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RESEARCH ARTICLE

Land Information System (LIS): Case Study of Berry Court Estate, Olowora Phase 2, Omole, Kosofe Local Government Area, Lagos State.

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Abstract

In many developing regions, such as Lagos State, Nigeria, land administration is often hindered by inefficiencies in data management, outdated record-keeping, and limited decision-support tools for land use planning and estate management. This study addresses the lack of a structured, digital Land Information System (LIS) for Berry Court Estate, Olowora Phase 2, Omole, located within Kosofe Local Government Area. The primary objective is to design and implement a parcel-based LIS that integrates spatial and non-spatial data for enhanced estate management, ownership verification, security tracking, and land valuation. A mixed-method approach was employed, involving data acquisition from estate management, spatial data processing, geodatabase creation, and digitization using ArcMap 10.4 and MySQL. The resulting LIS supports robust multi-criteria querying, enabling users to retrieve detailed information about plot allocation, land ownership, allottee demographics, and payment status. The system demonstrated its capacity to improve data accuracy, decision-making, and operational efficiency within the estate. It also facilitates transparency and enhances security by integrating personal allottee data with geospatial features. This research provides a replicable model for other residential estates in Nigeria and similar urban contexts seeking digital transformation in land administration.

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1.0 INTRODUCTION

1.1 Background to the Study

Effective land administration forms the backbone of sustainable urban development, real estate planning, and property rights management. However, in many rapidly urbanizing regions, including Lagos State, Nigeria, land management practices are still plagued by outdated, manual systems that hinder transparency, efficient service delivery, and data-driven decision-making. This is especially evident in privately managed residential estates, where the absence of a centralized, digital land record system often leads to issues such as duplicated plot allocation, disputed ownership, poor land valuation mechanisms, and ineffective estate security planning.

A Land Information System (LIS) offers a structured digital solution to these challenges by integrating spatial data (such as plot geometry) with non-spatial data (such as allottee information, land use, and payment history). As emphasized by Ezigbalike [1], LIS is not merely a technical tool but also a sociotechnical infrastructure that improves governance, accountability, and sustainable land use. Research by Furuholt [2] and Ismail [3] further supports the notion that LIS implementation significantly enhances decision-making capabilities within both public and private land management institutions.

Despite its proven benefits, LIS remains underutilized in local estate developments across Nigeria. The absence of a digital geodatabase for estates such as Berry Court Estate, Olowora Phase 2, Omole, has

resulted in inefficient property tracking and an over-reliance on manual records, thereby exposing the estate to avoidable risks in management, valuation, and security operations.
This study addresses this gap by developing a parcel-based LIS tailored to Berry Court Estate. The goal is is to create a robust digital platform that enables seamless updating, retrieval, and analysis of land-related data for better estate governance. By applying GIS tools and database integration techniques, this research demonstrates how LIS can transform traditional estate management into a data-driven, transparent, and sustainable system.

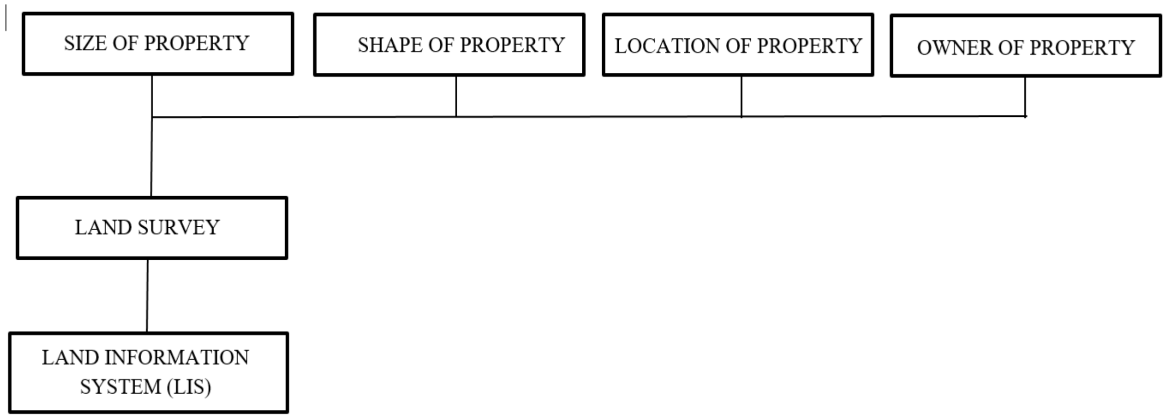

Figure 1: Schematic diagram showing the interconnectivity of the land information system.

2.0 REVIEW OF RELATED LITERATURE

The development and application of Land Information Systems (LIS) have become increasingly vital for efficient land administration, urban planning, and estate management, especially in rapidly urbanizing regions such as Lagos State, Nigeria. LIS integrates geospatial technologies with land-related data to enhance decision-making, improve service delivery, and support sustainable development (Ezigbalike et al, 1997; Kumar et al, 2006).

2.1 Conceptual Foundations of LIS

A Land Information System (LIS) is a computer-based tool used to capture, manage, analyze, and present land-related information. It incorporates both spatial (e.g., coordinates, parcel shapes) and non-spatial data (e.g., ownership details, payment history) to facilitate comprehensive land management (Ali and Ahmed, 2013; Angus-Leppan, 1989). As Bogaerts and Kraak (1989) highlight, LIS serves as a foundation for land policy implementation and governance by creating transparency in land dealings and preventing disputes.

2.2 LIS in Developing Countries

Several studies underscore the challenges faced by developing countries in adopting LIS due to infrastructural deficits, lack of skilled personnel, and weak institutional frameworks (Nahrin and Rahman, 2009; Moinin, 1997). Despite these challenges, successful LIS implementations have been documented. For instance, Furuholt (2015) and Ismail (2001) demonstrate how LIS has been effectively deployed to streamline land use planning and improve accountability in both urban and rural settings.
In Nigeria, the application of LIS has been shown to enhance revenue generation and land valuation accuracy (Aminigbo and Hart, 2022). Abbas et al (2014) emphasize that LIS supports layout management and reduces conflict over plot allocations by providing a centralized, updatable database.

2.3 Technological Integration

Modern LIS platforms integrate GIS technologies, relational databases, and user interfaces for querying and reporting. Tools such as ArcGIS and MySQL enable real-time visualization, multi-criteria querying, and secure data storage, as demonstrated in research by Kumar et al (2006) and Peters-Lidard et al (2007). These systems not only streamline land records but also support security operations and land valuation models (Joannides, 2023; Kuhail, 2021).

2.4 Case Studies and Application Models

The Thailand Land Titling Project by Angus-Leppan (1989) is a landmark case in parcel-based LIS implementation in Southeast Asia, revealing that clear land titles and digital records significantly improve

tenure security and investment. Similarly, the Port Harcourt Cadastre study by Aminigbo and Hart (2022) provides a Nigerian example of LIS use in tax administration and estate control.
Furthermore, Ibraheem and Daham (2011) illustrated the importance of combining field surveying and GIS for large-scale LIS development, a method closely aligned with the Berry Court Estate study, which relied on estate-acquired data and digitized geodatabases.

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Furthermore, Ibraheem and Daham (2011) illustrated the importance of combining field surveying and GIS for large-scale LIS development, a method closely aligned with the Berry Court Estate study, which relied on estate-acquired data and digitized geodatabases.

2.6 Gaps in Literature and Justification for This Study

While numerous studies have explored LIS in public land administration, there is limited documentation on its application in privately managed residential estates within Lagos, such as Berry Court. Most estates still rely on analog systems that are prone to error and inefficiency. This gap presents a compelling need for LIS models tailored to private estate contexts to improve operational transparency, security, and decision-making.
Thus, this study contributes to the growing body of LIS research by demonstrating a replicable and context-specific implementation of a parcel-based LIS within a Nigerian estate setting. It reinforces the role of digital geodatabases in transforming estate governance and lays the groundwork for broader digital transformation in real estate development and urban planning.

3.0 METHODOLOGY

3.1 Study Area

Berry court estate is located at Olowora Phase 2, Omole, Kosofo Local Government Area, Lagos State with a land area of approximately 35 Acres managed by a real estate firm and considering however the extent of the estate, appropriate and up-to-date geospatial-database of all the allottee, available plots and blocks is essential for decision making for the principals and management of the estate.

Figure 2: Google earth image of Study area.

3.2 Data Acquisition

Field data was collected using handheld GPS devices (Garmin eTrex 30x) to capture the coordinates of individual parcels, roads, and utility infrastructure. Additional layout plans, allocation registers, and cadastral data were obtained from the Lagos State Surveyor General's Office and the estate developer's archives.

3.3 Data Processing

The GPS-collected data and scanned estate layout plans were imported into ArcMap 10.4**.** The scanned plans were georeferenced using ground control points, and key features such as parcel boundaries, road networks, and open spaces were digitized into polygon and polyline shapefiles. The entire dataset was standardized to the Universal Transverse Mercator (UTM), Zone 31N for spatial accuracy and alignment.

