A PROJECT REPORT

ON

TOPOGRAPHIC SURVEY OF GOVERNMENT GIRLS DAY SECONDARY SCHOOL, PAKATA, ILORIN WEST LGA, KWARA STATE.

BY

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HND/23/SGI/FT/0035

SUBMMITED TO:

THE DEPARTMENT OF SURVEYING AND GEO-INFORMATICS, INSTITUTE OF ENVIRONMENTAL STUDIES, KWARA STATE POLYTECHNIC ILORIN.

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF HIGHER NATIONAL DIPLOMA IN SURVEYING AND GEO-INFORMATICS.

JUNE, 2025

CERTIFICATE

I hereby certified that the information given in this project was obtained as a result of the observation and measurement made by me and that the survey was carried out in accordance with survey laws, regulations and departmental instructions

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FANIWA ELIZABETH BRIGHT
Matric. No: HND/23/SGI/FT/0035

CERTIFICATION

This is to certify that this project was carried out by FANIWA ELIZABETH BRIGHT with Matric No.: HND/23/SGI/FT/0035 under my instruction and supervision for the award of Higher National Diploma in Surveying and Geo-informatics, Kwara State Polytechnic, Ilorin, Kwara State Nigeria. I hereby declared that she has conducted herself with due diligence and honesty on the said duties.

………………………………… ………………………………

SURV.A. AYUBA DATE

(Project Supervisor)

………………………………. …………………………

SURV. R.S. AWOLEYE DATE

(Project Coordinator)

……………………………… ………………………………

A.I ISAU DATE

Head of Department (H.O.D)
Surveying & Geo-informatics

……………………………….. ……………………………..

EXTERNAL EXAMINER *DATE*

DEDICATION

This project is dedicated to Almighty GOD, the author and the finisher of everything who gave me the grace and privilege to attain this stage in my education pursuit.

ACKWOLEDGEMENT

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

My sincere gratitude goes to my Head of Department (HOD); A.I ISAU and my Supervisor; SURV.A. AYUBA for their support towards the success of this project, I really appreciate you sir.

To all the lecturers in the department of Surveying and Geo-informatics; Abimbola I. Isau, Surv. A. Ayuba, Surv. R.S. Awoleye, Surv. A.G. Aremu, Surv. B.F Diran, Surv. Wlliams Kazeem, Surv. Kabir Babatunde, Surv. R.O. Asonibare who has imparted their knowledge in me in one area or the other during my year of study, I am grateful for the effort and support. May Almighty GOD bless you all (Amen).

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

My most appreciation goes to my family members for their love and support; Mrs C.O Adedoyin and my caring guidance; Mr. and Mrs. Ogundele for your spiritual and financial support shown to me and also I want to appreciate Miss Moses Oluwatosin, Miss Faniwa Omolade, Miss Olorunshola Seyi, Miss Deborah Adedoyin, and to my friends and loved once; Mr. Matthew Emmanuel Abiodun, Miss Jimoh Gloria Oluwaseun, Mrs Kolawole Oluwatimilehin, Ajayi Oluwafemi, thanks for your words of encouragement and support towards the success of my HND programme in school. I pray may you eat the fruit of your labour we shall all be celebrated and may your heart desires be granted. I love you all.

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ABSTRACT

This project developed a detailed Topographic Information System (TIS) for a section of Government Girls' Day Secondary School, Pakata, Ilorin West Local Government Area, Kwara State, Nigeria. Recognizing the critical need for accurate spatial data to support effective land use planning, infrastructure development, and environmental management in this rapidly urbanizing area, the study employed field surveys using GPS technology and Total Station (TS). Key topographic features, including elevation points, contours, slopes, drainage patterns, and significant man-made structures, were meticulously captured and integrated. The processed data was used to generate essential digital products, including a high-resolution Digital Elevation Model (DEM), detailed contour maps, slope classification maps, and a comprehensive topographic map of the study area. These outputs were systematically organized and managed within a Geographic Information System (GIS) environment, creating a robust spatial database. The resulting Topographic Information System provides a vital geospatial framework. It offers planners, engineers, environmental scientists, and local government authorities precise and readily accessible information on the terrain characteristics of Government Girl's Day Secondary School. This system is fundamental for informed decision-making in site suitability analysis, flood risk assessment, road network planning, construction projects, and sustainable land management within the studied locality.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Surveying is a profession with many definitions as applied to it over the years, changing even as the duties of surveyor has been dynamic over the years. Some years back, surveying was defined as the science and art of making reliable measurements of the relief position of features above or beneath the datum and plotting of these measurements to some suitable scale to form a map, plan, or chart (***Brinker***).

In recent times, the millennium definition of surveying is given as a mathematical science which deals with making measurements of relative position of the earth features and presentation of this information either graphically or numerically (***U.S Geological Survey 2008***) surveying has played a major role in engineering projects, the immediate physical environment of the nation. Surveying is the first process which is usually carried out before any physical development is done on the ground.

Surveying is generally considered as the bedrock of very environment development. It plays a very important role in every aspect of the human life because various activities of other profession are based usually on the laid down foundation of the surveyor. In all the aspect environment development, surveying is usually the first to provide the basic information for better decision making and probably the last for integrity checking of the executed environmental projects.

Surveying may be define as the art and science of making reliable measurement to various points on the earth surface such that when drawn to scale, both natural and artificial features are well delineated on a map/plan in their true relationship.

Surveying is regarded as the bedrock of all development as it performs a very significant role in environmental development either before the commencement or during process of development. A good topographical map is required in the planning and construction of roads, sewage, dams, buildings, citing railroads, pipelines, electricity, and other similar engineering works.

