for property documentation, development control, and infrastructural assessments within the estate. This survey underscores the critical role of as-built mapping in estate management and urban development.*

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1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

An as-built survey is a crucial subset of land and engineering surveying that involves the detailed documentation of constructed features within a site after construction has been completed. It serves as a verification tool for recording what has actually been built on the ground as opposed to what was originally designed on paper. The survey captures the precise locations, shapes, dimensions, and orientations of buildings, utilities, road networks, drainage lines, and other infrastructural components (Oluwatosin, 2018). These records are indispensable for estate planning, facility management, legal validation, property registration, urban planning, and infrastructural maintenance.

The term "as-built" refers to the final status of a structure or site after construction works have ended, capturing any modifications, adjustments, or deviations from the initial design. In reality, changes during construction are common due to site conditions, technical challenges, supply constraints, or client requests. Consequently, there is often a variation between the original design drawing (proposed plan) and the completed structure (as-built plan). Without an accurate as-built survey, these discrepancies remain undocumented, which may cause issues for future development, maintenance, or legal adjudication (Ezeokoli et al., 2021).

In developed countries, as-built surveys are a compulsory part of the project lifecycle and are often mandated before commissioning, handing over, or issuing building permits. However, in many parts of Nigeria, this practice is still inconsistently applied or completely neglected, leading to problems such as encroachments, poor record-keeping, and uncoordinated infrastructure development. The need for precision and comprehensive data has become even more essential with the growth of smart cities, Geographic Information Systems (GIS), and Building Information Modeling (BIM), which rely heavily on accurate spatial inputs (Nwilo & Osanwuta, 2017).

The city of Ilorin, capital of Kwara State, has experienced steady urbanization due to its strategic position in the North Central region of Nigeria. As more people migrate from rural communities in search of better opportunities, the demand for housing, transportation, and social amenities continues to rise. In response to this, estate development projects have flourished across peri-urban areas such as Oke Ose and Oke Oyi. The Honeywell Estate is one of the notable residential developments along this corridor, designed to cater to middle-class and upper-middle-class families seeking serene and affordable housing environments (Ajayi & Olayemi, 2020).

However, as development progresses in Honeywell Estate, the lack of structured documentation, including up-to-date as-built surveys, threatens to compromise the sustainability and manageability of the estate. Property owners, surveyors, developers, and regulatory bodies require accurate information on the current spatial arrangement of buildings, roads, and drainage systems to make informed decisions on renovation, expansion, taxation, and utility provisioning. Without such data, disputes over land boundaries may arise, infrastructural installations may be misaligned, and estate management could become inefficient or chaotic (Adebayo & Ogunleye, 2019).

Additionally, an as-built survey can serve as a valuable legal document, especially in environments where land ownership and titling are frequently contested. It helps prevent unauthorized developments, ensures that buildings conform to building codes, and facilitates the issuance of Certificates of Occupancy (C of O), building permits, and development approvals. For Honeywell Estate, producing an as-built survey also contributes to transparency in estate management and supports compliance with Kwara State's urban development policies (Kwara State Ministry of Lands, 2022).

The process of conducting an as-built survey typically involves field reconnaissance, control point establishment, data acquisition using tools such as Total Stations and Global Navigation Satellite Systems (GNSS), data processing using computer-aided design (CAD) and GIS software, and finally, the generation of detailed as-built drawings. These outputs are not only technical but can also be interpreted by stakeholders such as estate managers, government agencies, and construction firms for various purposes.

In the context of academic and professional research, this study also aims to demonstrate the practical applications of surveying principles to real-world problems, particularly the transition from paper-based design drawings to physically built environments. It emphasizes the importance of spatial data accuracy in urban planning and estate development and showcases the relevance of geospatial science to national development goals.

Thus, the as-built survey of Honeywell Estate is not just a technical task, it is an essential step toward promoting orderly, lawful, and sustainable urban expansion. It provides a tangible contribution to estate planning, supports land information systems, and reflects the value of surveying in bridging the gap between architectural imagination and construction reality.

1.2 STATEMENT OF THE PROBLEM

In estate development projects across Nigeria, particularly in fast-growing urban and peri-urban areas like Ilorin, there is a persistent challenge of inconsistency between proposed architectural or engineering drawings and the final structures that are built on-site. While it is widely acknowledged that some level of variation may occur during the construction phase due to practical constraints, these deviations are often left undocumented. This lack of documentation poses a serious problem for accurate spatial record-keeping, regulatory oversight, and long-term estate management (Ezeokoli et al., 2021).

In the case of **Honeywell Estate**, located along the Oke Ose/Oke Oyi axis of Ilorin, Kwara State, the estate has witnessed rapid development and building activities in recent years. However, despite the growth and infrastructural expansion, there is no comprehensive and updated *as-built survey* to verify or validate the current layout of buildings, roads, drainage systems, and open spaces relative to the initial design plan. This lack of current spatial documentation means there is a significant information gap between the physical reality on the ground and the estate's official development records.

Such gaps can create numerous technical and administrative problems. For instance, without a proper as-built survey, it becomes difficult to assign property titles accurately, leading to overlapping plots or land disputes. Furthermore, infrastructural elements like water supply lines, electrical cables, and drainage channels may be misaligned due to inaccurate assumptions about building positions, causing frequent service disruptions or inefficiencies (Adebayo & Ogunleye, 2019). Estate managers are often left without reliable data to make planning decisions or enforce development control, especially in the face of unapproved extensions or encroachments.

Moreover, government regulatory agencies responsible for urban planning and zoning approvals require reliable as-built records for post-construction evaluations. The absence of such documentation may lead to the approval of unregulated structures, illegal constructions, or violations of building setback standards. In worst-case scenarios, this could result in demolitions, legal conflicts, and loss of investment (Nwilo & Osanwuta, 2017). In addition, the inability to verify the actual built environment limits the potential for integrating

Honeywell Estate into larger land administration systems such as Geographic Information Systems (GIS) or digital cadastral databases used for taxation and infrastructural planning.

From a surveying and geoinformatics perspective, this problem also undermines the practical relevance of spatial data in estate development. Surveyors and planners rely on current, ground-truth data to support decision-making, land valuation, and the integration of estate layouts into broader urban development frameworks. The absence of an accurate as-built survey restricts such integration and weakens spatial intelligence across key sectors such as housing, infrastructure, and environmental planning (Ajayi & Olayemi, 2020).

Furthermore, many developers and estate owners overlook the importance of post-construction documentation due to cost-saving strategies or lack of awareness. This results in estates like Honeywell lacking a verified map of what exists on the ground, even years after project completion. As more residents occupy the estate and demand for services increases, the absence of a reference framework makes it difficult to plan utility extensions, maintenance schedules, or emergency response strategies.

Given these challenges, there is a pressing need to conduct a detailed and accurate as-built survey of Honeywell Estate. This will bridge the gap between the proposed and the existing spatial configurations and ensure that planners, regulators, and residents can rely on precise geospatial data for informed decisions. Addressing this problem is essential not only for the estate's present management but also for its long-term sustainability and integration into Kwara State's urban development agenda.

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 Aim:

To conduct an as-built survey of Honeywell Estate along Oke Ose/Oke Oyi, Ilorin, Kwara State, for accurate spatial documentation and planning.

1.3.2 Objectives:

1. To identify and collect geospatial data on the physical features of Honeywell Estate, including buildings, roads, and drainage systems.
2. To compare existing as-built features with initial design plans.
3. To produce detailed maps and drawings using GIS and surveying techniques.
4. To provide recommendations for future estate planning and development based on the findings.