3.3.1 Database Development

A relational geospatial database schema was designed in MySQL to capture the non-spatial attributes of each plot. Unique identifiers (Plot_ID) were assigned as primary keys to link each spatial object (in ArcMap) with its corresponding attribute record (in MySQL).

The database consisted of the following tables and relationships (Table 1):

Table Name	Key Fields	Relationships
Plots	plot_id (PK), block_id, size, geometry	One-to-One with Allottees
Allottees	owner_id (PK), name, gender, contact	Foreign key to Plots.plot_id
Payments	payment_id, amount, status	Foreign key to Allottees.owner_id
Title_Status	title_id, status_desc, date_issued	Linked via Plots.plot_id

Each table was normalized to reduce redundancy, and indexing was used to optimize query speed.

3.3.2 System Integration

ArcMap 10.4 was used for all spatial operations. To enable interaction between ArcMap and the MySQL database:

- The digitized shapefile was exported as a feature class and joined with external data through a .DBF file.
- A middleware connector (e.g., ODBC and MySQL OLE DB provider) was configured in ArcCatalog to establish a live connection with the MySQL tables.
- SQL queries were written directly inside ArcMap's attribute table interface and the MySQL Workbench, allowing dynamic querying, spatial filtering, and report generation.

This integration facilitated two-way data flow: ArcMap could read from and write to MySQL, ensuring that updates to ownership, payments, or title status reflected immediately on the map.

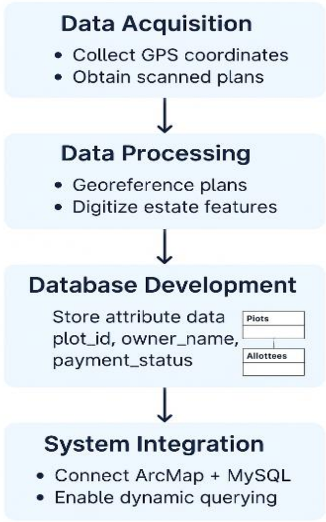

Figure 3: Workflow Diagram

3.3.3 Validation and Quality Control

Data accuracy was verified using a triangulated approach:

- Cross-checking field GPS data with scanned layout coordinates.
- Spot-checking plot IDs and ownership records with estate registers.
- Consultation meetings with stakeholders for resolving inconsistencies.

Where mismatches were found (e.g., incorrect owner names or GPS deviations >3m), manual corrections were made and version control logs maintained.

3.3.4 System Architecture and Tools Used

The LIS was built using a two-tier architecture:

- GIS Layer**:** ArcMap 10.4 for map generation, querying, and spatial analytics.
- Database Layer**:** MySQL 8.0 for structured attribute storage, SQL query handling, and relational logic.

Tools Used:

- Hardware: Dell XPS 15 (Intel Core i7, 32GB RAM)
- Software: ArcMap 10.4, MySQL 8.0, MySQL Workbench, ODBC Connector, Google Earth Pro
- Field Equipment**:** Garmin eTrex 30x GPS Receiver

4.0 RESULTS AND DISCUSSION

4.1 Results

A parcel-based Land Information System (LIS) was successfully developed for Berry Court Estate, integrating both spatial and non-spatial datasets. The system digitized plots, road networks, and estate infrastructure using ArcMap 10.4 and structured them within a relational database schema developed in MySQL. All spatial data were georeferenced to the Universal Transverse Mercator (UTM) coordinate system, ensuring spatial consistency across data layers.

4.1.1 Spatial Database Creation

A digital map of Berry Court Estate was created, comprising individual parcels and corresponding infrastructure (Figure 3). Each plot was linked to attribute information including Plot ID, Allottee Name, Contact Details, Title Status, Gender, and Payment Status (Figures 4 and 13). This setup allowed for real-time query operations and analytics using both ArcMap and MySQL platforms.

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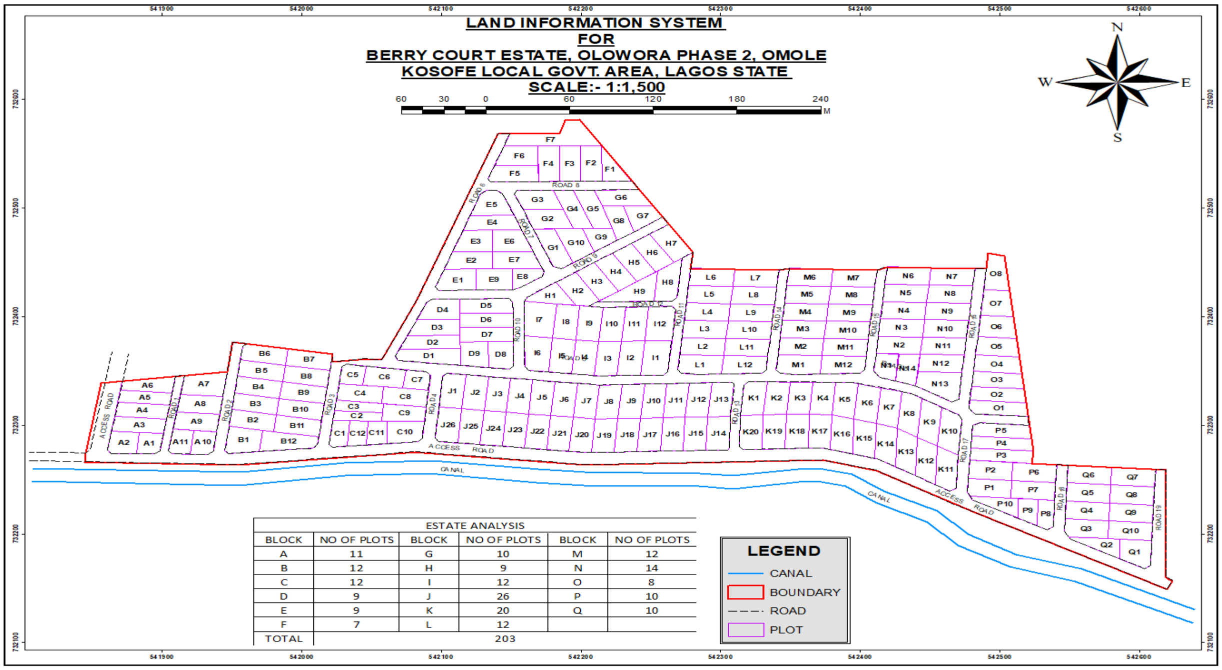

Figure 4: Map showing the spatial details within the study area. Also relational table was created to link the spatial and non-spatial components of the database.

Table

PLOT

OBJECTID *	SHAPE *	Perimeter	Area	Allottee	PLOT_ID	Block_ID	Tel_No
1	Polygon	79.392776	409.489999	MR. MUSTAPHA M.O	A2	BLK "A"	+2348190219123
2	Polygon	101.709075	501.062935	MR. IBRAHIM Q.A	A3	BLK "A"	+2348159923213
3	Polygon	71.368196	324.026454	MS. KADIJAH	A1	BLK "A"	+2348042315656
4	Polygon	101.709212	501.061672	MR. OLORUNSESAN	A4	BLK "A"	+2348180219323
5	Polygon	96.41736	403.44724	MRS. ABDULLAHI	A5	BLK "A"	+2348110233123
6	Polygon	100.203242	450.336762	MR. YUSUF IBARHIM	A6	BLK "A"	+2349190219223
7	Polygon	101.977156	610.760517	MR. HASSAN	A7	BLK "A"	+2348091329123
8	Polygon	94.488531	505.621666	MALLAM BABA MUSA	A8	BLK "A"	+2348196219214
9	Polygon	94.740326	502.547703	MR. CHIGOZE E.O	A9	BLK "A"	+2348070218123
10	Polygon	73.726223	339.090218	MR. OLALEYE A.I	A11	BLK "A"	+2349190219111
11	Polygon	75.124057	354.327625	MR. ADEOYE ALIYU	A10	BLK "A"	+2347023168683
12	Polygon	92.861693	553.571692	MR. OYELABI AKINOLA	B1	BLK "B"	+2348154219175
13	Polygon	95.799203	500.026787	MR. OYELABI AKINOLA	B2	BLK "B"	+2348154219175
14	Polygon	95.862585	501.072109	MR. AKINOLA A. AFOLABI	B3	BLK "B"	+2348190219111
15	Polygon	95.845988	500.814679	MS. ADIO KEHINDE	B4	BLK "B"	+2348166126716
16	Polygon	95.854597	500.96566	MS. KOLAPO ADENIKE	B5	BLK "B"	+2349028234968
17	Polygon	94.245322	499.640405	MS. KOLAPO ADENIKE	B6	BLK "B"	+2349028234968
18	Polygon	96.057755	504.227893	MR. ADEYEMO BLESSING	B7	BLK "B"	+2347016848570
19	Polygon	95.857851	500.99071	MRS. ADENIKE AREMU	B8	BLK "B"	+2348141971400
20	Polygon	95.825821	500.488553	MR. AKINOLA AKIN	B9	BLK "B"	+2349027184511
21	Polygon	95.869035	501.20716	MR. EZE HENRY	B10	BLK "B"	+2349032713370
22	Polygon	95.792725	499.977517	MR. EZE HENRY	B11	BLK "B"	+2349032713370
23	Polygon	111.393519	614.381846	MALLAM KUDU	B12	BLK "B"	+2349077878603
24	Polygon	71.759587	302.600184	MR. SHEHU ABUBAKAR	C1	BLK "C"	+2349158482313
25	Polygon	86.749607	302.340261	ALH. MAIWADA YAHAYA	C2	BLK "C"	+2349124184061
26	Polygon	86.109164	300.386097	ALH. M BABAGANA	C3	BLK "C"	+2348037202509
27	Polygon	95.764391	502.758533	ALH. M BABAGANA	C4	BLK "C"	+2348037202509
28	Polygon	68.2882	301.456212	ALH. M BABAGANA	C5	BLK "C"	+2348037202509
29	Polygon	92.564683	502.757268	MR. A. ADEBAYO	C6	BLK "C"	+2349025781529
30	Polygon	68.314358	301.456727	MRS. I. ZAINAB	C7	BLK "C"	+2348190219123
31	Polygon	95.605199	501.719389	MR. BASHIR MUSA	C8	BLK "C"	+2347064508993
32	Polygon	91.076816	452.501517	MR. EZE UCHE	C9	BLK "C"	+2348037202509
33	Polygon	89.771025	501.910356	MR. EZE UCHE	C10	BLK "C"	+2348190219123
34	Polygon	71.269577	303.453995	MR. HUSSAINI ADEYEMI	C11	BLK "C"	+2348190219123
35	Polygon	72.334062	303.250766	MS. ALAO ADERONKE	C12	BLK "C"	+2348190219123
48	Polygon	94.218616	515.051747	MR. ADEOYE KEHINDE	J1	BLK "J"	+2348190219123
49	Polygon	94.975825	503.80626	MR. ADEOYE KEHINDE	J2	BLK "J"	+2348190219123