1.4 STUDY AREA

Honeywell Estate is located along the Oke Ose/Oke Oyi corridor in Ilorin East Local Government Area of Kwara State, Nigeria. Ilorin is situated in the North Central geopolitical zone of Nigeria and lies between latitude 8°26′N and longitude 4°35′E. The estate is within a semi-urban growth zone, characterized by rapid residential development and infrastructural expansion. The climate is tropical with a wet and dry season, and the terrain is a mix of gentle slopes and flat plains—favorable for building activities (Kwara State Ministry of Lands, 2022).

1.5 SIGNIFICANCE OF THE STUDY

This study is significant for several reasons. First, it provides a reliable spatial database for Honeywell Estate, which can aid estate management, urban planning, and infrastructural development. Second, the findings will help identify deviations from original designs, thereby enhancing accountability among contractors and developers. Additionally, the resulting maps and plans can serve as vital tools for title documentation, asset valuation, and urban development policies (Nwilo & Osanwuta, 2017).

1.6 SCOPE AND LIMITATIONS OF THE STUDY

Scope:

The study is limited to Honeywell Estate and focuses on surveying the positions and dimensions of physical structures such as buildings, access roads, drainage lines, and open spaces. It includes data acquisition, analysis, map production, and documentation.

Limitations:

Possible limitations may include accessibility to some parts of the estate due to ongoing construction, weather conditions during fieldwork, and discrepancies in existing design documents.

1.7 JUSTIFICATION OF THE STUDY

With the rapid pace of urban development, there is a growing need for reliable and up-to-date spatial information for informed decision-making. As-built surveys ensure accuracy, legal compliance, and efficient land administration. This study will contribute to the literature on estate mapping and support local authorities in maintaining structured urban growth. It will also serve as a reference for future infrastructure extension, renovation, or disaster management planning in Honeywell Estate and similar communities.

1.8 PROBLEMS ENCOUNTERED

i. Harsh weather condition as there is burning sun on the day of data acquisition
ii. Financial challenges
iii. Inexperience using of Arcmap.
iv. Minor instrument calibration errors and tripod instability due to uneven terrain affected some angle and distance measurements.
v. Occasional software crashes or data corruption.

vi. Miscommunication among team members regarding feature coding and measurement procedures led to duplication or omission of some feature.

vii. Fatigue and field stress contributed to occasional oversight during data logging and prism handling.

1.9 PERSONNEL

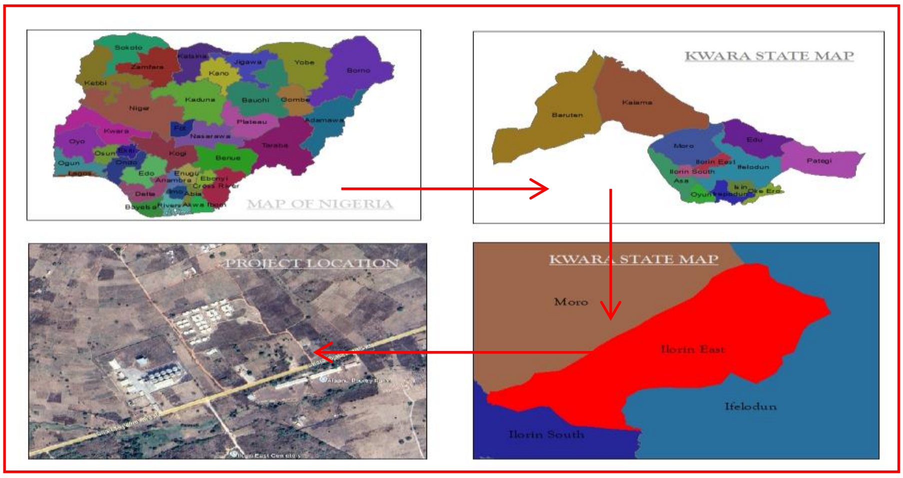
The following were the personnel who participated in the execution of the project.

NAME	MATRIC NO	REMARKS
1. OYEWUMI TOHEEB. O.	HND/23/SGI/FT/0107	AUTHOR
2. DADA OLUWAFRANMI. N.	HND/23/SGI/FT/0122	MEMBER
3. TOMOYE PELUMI FAVOUR	HND/23/SGI/FT/0119	MEMBER
4. TIJANI DAMILOLA. F.	HND/23/SGI/FT/0100	MEMBER
5. IDOWU ABEEB LOLADE	HND/23/SGI/FT/0106	MEMBER
6. IDRIS OLONA	HND/23/SGI/FT/0108	MEMBER
7. OBAMILA ODUNAYO FUNKE	HND/23/SGI/FT/0101	MEMBER
8. ADEYINKA GRACE TOSIN	HND/23/SGI/FT/0098	MEMBER

1.10 PROJECTION LOCATION

The project location is situated at HONEYWELL ESTATE opposite Government cemetery along oke oyi/oke ose road, Ilorin East local government area, Kwara State. Nigeria. It lies approximately within latitude 8° 33' 23.443"N and longitude 4° 40' 15.384"E with an approximate area of 7.18 hectares.

DIAGRAM OF THE PROJECT AREA `



CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 CHAPTER OVERVIEW

This chapter provides a critical review of relevant academic and professional literature on as-built surveys. It explores the conceptual framework, methodological approaches, historical background, challenges, and the role of as-built surveys in estate development and urban planning. Furthermore, it identifies knowledge gaps and establishes the basis for the present study.

2.2 CONCEPT OF AS-BUILT SURVEY

An as-built survey is a comprehensive post-construction documentation of the actual state of a built environment. It involves capturing the final dimensions, layouts, elevations, and positions of structures and utilities as they exist on the ground, regardless of deviations from the original design (C. Ghilani & P. Wolf, 2012). According to Alausa and Adaradohun (2021), as-built surveys are essential to verify compliance between design intent and construction outcome, and they serve as critical tools for decision-making, land titling, renovations, and facilities management.

In contrast to pre-construction surveys that rely on planned features, the as-built process provides accurate, real-world spatial data, correcting discrepancies and informing subsequent development phases. Clayton et al. (2016) highlight that as-built surveys help avoid assumptions about construction conformance and are integral in areas where infrastructure expansion or maintenance is frequent.

2.3 HISTORICAL DEVELOPMENT AND GLOBAL PRACTICES

The concept of as-built surveys has evolved significantly over the years, shaped by the progression of engineering practice, land administration systems, and technological innovation in geospatial sciences. Historically, the need to verify and document what has actually been built on a piece of land stemmed from the necessity to prevent construction errors, facilitate post-construction evaluations, and ensure that developments complied with planned land use and regulatory frameworks.

Early Practices in As-Built Documentation

In ancient civilizations such as Egypt and Mesopotamia, rudimentary forms of land surveying and construction documentation were employed using ropes, straight edges, and observational tools to measure and align structures. While these early systems lacked formal accuracy, they laid the foundation for the present-day surveying profession. As civilizations advanced, the Greeks and Romans began implementing more precise geometric principles in architecture and land development. However, it was not until the post-medieval period that as-built documentation became more formalized, particularly with the rise of cadastral mapping for land taxation and legal ownership (Ghilani & Wolf, 2012).

During the industrial revolution, rapid urbanization and complex infrastructure developments necessitated more accurate post-construction records. This led to the use of manual drawing instruments, field sketching, and baseline measurements to produce scaled drawings that represented the final layout of constructed features. The process was labor-intensive and prone to human error, especially in large-scale urban projects.

The Shift to Modern Surveying Technologies

The 20th century witnessed a significant shift in surveying practice with the advent of theodolites, electronic distance measurement (EDM) devices, and total stations. These instruments increased the accuracy and efficiency of as-built surveys. As-built documentation evolved from being merely a paper-based record to a critical quality control component in engineering and construction workflows. In the 1980s and 1990s, the integration of computer-aided design (CAD) systems transformed the way survey data were visualized and stored. Instead of relying solely on manual plotting, surveyors could now digitize and edit layouts with greater precision.

The introduction of Global Navigation Satellite Systems (GNSS), including GPS, GLONASS, Galileo, and BeiDou, further revolutionized as-built surveys by providing high-precision positional data, especially for wide-area and infrastructure projects. Real-Time Kinematic (RTK) GNSS technology enabled centimeter-level accuracy in real-time, dramatically reducing survey time and increasing reliability (Teunissen et al., 2014). Total Stations continued to complement GNSS, especially in built-up or canopy-covered areas where satellite signals may be obstructed.

Global Practices and Standardization

Across the world, as-built surveys are now recognized as mandatory components of construction and estate development. In many developed nations, including the United States, United Kingdom, Germany, and Canada, national and local building codes mandate the submission of as-built documentation before construction projects can be certified complete. These countries have institutionalized digital spatial databases where as-built records are integrated into centralized systems for planning, taxation, environmental monitoring, and disaster management.

In Poland, for instance, the Geodetic and Cartographic Law Act governs all geospatial activities, including the submission and verification of as-built documentation. Every construction project is required to undergo a geodetic inventory, which must be approved by the Head Office of Geodesy and Cartography before an occupancy permit is issued (Król et al., 2022). The documentation must comply with standards related to coordinate systems, data precision, and data submission formats such as GML (Geography Markup Language).

In Turkey, where earthquake risk is high, as-built surveys serve a dual purpose of compliance verification and risk management. According to Meydan Yıldız (2019), the Building Inspection Law mandates geomatics engineers to carry out as-built workflows during and after construction. The data is tied into the GRS 80 ellipsoid and ITRF 96 coordinate system to ensure consistency and reliability.

Ukraine has also moved toward modernization, especially post-2020 with regulatory reforms to decentralize building inspection and spatial data verification. Despite challenges posed by the COVID-19 pandemic, as-built surveys in Ukraine are now a crucial part of development control and cadastral updating (Ivanchenko, 2021).

Emerging Trends in As-Built Surveying

The global practice of as-built surveying has now embraced technologies such as:

- **Terrestrial Laser Scanning (TLS)**: which allows for rapid 3D capture of complex structures.
- **Photogrammetry and Drone Mapping**: which enable aerial as-built documentation.
- **Building Information Modelling (BIM)**: which combines spatial and attribute data into intelligent 3D models (Tang et al., 2010; Lin et al., 2018).
- **Cloud-based Data Management**: for real-time sharing and collaboration among architects, engineers, and planners.

Automated as-built generation using AI and machine learning is also emerging, with capabilities to detect design-construction mismatches automatically and recommend corrections.

Status of As-Built Practices in Developing Countries

In developing nations like Nigeria, as-built surveys are not yet systematically enforced. Most construction projects, especially residential and estate developments, often skip this crucial stage due to lack of regulatory oversight, cost-saving tendencies by developers, and low awareness. Where as-built data exists, it is often fragmented, paper-based, or outdated. According to Nwilo and Osanwuta (2017), the limited integration of surveying with digital planning systems has hampered the effectiveness of estate management and land administration in Nigeria.

However, with increasing adoption of GIS and surveying technologies in Nigerian academic institutions and professional practices, there is a growing recognition of the importance of post-construction documentation. Pilot projects, like the one carried out at Federal Polytechnic Ilaro (Alausa & Adaradohun, 2021), have demonstrated the potential of as-built surveys in updating building plans, identifying compliance issues, and supporting estate expansion.

2.4 IMPORTANCE AND APPLICATIONS OF AS-BUILT SURVEYS

The value of as-built surveys cuts across several sectors:

- **Estate Development**: It ensures orderly planning and helps developers validate the extent and alignment of structures (Adebayo & Ogunleye, 2019).
- **Facility Management**: Accurate records aid in utility servicing, renovations, and retrofitting of existing structures (Lin et al., 2018).
- **Legal and Regulatory Compliance**: As-built surveys serve as legal evidence during property disputes and are used for issuing Certificates of Occupancy (Ezeokoli et al., 2021).

- **Disaster Planning and Recovery**: Knowing the precise layout of buildings and utilities can improve emergency response (Son et al., 2015).

In addition, as-built surveys facilitate integration into Geographic Information Systems (GIS), which support planning, taxation, and infrastructure development.

2.5 METHODOLOGIES IN AS-BUILT SURVEYING

2.5.1 Traversing and Detailing

Traversing involves establishing control points from which all measurements are referenced. Detailing refers to capturing features like roads, utilities, and buildings. In as-built projects, this is typically done using ray-shooting and polar methods (Chekole, 2014).

2.5.2 Use of Total Station and GNSS

Modern as-built surveys leverage Total Stations and GNSS (Global Navigation Satellite Systems) to collect 3D coordinates of site features with high accuracy. RTK (Real-Time Kinematic) GNSS systems provide centimeter-level precision in open environments (Teunissen et al., 2014). For areas with poor satellite visibility, total stations remain the preferred option due to their angular precision.

2.5.3 CAD AND GIS INTEGRATION

Surveyed data are processed using software like AutoCAD and ArcGIS. CAD aids in drafting the geometrical layouts, while GIS supports spatial analysis, overlays, and integration with attribute data (Adaradohun & Alausa, 2021). These platforms enable comparison between as-built and design drawings, detection of spatial mismatches, and database updates.

2.6 AS-BUILT SURVEYING IN ESTATE DEVELOPMENT

Estate developments require accurate spatial records for property allocation, utility design, and compliance monitoring. As-built surveys provide evidence-based layouts used by planning authorities, especially when issuing permits or conducting property assessments (Nwilo & Osanwuta, 2017). In the Nigerian context, many estates lack verified records, which leads to overlapping plots and planning inefficiencies.

In their study of Federal Polytechnic Ilaro, Alausa and Adaradohun (2021) observed several mismatches between as-built data and archived building plans. Features such as soak-away pits, water tanks, and generator houses were missing from original documents, emphasizing the need for continuous updates and periodic as-built checks.

2.7 CHALLENGES IN CONDUCTING AS-BUILT SURVEYS

Despite the importance of as-built surveys, several challenges exist:

- **Technical Limitations**: Poor visibility, terrain obstacles, and equipment calibration issues can affect data accuracy.
- **Data Inconsistencies**: Variations in coordinate systems, especially in multi-phase projects, often lead to conflicting outputs (Król et al., 2022).
- **Financial Constraints**: Developers may skip as-built surveys to reduce costs, especially in informal settlements.
- **Lack of Enforcement**: In Nigeria, weak institutional frameworks mean that as-built documentation is often not enforced, resulting in incomplete or outdated estate records (Adebayo & Ogunleye, 2019).
- **Human Factors**: Limited technical capacity, training gaps, and lack of awareness contribute to underutilization of modern surveying tools.