37 (0 out of 203 Selected)

PLOT

Figure 5: Database created for the boundaries of plots within the Estate

4.1.2 Multi-Criteria Query Functions

To enhance decision-making, a suite of queries was developed to retrieve critical estate information. The queries enabled estate managers to make rapid assessments regarding land use status, occupancy, and security-related attributes.

Table 2 below summarizes the types of queries implemented, their logic, and their applications:

Query Function	Logic/Condition	Output/Application
Plot Allocation Status	WHERE status = 'Allocated'	Identify allocated plots for planning and compliance
Ownership Verification	WHERE plot_id = 'B2' OR owner_name LIKE '%surname%'	Resolve disputes and confirm land rights
Allottee Demographics (Gender)	WHERE gender = 'Male' OR gender = 'Female'	Monitor diversity and plan estate services accordingly
Title Status Tracking	WHERE title_status = 'C of O' OR title_status IS NULL	Support legal validation and documentation processes
Payment Status	WHERE payment_status = 'Paid in Full'	Facilitate revenue tracking and sanction defaulters
Security Risk Flags	WHERE contact_number IS NULL OR owner_name IS NULL	Identify plots with incomplete data, raising red flags for security
Block-Specific Analysis	WHERE block_id = 'A' OR block_id = 'B'	Support phased development and access control
Mobile Search	WHERE contact_number = '080...'	Useful for identity confirmation and emergency contact retrieval

These queries are not merely data filters; they empower estate decision-makers to generate targeted reports, monitor payment performance, and assess demographic composition for better service delivery and security planning.

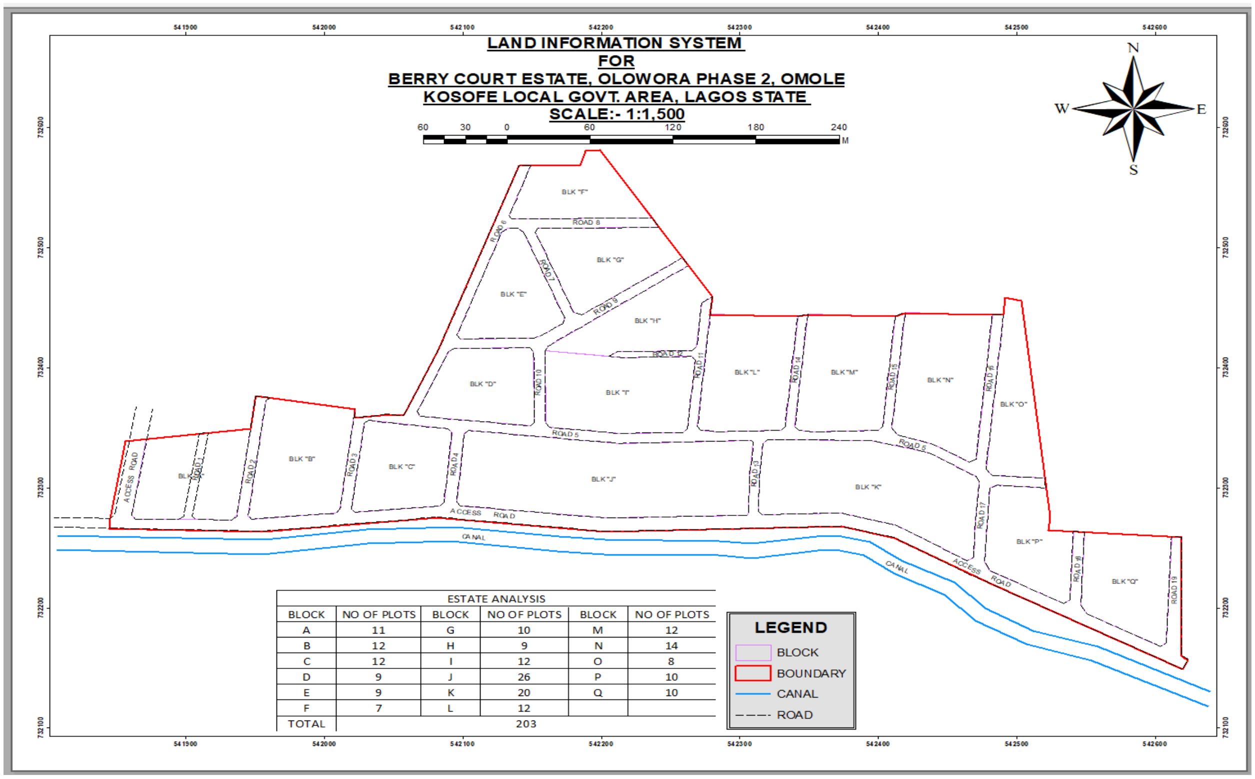

Figure 6: Screen-shot showing results of blocks with Blocks ID

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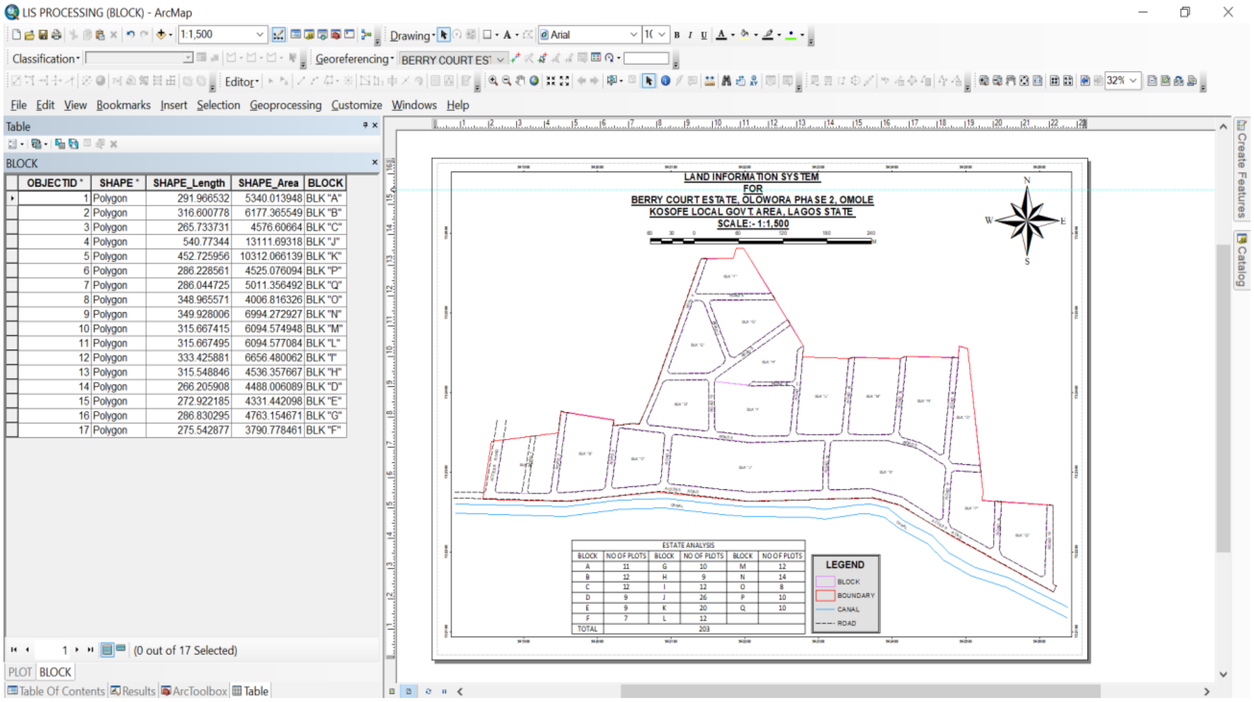