2.8 THEORETICAL FRAMEWORK

This study adopts the Geospatial Infrastructure Framework (GIF) which emphasizes the role of spatial data in supporting sustainable urban development. According to Sahely et al. (2019), the availability of accurate spatial information is central to managing land, allocating resources, and planning for infrastructural growth. The theory underpins the idea that spatial inaccuracies hinder estate development and limit effective planning, which the as-built survey aims to correct.

2.9 EMPIRICAL REVIEW OF SIMILAR STUDIES

- **Król et al. (2022)** conducted an as-built inventory of residential infrastructure in Poland, focusing on single-family buildings. Their workflow incorporated RTK and tacheometry to achieve centimeter-level accuracy.
- **Alausa & Adaradohun (2021)** investigated the as-built status of Federal Polytechnic Ilaro's buildings. Their findings revealed structural variations from design drawings, underscoring the need for regular updates.
- **Kala (2009)** explored issues of measurement accuracy in as-built surveys and recommended standard tolerances to reduce inconsistencies.
- **Tang et al. (2010)** focused on automatic reconstruction of as-built BIM models from laser scans, a method increasingly adopted for complex facilities.

These studies demonstrate how as-built surveys are used globally and locally to address design-execution mismatches, legal compliance, and digital asset management.

2.10 GAPS IN THE LITERATURE

While many studies address as-built survey techniques and applications in developed contexts, limited empirical data exists on estate-level surveys in Nigeria, especially in fast-growing cities like Ilorin. Furthermore, most local studies do not integrate GIS for spatial analysis or focus on compliance with regulatory zoning. There is also a lack of research linking as-built surveys to broader estate management practices in peri-urban environments.

This study seeks to bridge these gaps by producing a spatially accurate as-built survey of Honeywell Estate, integrating modern geospatial tools, and offering insights for estate planning and policy formulation.

2.11 SUMMARY OF THE REVIEW

This chapter has reviewed key concepts, methods, and practices related to as-built surveys. It discussed their significance in estate development, outlined challenges, and examined empirical works globally and locally. The review established the theoretical basis for this research and identified specific gaps, particularly in the Nigerian context. These insights provide a foundation for the methodological and analytical frameworks presented in subsequent chapters.

CHAPTER THREE

3.0 METHODOLOGY

The process followed to achieve the expected result is grouped into the following three stages;

- Planning
- Data acquisition
- Data processing

3.1 PLANNING

The following are the methods adopted in carrying out as-built survey of Honeywell estate off oke ose/oke oyi road Ilorin, olrin south local government area

3.1.1 OFFICE PLANNING (RECONNAISSANCE)

This includes the purpose, precision, and accuracy of the survey, the type of equipment used, and the best method engage for the survey carried out. It also involves the decision and collection of instruments needed for the work, acquisition of existing building plans for buildings studied, instrument test, work plan, and acquiring and evaluating of all relevant data used for the project. Other secondary data needed for the study, such as the available coordinates of the control network used, was gotten from the department of surveying and geo-informatics.

Table.3.1 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: office of surveyor general kwara state

3.1.2 FIELD PLANNING (RECONNAISSANCE)

This starts by visiting the study area to be pre-informed about the state of the site, and to determine the work path, then to ground truth the information obtained during the office recce.

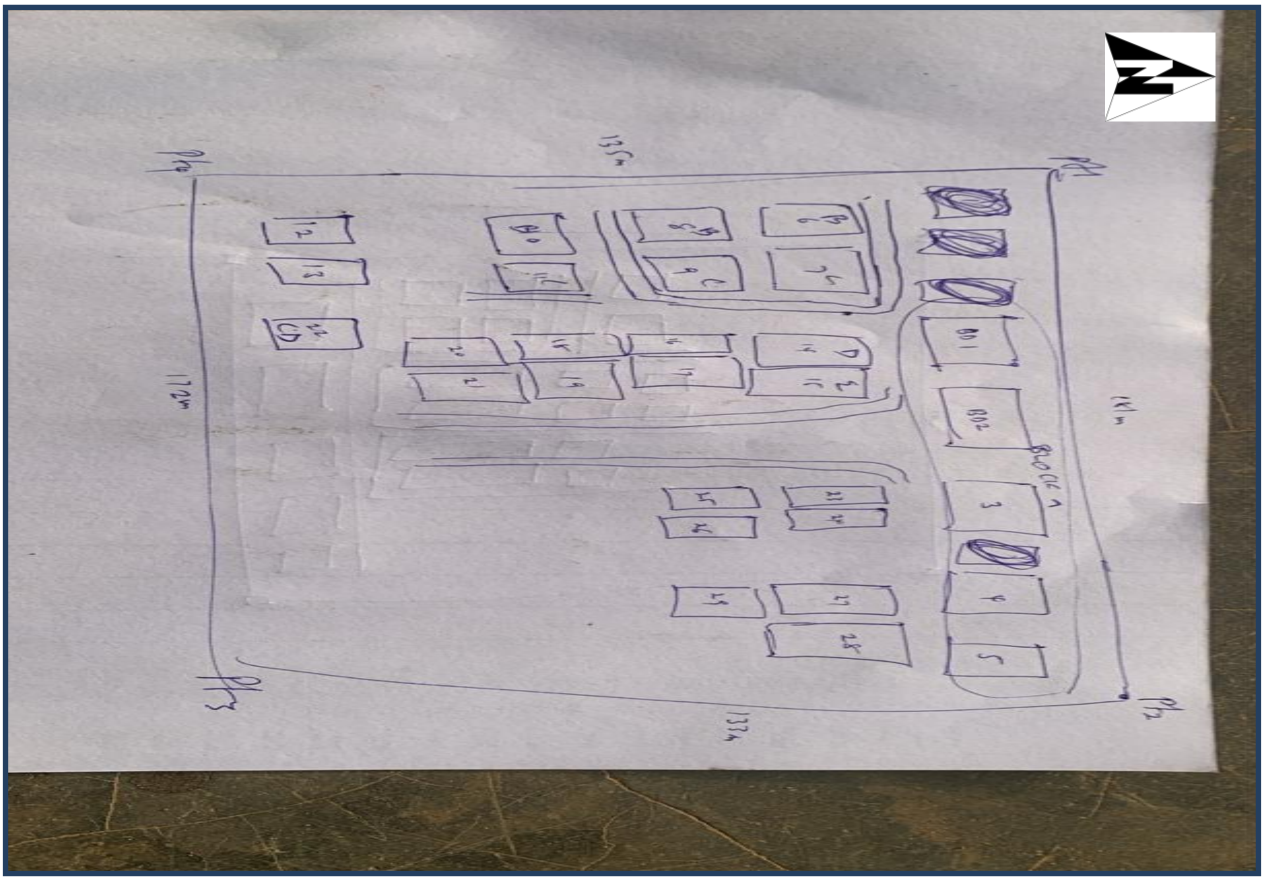


Fig.3.1: Reece diagram of the study area (not drawn to scale)

3.2 DATA BASE DESIGN

The design of any database involves three stages namely;

i Conceptual design

ii Logical design

iii Physical design

3.2.1 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 as-built of the project. Since it is not 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 using this project Includes; Green serve, Roads, Electric poles, Trees, Water Facilities, Buildings, Football pitch, Streams.

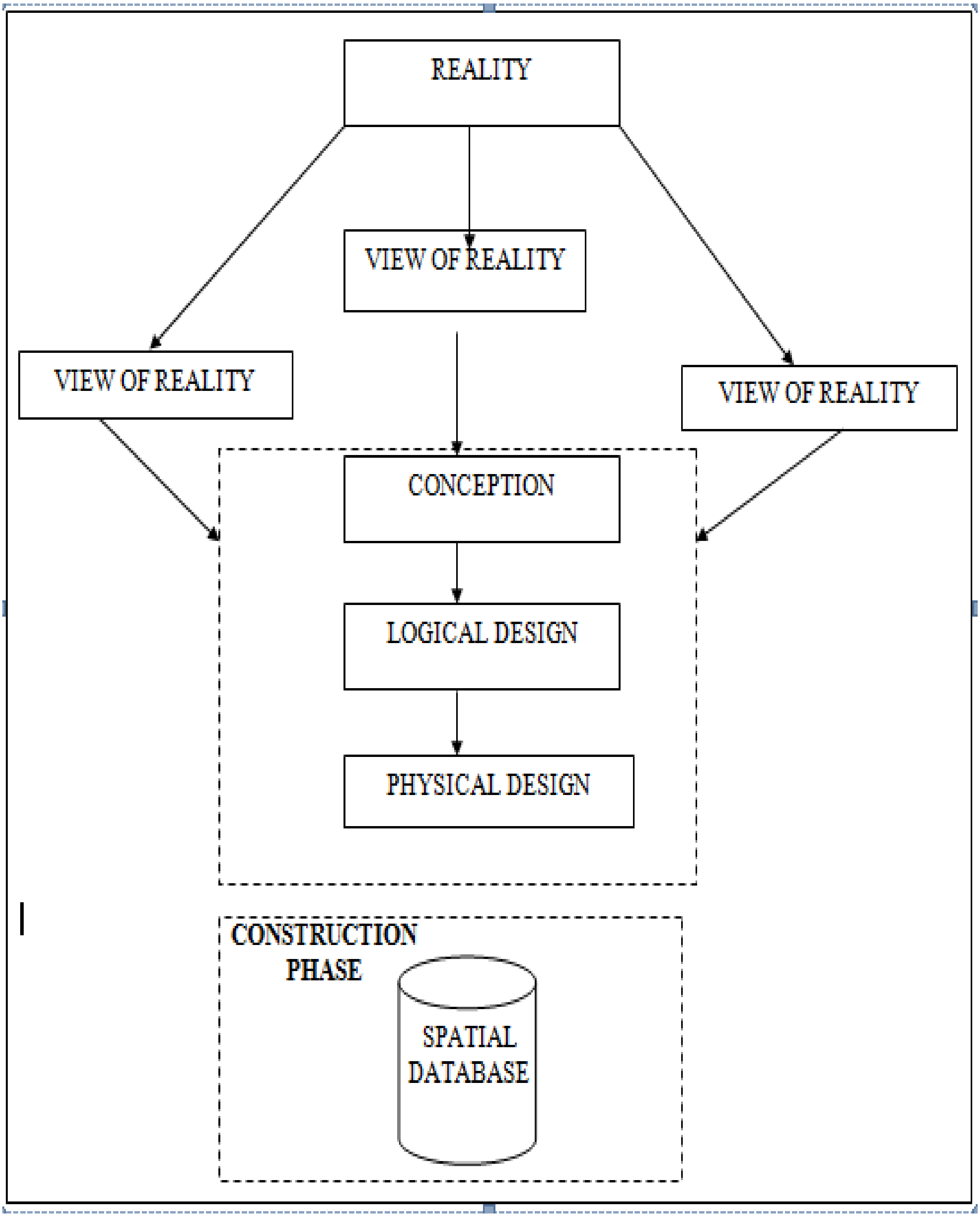


Fig.3.2 Design and Construction Phases in Spatial Database

3.2.2 CONCEPTUALDESIGN

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)

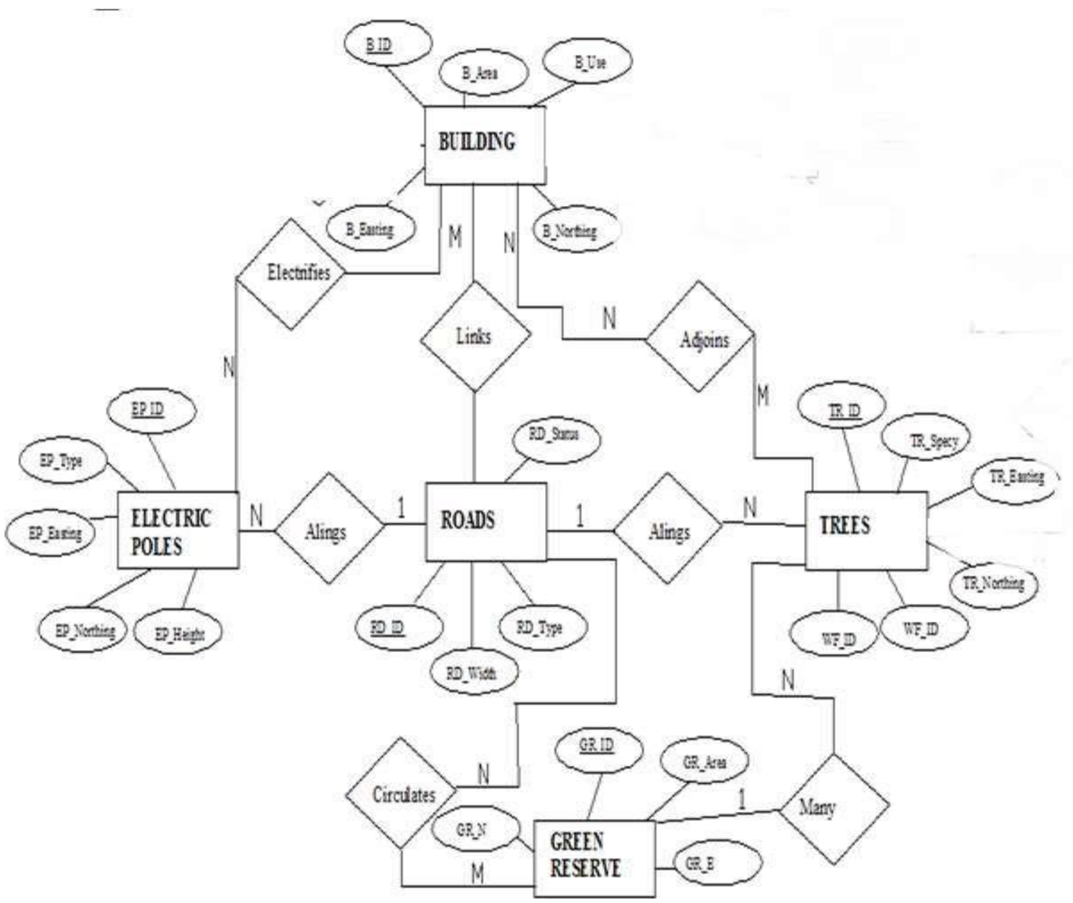


Fig.3.3. E-R Diagram (Entity relationship diagram)

3.2.3 LOGICALDESIGN

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 no information 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 Tree(TR _ ID, TR_ spp, TR_ Importance, TR_ Easting, TR_ Northing)

3.2.4 PHYSICALDESIGN

Table3.2: 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

Table3.3: 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

Table3.4: Trees and its attributes

ENTITY	DESCRIPTION
TR_ID	Tree Identifier
TR_ Spp	Tree specy
TR_E	Tree_ Easting
TR_N	Tree Northing

3.3 EQUIPMENTUSED/SYSTEMSELECTIONANDSOFTWARE

3.3.1 HARDWAREUSED

i. Total station

ii. 1reflector with a tracking rod.

iii. 1Tripod

iv. One(1)50m tape

v. One(1)umbrella

vi. 1cutlass

vii. Hand held GPS

viii. Hammer

ix. Nails and bottle cover

x. Field book and writing materials

xi. 1-NoofPersonalComputerHP655 and its accessories

xii. 1-NoofHP DeskJetK7100 A3 printer

xiii. 1-NoofHPDeskJet 1110 A4printer

3.3.2 SOFTWARE COMPONENT

i. Notepad.

ii. Microsoft Excel.

iii. AutoCAD2007

iv. Arc GIS10.2

v. Microsoft Word.