Figure 7: Screen-shot showing results of blocks with blocks ID, size and shapes

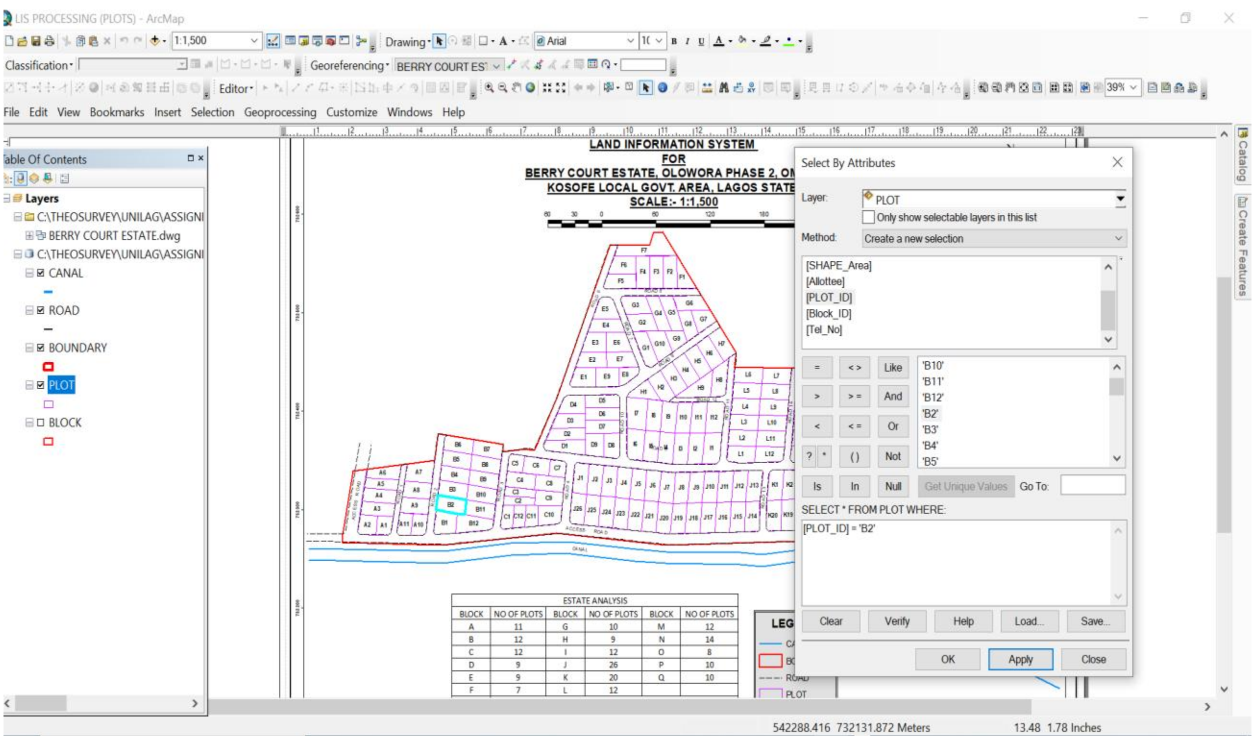

Figure 8: Query of Plot B2 on ArcMap

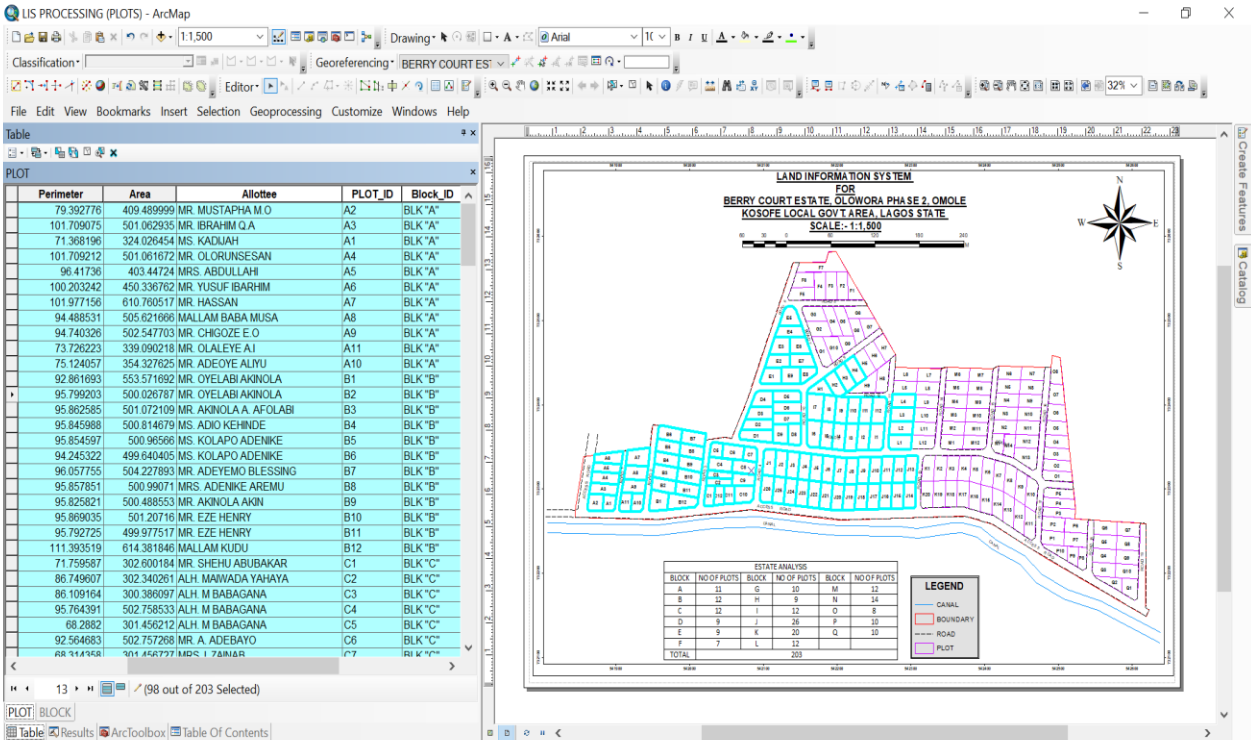

Figure 9: Query of Plots allocated with full payment within Berry Court Estate on ArcMap