3.4 INSTRUMENTTEST

To ensure the quality of the data, the Total Station employed for this project was tested for vertical index and horizontal collimation errors. These tests also aimed to verify the instrument's efficiency and reliability. The procedure followed is outlined below.

3.4.1 HORIZONTALCOLLIMATIONTEST

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

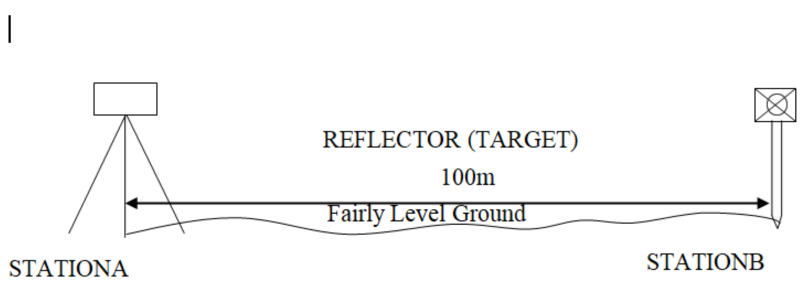


Fig3.4; Horizontal Collimation and Vertical Index error test.

Table3.5: 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 IX ERNDEROR TEST

To perform the test, the Total Station was set up over a known point, and all necessary temporary adjustments were made to ensure proper alignment and functionality. A target was placed approximately 100 meters away, and the instrument was aimed at it. The target was first bisected using the face left position, and the corresponding vertical angle was recorded. The same process was then repeated using the face right position, and the resulting reading was also documented. The recorded values are presented below:

Table3.6: 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 ANALYSISOFCOLLIMATIONANDVERTICALINDEXDATA

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

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

Verticalcollimation={(FL+FR)–360}=(90˚00‘‘00”+270˚00‘‘02”)-

360}=02”Theresult 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.

Table3.7: Table showing the back computation of the control coordinates

From STN	Bearing	Dist (m)	ΔN	ΔE	Northing(m)	Easting(m)	ToSTN
					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

Table3.8: 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

Table3.9: TABLE showing the observation result of the control check

STN	SIGHT	FACE	OBSERVEDH ZANGLE	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 allow able 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.

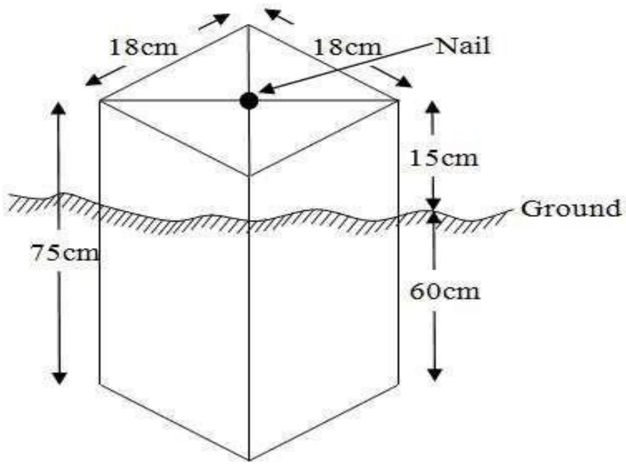


Fig.3.5: Pillar Description

3.7 DATA ACQUISITION

Data acquisition is a fundamental aspect of digital mapping. It involves collecting coordinate data of map features in a format compatible with computers. Various techniques exist for gathering topographical data, and the choice of method depends on several factors, including the data source, available hardware and software, desired level of accuracy, and the manpower involved. In addition to field and laboratory methods, data can also be obtained through social surveys.

In the context of this project, data acquisition refers to the methods and processes used to obtain the necessary data. The acquired data is categorized into two main types: 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 conspicuous points 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

This involves the acquisition of Nothings, Easting and Height value of features that are present on the project site. In the aspect of this project digital land survey method was adopted.

3.7.2 TRAVERSING

This is a series of connected straight lines, the length and direction of which are determined from measurements. This includes the distance measurement and angular measurements which include horizontal angle and vertical angle between points, whose direction between selected points is determined after some calculations. The total station computed directly the angle and distance measured on the site to determine the coordinates of the point with the aid of the processor. The total station was used to determine the coordinates of the boundary of the project site. The instrument was set on control ‘Y’ and adjustment (temporary) was done, the instrument was focused at the reflector on point ‘X’ to set orientation and point ‘Z’ was observed as the forward station. All other boundary point was observed as the reflector was placed on them.

3.7.3 DETAILING

Detailing entails fixing both natural and artificial feature that exists in the boundary. These include buildings, electric poles, footpaths, culverts, etc. In this project, details were fixed using the total station and its accessories using the ray shooting method.

Here, the ray shooting method was employed to effectively fix the details along the project area. Features such as roads, buildings, storex, etc. were fixed. To achieve this, the total station is set on the transferred point in the project boundary to bisect many edges of details and the reflector was placed at a known station for orientation before positioning it at each corner of the details. The coordinate of each corner is observed and recorded. The details taken include Road, Building, Storex, and Electric poles.

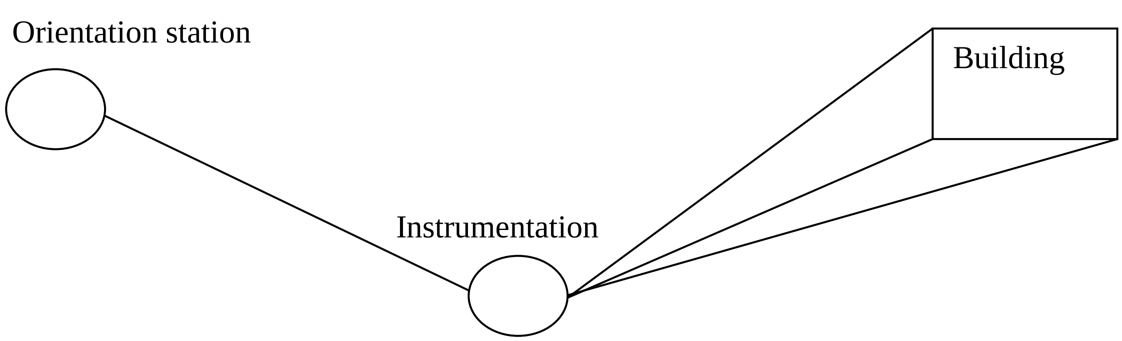


FIGURE 3.6 SHOW THE DETAILING OBSEVATION

3.7.4 ATRIBUTES 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 and around the study area.

3.8 DATA DOWNLOADING AND PROCESSING

3.8.1 DATADOWNLOADINGANDEDITING

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

These data were processed using AutoCAD 2007 where the acquired coordinate was plotted, and details fixed to depict the study area, after which were exported to Arc GIS 10.2 where digitizing was done, and the attribute data was used to create a database table in relationship to the details. This data table was queried to provide useful cadastral information.

3.8.3 SPATIAL RELATIONSHIPS

Spatial relationships are the relationship determined by the location, size, shape, and other features of spatial objects. The most common spatial relationships are distance relationships, direction relationship, and topological relationships.

3.8.4 OVERLAY OF PLAN

The 2D plan of the building in the study was gotten from the ministry and was captured with a digital camera. After which, the captured image was added into the Arc GIS 10.2 environment as a geo-referenced raster image and the conversion to digital form was done by digitizing, then the overlay was done by putting on the two layers containing both files.

3.9 DATABASE IMPLEMENTATION

This phase involves the creation of the spatial database. Following the completion of the three design stages Reality, Conceptual, and Logical design the database was developed using ArcGIS10.2 software. This process entails integrating and storing both the acquired geometric (graphic) data and attribute data to enable spatial analysis and queries.

A database is an organized and integrated collection of data that is structured for efficient access and use by relevant applications, with data retrievable through various logical operations. Once the attribute table was populated manually via the keyboard, certain attributes such as the areas of settlements were automatically calculated and displayed using specific commands available in ArcGIS10.2.

Arc GIS was also used to link the graphic data with the attribute table, allowing for the execution of spatial queries and further analysis.

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 from the 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 way of 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

Table 3.10 Shows The Backward Computation

STN FROM	BEARING ° ' "	DIST (m)	△ N	△ E	X	Y	STN TO
					683827.457	946283.854	PL1
PL1	66 1 55	303.145	123.146	277.005	684104.462	946407.843	PL2
PL2	149 46 46	192.751	-166.555	97.017	684201.479	946241.288	PL3
PL3	155 17 55	50.039	-45.426	20.985	684222.464	946195.862	PL4
PL4	249 25 28	312.969	-109.990	-293.005	683929.459	946085.872	PL5
PL5	332 44 31	222.713	197.982	-102.002	683827.457	946283.854	PL1

3.9.4 AREA COMPUTATION

Table 3.11 Shows Area Computation

Double Latitude	Departure	Multiplier
123.99	-277.00	-34,345.23
123.99		
247.98		
-166.55		

81.43	97.02	7900.34
-166.55		
-85.12		
-45.43		
-130.55	20.98	-2738.94
-45.43		
-175.98		
-109.99		
-285.97	-293.00	83,789.21
-109.99		
-395.96		
+197.98		
-197.98	-102.00	20,193.96
+197.98		

0.00		

Total Area = {(-34,345.23--2738.94) + (7,900.34+83,789.21+20,193.96)}/2

Total Area = {(-37,084.174) + (111,883.51)}

Total Area = 74,799.336/2

Total Area = 37,399.668 SQ MTS

3.9.5 LINEAR ACCURACY COMPUTATION

Linear Accuracy = 1

{[SQRT (change in Northing) ^{2} + (change in Easting) ^{2}

Total Distance

Linear Accuracy = 1

{SQRT [(0) ^{2} + (-554) ^{2}]

1081.954

Linear Accuracy = 1

{SQRT [306916]}

1081.954

Linear Accuracy = $\dfrac{1}{\dfrac{554}{1081.954}}$

Linear Accuracy = $\dfrac{1}{0.512036}$

Linear Accuracy = 1: 0.5

CHAPTER FOUR

4.0 RESULTS, ANALYSIS, AND DISCUSSION

GIS stands out from other information systems due to its powerful spatial analytical capabilities particularly overlay operations, buffering, spatial search, topographic analysis, and neighborhood and connectivity functions. These capabilities enable GIS to answer fundamental questions related to location, conditions, trends, routing, patterns, and modeling by manipulating and analyzing spatial data. In this project, the primary analyses conducted included overlay operations, topographic analysis, and spatial searches.

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 in to test its retrieval capabilities. This was done by designing a sample query with certain conditions attached and the query will began to see if desired result is achieved.

Analysis of Result

Data captured were full to ensure standardization of task. Coordinated point was used in order to produce information required 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 arc view these include measurement techniques, query analysis and geometric operation in this project include questions such as:-

- Architectural planning
- Building overlay

The above listed queries are shown

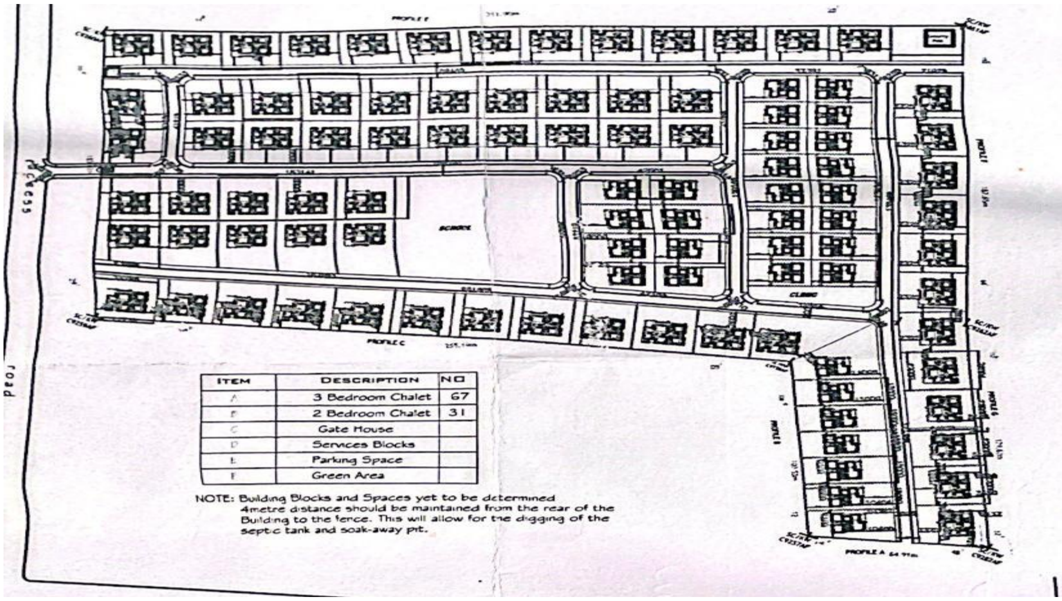


Fig4.1. showing the 2d plan architecture structure of the building

Note: - the 2d plan of the building in the study was gotten from the owner of the Honeywell estate and was captured with a digital camera. after which, the captured image was added into the Arc Gis10.2 environmental as a geo-referenced raster image and the conversion to digital form was done by digitizing then the overlay was done by putting on the two layers containing both files

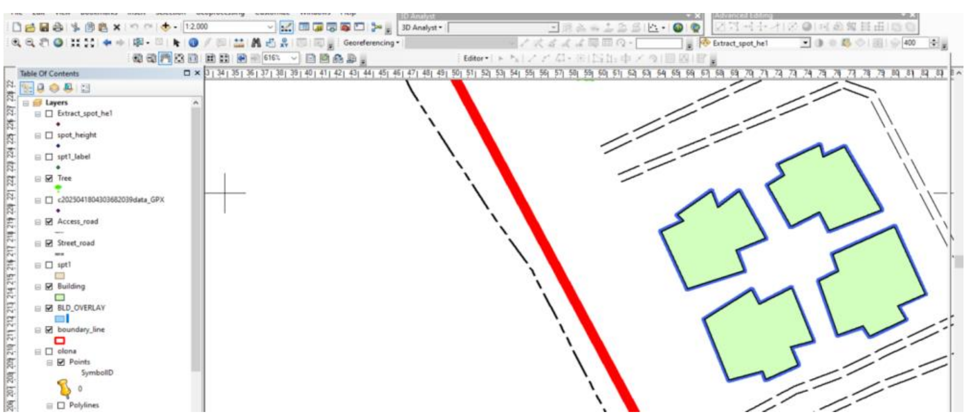


Fig4.2: showing overlaid of all building in block A

DISCUSSION OF RESULT (BUILDING OVERLAY BLOCK A)

The blue line represents observed edges of the building while the black line represents the digitized edges of the building. It was noticed that the existing building archive design is the same with what we observed in field.