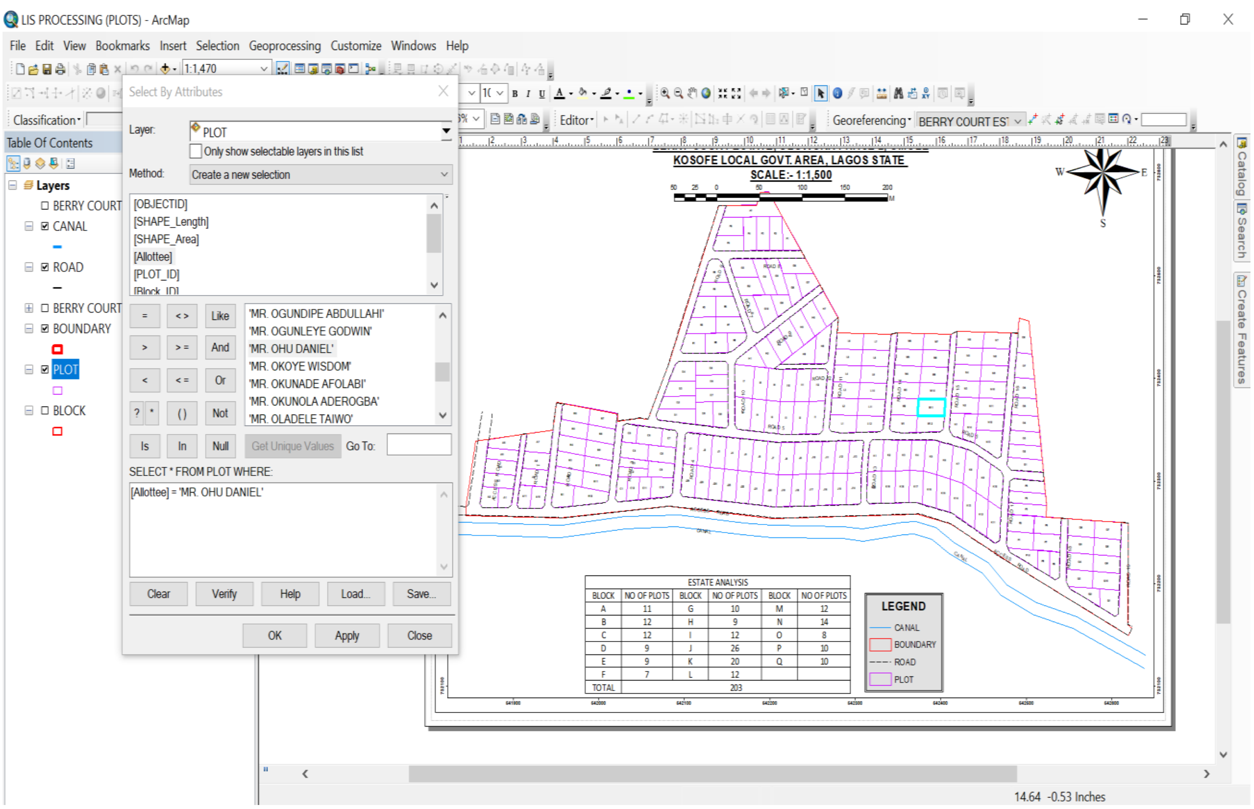

Figure 10: Query of Allotte Name from Berry Court Estate Database on ArcMap

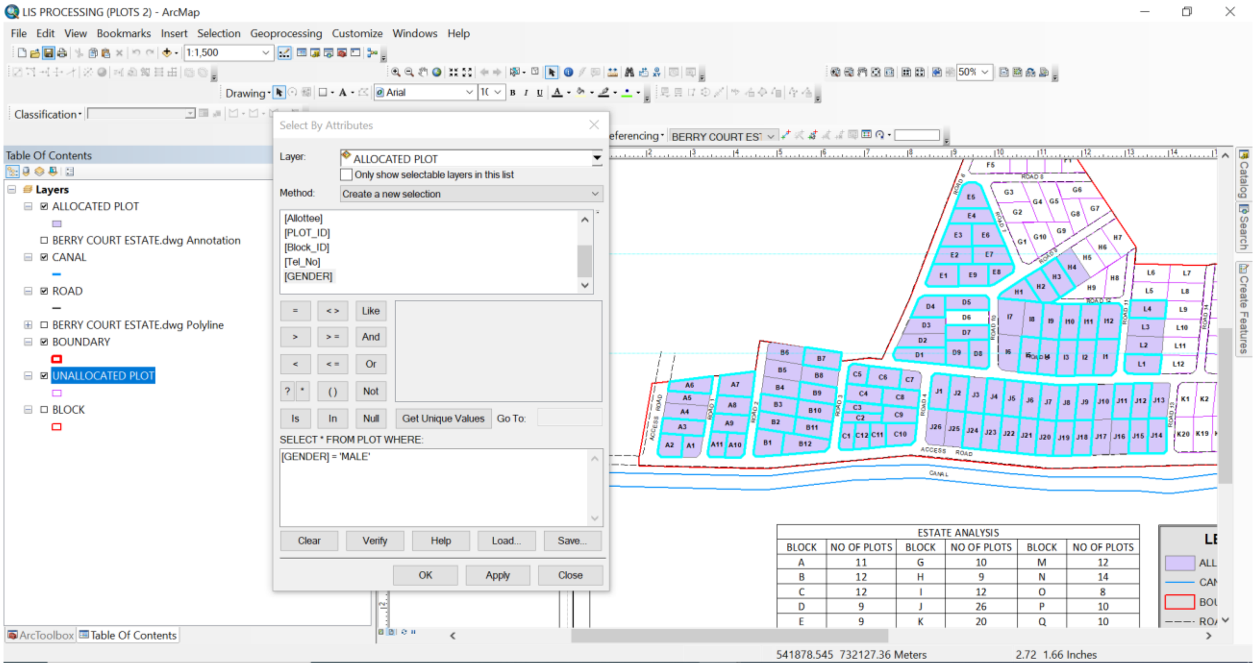

Figure 11: Query for Male Allotties within Berry Court Estate on ArcMap

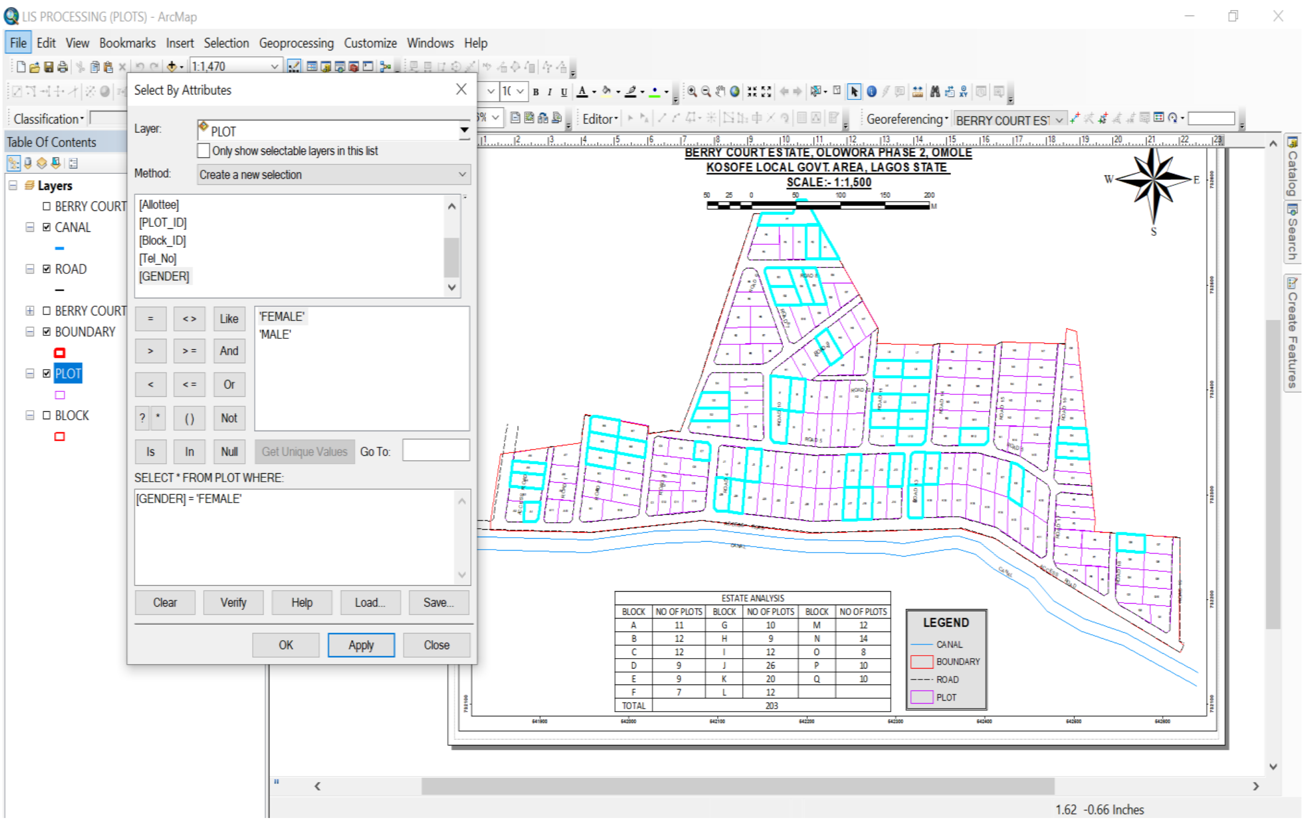

Figure 12: Query for Female Allotties within Berry Court Estate on ArcMap

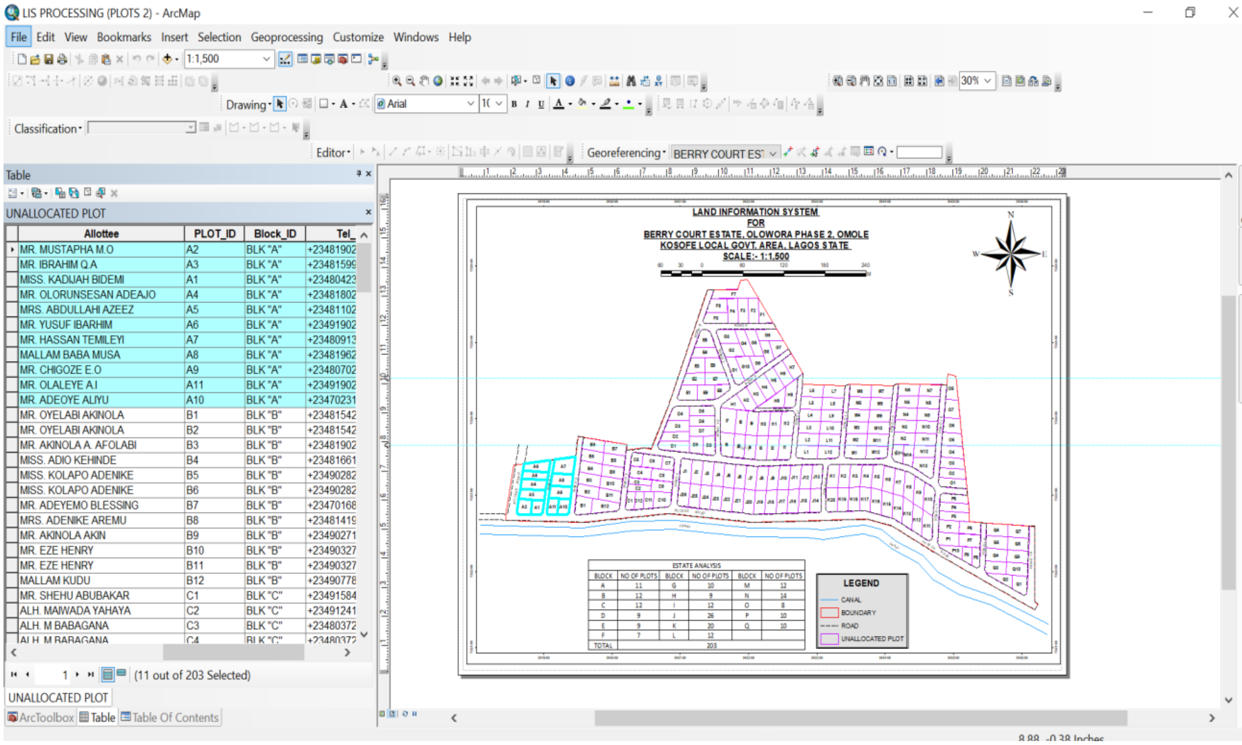

Figure 13: Query for Plots on Block ‘A’ within Berry Court Estate on ArcMap

4.1.3 Complex Query Logic: Security & Planning

For more advanced use cases, particularly security tracking, compound queries were created to identify plots with missing ownership or contact details. For example:

```
SELECT * FROM Allottees

WHERE contact_number IS NULL

  OR owner_name IS NULL

  OR payment_status != 'Paid in Full';
```

This logic allows estate management to flag plots potentially linked to fraudulent transactions, delayed registration, or non-compliant occupants—thus supporting proactive risk mitigation.

Similarly, block-level spatial distribution queries help in development sequencing and infrastructure prioritization**,** e.g.:

```
SELECT COUNT(plot_id), block_id

FROM Plots

GROUP BY block_id

ORDER BY COUNT(plot_id) DESC;
```

This query guides the estate developers in identifying areas of high occupancy and infrastructure demand.