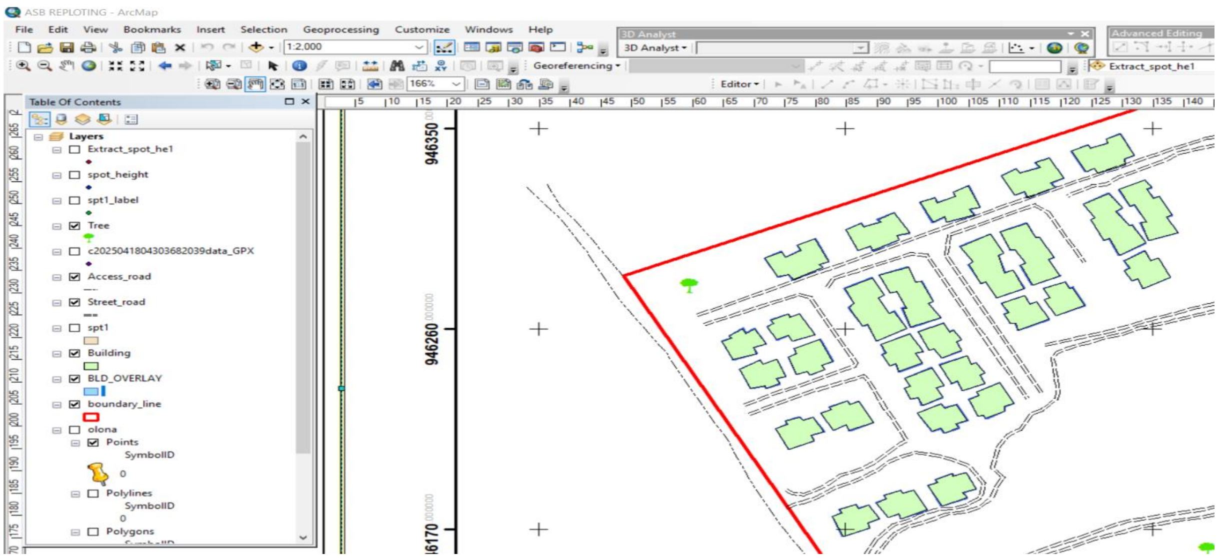


Fig 4.3: showing overlaid of all building of all block

Discussion of result (building overlay of building in all block)

The blue line represents observed edges of the building while the black line represents the digitized edges of the building. It was noticed that the existing building archive design is the same with what we observed in field. But some road paramount with existing architecture lay out while some not paramount, and all of the building shows in architecture plan are not built in land.

Figure 4.4 Shows the Height of Drainages

This height shows in the figure 4.4 above is the height of drainage were measured in sight with total stations

CHAPTER FIVE

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

This study was conducted to carry out an as-built survey of Honeywell Estate along the Oke Ose/Oke Oyi corridor in Ilorin, Kwara State. The need for updated spatial data and accurate documentation of infrastructural elements such as buildings, roads, and drainage systems necessitated this research. The survey served as a tool to identify discrepancies between the original estate design and its current state while also supporting planning, property management, and legal documentation.

A systematic methodology was adopted involving reconnaissance (both office and field), establishment of control points, equipment testing, data acquisition using Total Station, and post-processing with CAD and GIS tools. The spatial data collected were subjected to analysis which revealed the exact positions, dimensions, and relationships of estate features.

Database creation and spatial queries further confirmed the integrity and usability of the dataset. Analyses such as back computation, area and linear accuracy computations validated the precision of field measurements. Additionally, cost analysis provided an insight into the resources and logistics involved in executing an as-built survey of this scale.

The entire workflow, from field observation to digital mapping and spatial querying, aligns with global best practices and demonstrates the practical application of geospatial technologies in estate development and administration.

5.2 CONCLUSION

The execution of the as-built survey for Honeywell Estate has proven to be a significant contribution toward proper urban planning and estate management in Ilorin, Kwara State. The study has:

- Successfully acquired accurate geospatial data of physical features within the estate.
- Verified the conformity and deviations from the original layout.
- Produced updated digital maps using AutoCAD and ArcGIS.
- Demonstrated the integration of modern surveying techniques for spatial documentation.
- Created a functional geo-database that supports querying and spatial decision-making.

These outcomes affirm that as-built surveys are essential not only for record-keeping but also for enabling sustainable infrastructure planning, land titling, and service delivery.

In a developing urban context like Ilorin, where informal development is on the rise, this project underscores the urgent need for institutionalizing post-construction documentation. Accurate spatial records help mitigate conflicts, promote lawful developments, and support digital transformation efforts such as integration into GIS-based land administration systems.

5.3 RECOMMENDATIONS

Based on the findings and the broader implications of this research, the following recommendations are proposed:

1. **Institutionalization of As-Built Surveys**: Government agencies and planning authorities in Kwara State should mandate as-built documentation as part of estate approval and final inspection processes.

2. **Periodic Updates**: Estates like Honeywell should undertake periodic updates to their spatial data to reflect infrastructural changes due to renovations or new developments.
3. **Digital Integration**: The spatial datasets should be integrated into Kwara State's GIS platforms to support broader urban development planning, land registration, and infrastructure monitoring.
4. **Training and Capacity Building**: Estate managers and surveying professionals should be trained on the use of modern survey instruments and spatial analysis software to enhance the quality and reliability of spatial data.
5. **Standardization of Procedures**: There should be adherence to national and international surveying standards (e.g., ISO 17123) to ensure data accuracy and compatibility across projects.
6. **Collaboration with Stakeholders**: Urban planners, surveyors, engineers, and legal professionals should collaborate to ensure the effective use of as-built data in estate governance and dispute resolution.
7. **Cost Optimization Strategies**: Although comprehensive, as-built surveys are resource-intensive. Bulk procurement of equipment, shared services, or community-based funding can help reduce overall costs.

5.4 SUGGESTIONS FOR FURTHER STUDIES

This research focused solely on the Honeywell Estate. Future studies can:

- Compare multiple estates across Ilorin to assess general trends in design-execution discrepancies.
- Integrate Building Information Modeling (BIM) with GIS to develop intelligent 3D estate models.

- Explore the use of UAVs and LiDAR for faster and more extensive as-built documentation in larger or inaccessible estates.
- Investigate the impact of accurate as-built data on property valuation, taxation, and legal adjudication.

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