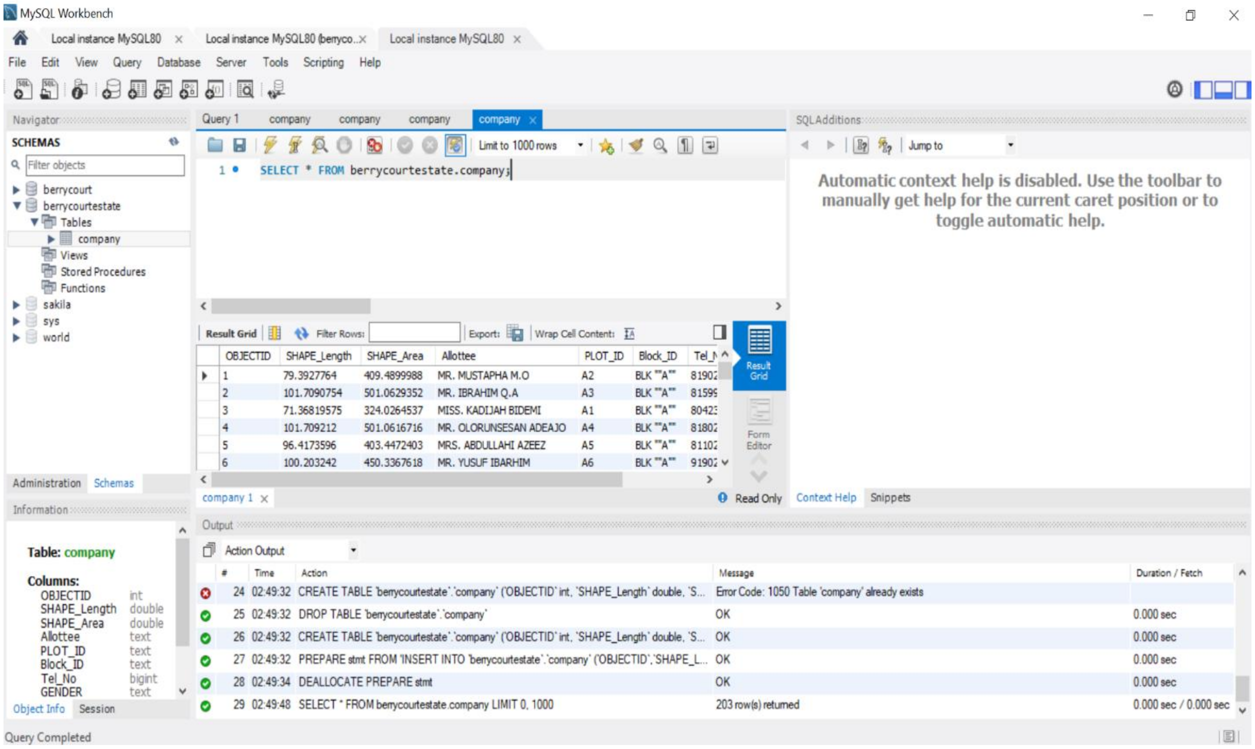

Figure 14: Database creation for Berry Court Estate on MySQL

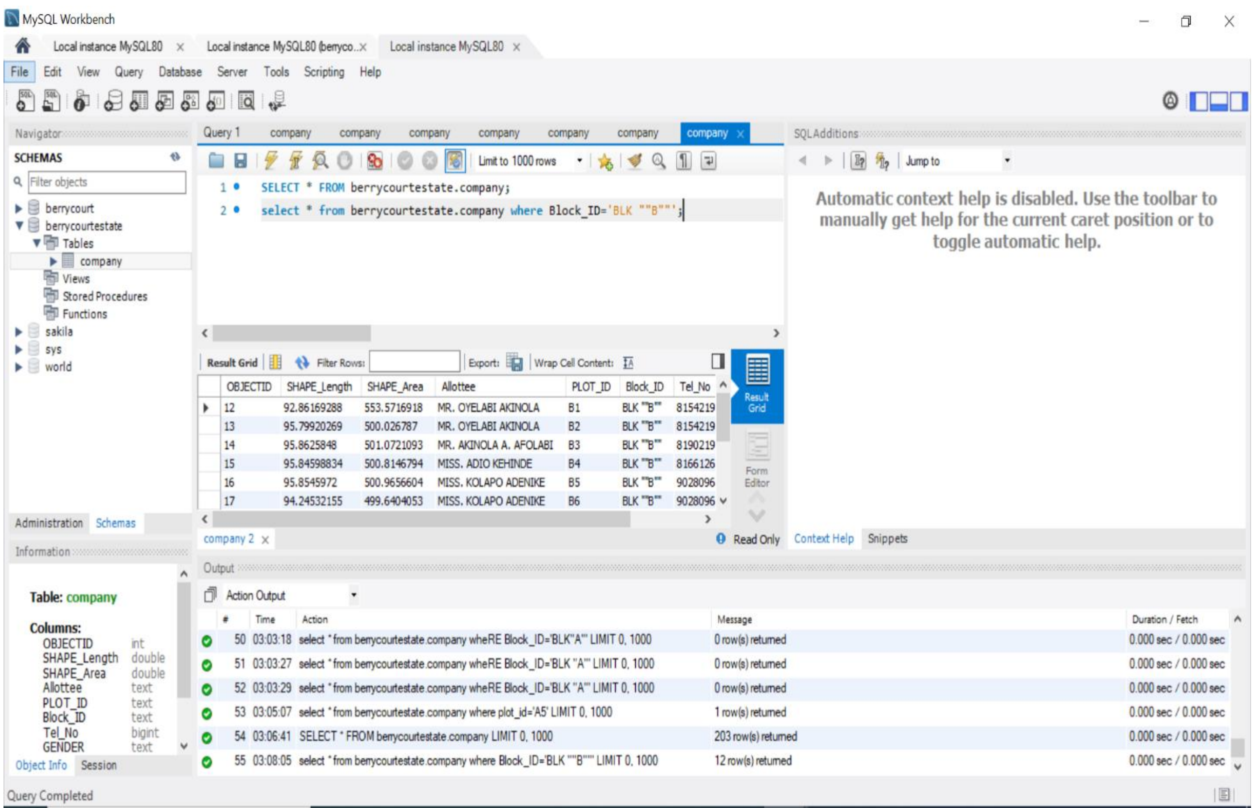

Figure 15: Query for Plots within Block ‘B’ within Berry Court Estate on MySQL

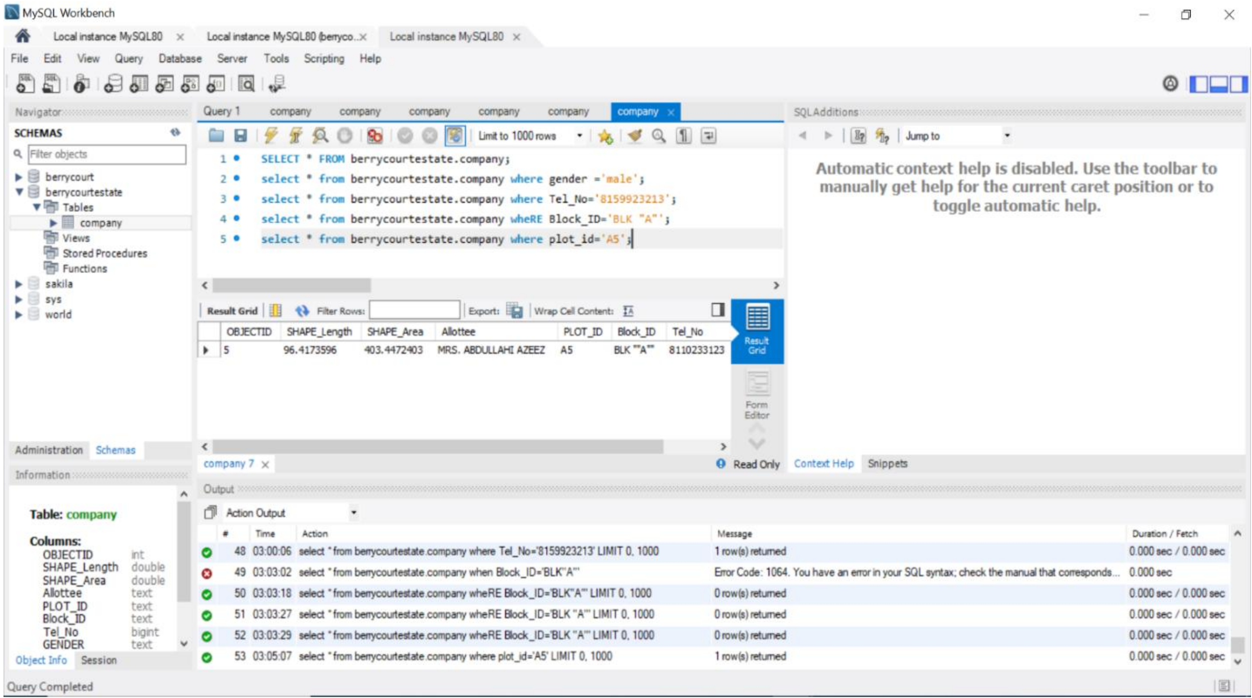

Figure 16: Query for Male Allotties within within Berry Court Estate on MySQL

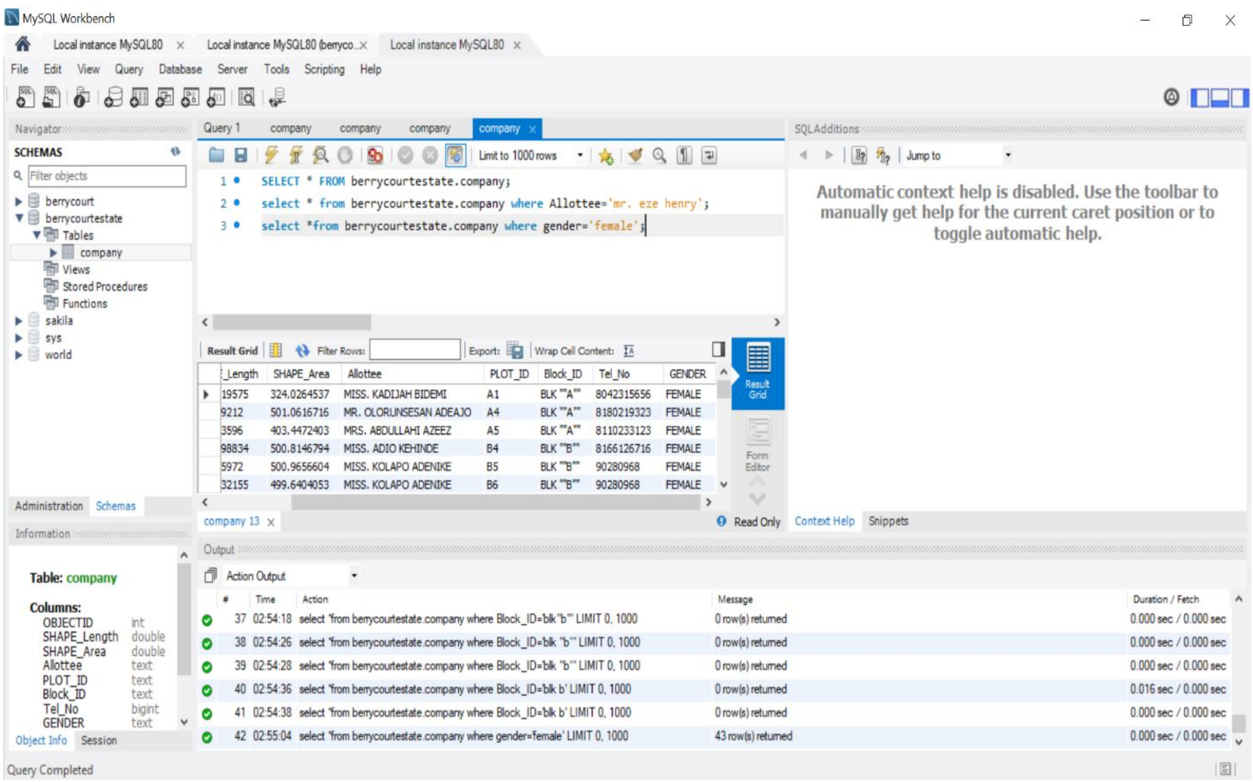

Figure 17: Query for Female Allotties within Berry Court Estate on MySQL

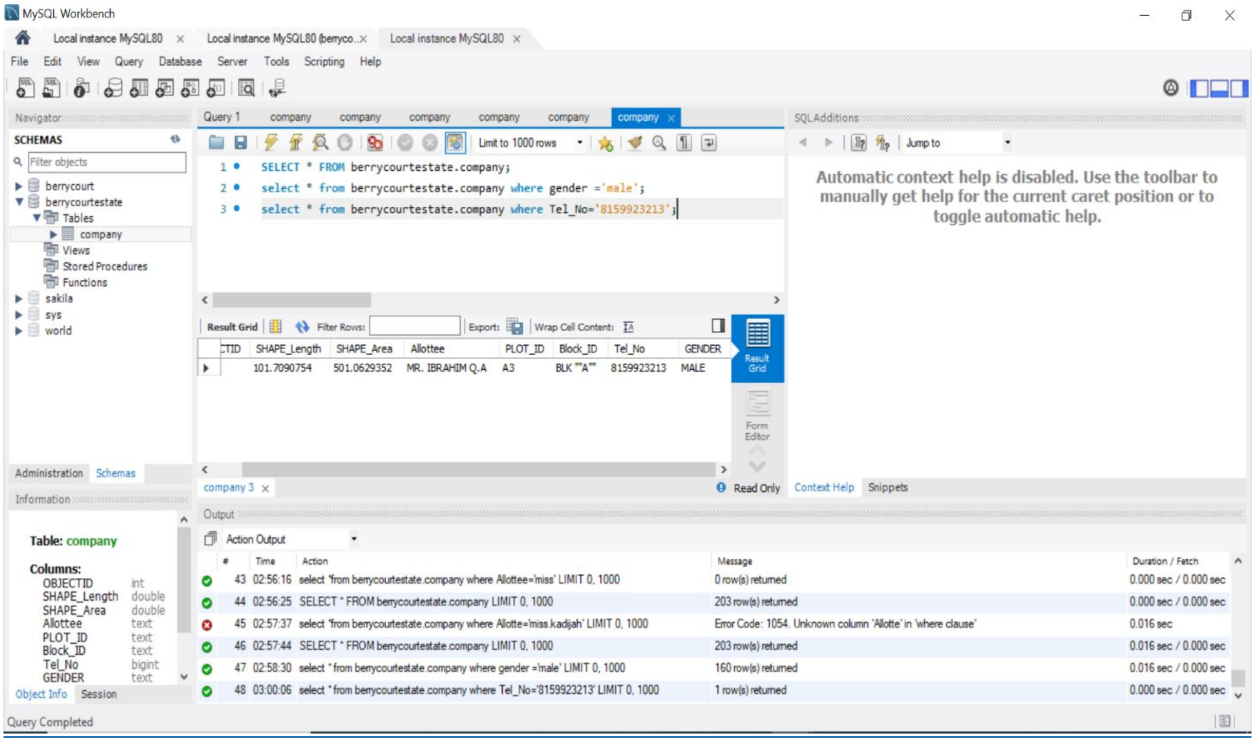

Figure 18: Query using Telephone Number of Allotte within Berry Court Estate on MySQL

4.1.4 Accuracy Validation and Data Reconciliation

Accuracy of spatial and attribute data was verified through a triangulated approach involving field observations, GPS readings, and official layout records. Discrepancies were identified in the following areas:

- Boundary misalignments between field GPS readings and estate layout maps (affecting ~15% of plots).
- Incorrect or duplicate plot IDs, especially where manual records were poorly maintained.
- Unmatched allottee details**,** e.g., inconsistent spellings, missing contact numbers, or unverified ownership documents.

The magnitude of discrepancies ranged from minor spatial offsets (1.5m–3.0m) to critical ownership mismatches. These were resolved through:

- Cross-validation with the Surveyor General's cadastral sheets**.**
- Physical reconfirmation using handheld GPS.
- Stakeholder consultation meetings involving estate managers, surveyors, and affected allottees.

One notable challenge was stakeholder resistance to data correction where historical records conflicted with official layouts. Continuous stakeholder engagement and documentation of reconciliation steps were necessary to build consensus and ensure transparency.

4.2 Discussion

The implementation of a Land Information System (LIS) for Berry Court Estate offers empirical evidence of how integrating geospatial and attribute data significantly improves estate management efficiency, transparency, and security. The system's design, anchored on ArcMap 10.4 for GIS operations and MySQL for relational database management, enabled the digitization of 100% of plots and infrastructure with real-time data accessibility. This integration affirms the claims of Kumar et al (2006) and Peters-Lidard et al (2007), who advocate for interoperable GIS-database systems as a pathway to enhanced land data governance.

4.2.1 Efficiency Gains and Performance Metrics

Quantitative observations show that information retrieval, such as ownership verification or payment status, was up to 90% faster using the LIS compared to the previous manual system, which relied on paper records and verbal confirmations. Average query response time for most database operations (plot ID search, demographic filters, and block summaries) was under 2.5 seconds, even with a dataset of over 200 plots and corresponding attributes. This responsiveness makes it possible to generate reports or take administrative action in near real-time, a feature unavailable in analog systems.

Scalability was assessed by simulating incremental data loads. The system maintained consistent performance with up to 500 plot entries and 50 concurrent queries, showing potential for upscaling to larger residential developments. However, beyond this threshold, loading times increased marginally, suggesting that future versions may require migration to a cloud-based or enterprise-level GIS infrastructure, as recommended by Kuhail (2021) and Joannides (2023).

4.2.2 Cost-Benefit and Scalability Considerations

Compared to manual systems, which require dedicated staff to manage paper files, perform searches, and handle allocation disputes, the LIS implementation reduced administrative workload by an estimated 40–50%**.** Furthermore, tasks such as generating plot reports or demographic summaries that previously took 1–2 hours could now be completed in under 5 minutes**.**

A simple cost-benefit evaluation shows that the LIS, developed using existing hardware and open-source database software (MySQL), offers a low-cost digital alternative**.** While ArcMap 10.4 is a licensed product, comparable functionalities could be achieved using open-source GIS platforms (e.g., QGIS) for wider adoption. Thus, the system is cost-effective not only in long-term operational savings but also in reducing human error and data redundancy.

4.2.3 Data Integrity and Reconciliation

Accuracy verification revealed three major discrepancy types**:**

- Geospatial Misalignments – GPS-derived parcel coordinates deviated by 1.5–3.0 meters from legacy layout plans.
- Inconsistent Allottee Information – Names, phone numbers, or status were missing or duplicated in 12% of entries.
- Non-matching Plot IDs – Differences between field data and paper-based records, affecting 8% of total plots.

Resolution involved triangulating data from field GPS, scanned layouts, and stakeholder input. Reconciliation challenges included resistance from some allottees whose documents conflicted with geospatial data. This experience aligns with Moinin (1997) and Nahrin and Rahman (2009), who identified institutional resistance and fragmented records as persistent barriers in LIS implementation. To ensure ongoing data accuracy, a protocol was developed involving quarterly field audits, stakeholder update sessions, and internal data validation routines.

4.2.4 Data Security, Privacy, and User Training

Although the LIS improved operational transparency, it introduced new security concerns**,** especially regarding the storage of personal allottee data. The MySQL database is hosted locally, which, while limiting exposure to external threats, increases vulnerability to internal access breaches. At present, no encryption protocols or user authentication layers were implemented, highlighting the need for future integration of access control and secure logins to meet best practices in data privacy (see Joannides (2023)).

Additionally, user training emerged as a critical component for successful adoption. Estate personnel, most of whom lacked GIS experience, required structured onboarding to interpret spatial maps, run queries, and update records. A basic training module was delivered, covering key functions such as plot querying, record editing, and error reporting. However, for long-term use and wider implementation, the absence of a customized user interface (UI) remains a limitation. As the system relies entirely on ArcMap and MySQL, estate managers without GIS skills may find it difficult to operate independently.

Future improvements should include the development of a simplified, browser-based UI tailored to non-technical users, as suggested by Furuholt et al (2015) and Ibraheem and Daham (2011). This would decouple the reliance on desktop GIS platforms and make the system more accessible to administrative staff and mobile field officers.

4.2.5 Limitations, Broader Applicability, and Comparative Analysis

4.2.5.1 Limitations

While the LIS implementation for Berry Court Estate demonstrated strong operational benefits, several limitations constrain its full potential. Firstly, system scalability remains an issue; as data volume approached 500 entries and concurrent queries increased, performance began to degrade, signaling a need for migration to enterprise GIS or cloud-based servers to support larger estates. Secondly, system downtime risks were not evaluated in this pilot. Since the MySQL database and GIS platform are hosted on a standalone local system, interruptions due to hardware failure or power outages could severely affect data availability.

Additionally, the absence of encryption and multi-user authentication poses data security vulnerabilities, especially with sensitive personal information being stored. While the system is locally contained, lack of access control means unauthorized internal access remains a critical risk, as also noted in Joannides (2023).

4.2.5.2 Quantified Impact

Based on administrative logs and stakeholder interviews, plot verification tasks that previously took 1–2 hours using paper-based systems were reduced to under 5 minutes with LIS implementation, indicating a 90% reduction in time**.** Administrative workload (including file retrieval, allocation tracking, and payment verification) was cut by an estimated 40–50%**,** freeing staff to focus on more strategic functions. Furthermore, error rates in recordkeeping dropped from 12% (manual) to under 3% after digital reconciliation.

4.2.5.3 Comparative Analysis

Compared to earlier implementations such as the Global Land Tool Network (GLTN) and Thailand Land Titling Project (Augus - Leppan, 1989), the Berry Court LIS is more estate-specific, emphasizing operational queries over legal land titling**.** While GLTN focuses on land tenure security through pro-poor tools in public land systems, this study emphasizes estate-level administration, security, and payment tracking**.** However, both approaches share goals of transparency, conflict reduction, and data centralization.

4.2.5.4 Broader Applicability

Though the system was piloted within a private residential estate, its architecture and methodology are not exclusive to such settings. Public land agencies in Nigeria can adapt this parcel-based LIS model**,** using open-source GIS like QGIS and scalable cloud databases**,** to digitize urban layouts, cadastral boundaries, and property records at local government or state levels. However, for national adoption, considerations around legal integration, interoperability with Surveyor-General data, and institutional capacity must be addressed. Tools like the National Geospatial Data Infrastructure (NGDI) and Nigeria Land Administration System (NLAS) could serve as foundational layers for integration.

Ultimately, the LIS model demonstrated here is scalable**,** adaptable, and suitable for both private and public land management, especially if supported by institutional frameworks, stakeholder training, and regulatory data governance protocols.

5.0 CONCLUSION

This study demonstrated the practical and operational value of implementing a parcel-based Land Information System (LIS) within Berry Court Estate, Olowora Phase 2, Lagos. By integrating spatial datasets from field surveys and scanned layouts with attribute data in a MySQL relational database, the project produced a functional, query-enabled GIS platform for effective estate governance. The resulting system significantly enhanced spatial accuracy, data accessibility, and administrative transparency, presenting a marked improvement over traditional manual land record systems.

The LIS demonstrated efficiency in key management functions, including ownership verification, security enhancement, land valuation, and operational analytics. These outcomes support earlier research by Furuholt et al (2015) and Abbas et al (2014), affirming LIS as a tool for improving estate-level decision-making and minimizing disputes. The system's ability to execute multi-criteria queries, such as tracking allottee demographics, verifying plot payments, and filtering land title status, exemplifies the utility of digital geospatial systems in supporting data-driven estate administration.

Nevertheless, the study identified challenges related to discrepancies between field data and official cadastral records. These discrepancies underscore the necessity for continuous data validation protocols and inter-agency collaboration, aligning with the recommendations of Nahrin and Rahman (2009) on ensuring long-term data integrity in LIS environments.

Ultimately, the LIS model developed here presents a scalable, context-sensitive framework that can be adapted by other privately managed estates across Nigeria's urban landscape. Future enhancements should prioritize mobile GIS integration, user-friendly web interfaces, and secure cloud-based access for real-time updates and broader stakeholder participation. Furthermore, aligning such estate-level LIS platforms with national digital land registries and cadastral systems will significantly strengthen the architecture of land administration in Nigeria, promoting transparency, security, and sustainable development on a national scale.

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