Topographic surveying is the science and art of carrying out measurement of both natural and artificial features of the surface of the earth and production of maps and plans to show their relative positions both horizontally and vertically.

The volume and form of this information had satisfied the user community till the end of 1970s. With advancement in graphical data processing technology and rapid progress of sophisticated information system, it became clear at the beginning of the 1980s that the analogue information did not always meet the demands of many public and private users. Digital information continues to become more and more desirable. With the introduction of digital techniques in surveying, graphic information can be displayed and updating of information can be made easily.

Over the years the production of topographical map has not being easy since the few types of equipment available then were analogue types. With the high demands on data and information, the capabilities for data collection, processing, and expanding needs of information by users has brought about the introduction of digital equipment's e.g. Total station, GPS, etc.to ease the process of data acquisitions, data processing and production of maps and plans in digital format especially topographical maps.

The production of Topographical Map of Government Girls Day Secondary School, Pakata, Ilorin, Kwara State will facilitate good and conducive planning for future development such as Irrigation Farming, adequate infrastructure development and maximization of other potentials of the area. The size of the plot is approximately 5.746 hectares and is located at Pakata, Ilorin, kwara-State. Connection to controls was made, the boundary corners were defined by the boundary beacons. Total Station with its accessories was the instrument adopted. All the spot elevations were also captured.

The data acquired in this project will also serve as a database for any further processing to facilitate or developing any type of information system that can be design to solve specific problem as a decision making tools.

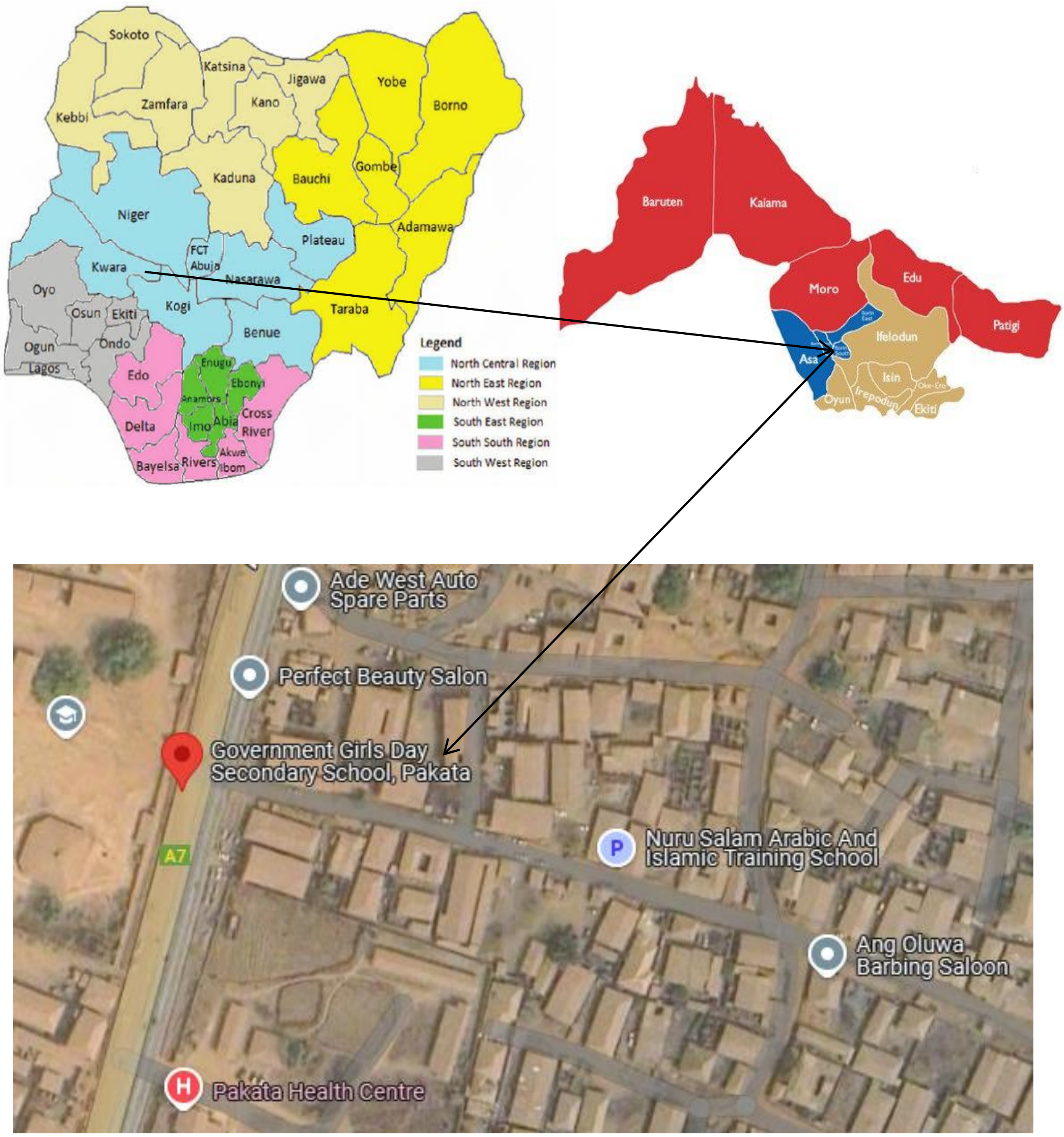
1.2 DATE OF THE PROJECT EXECUTION

The field work aspect of the project was executed and completed within 2days from the 21st of Febuary to the 22nd of February, 2025.

1.3 SITE LOCATION

The project site was Government Girls Day Secondary School, Pakata Ilorin Kwara State. It lies approximately within latitude 8.5013°N and longitude 4.5163°E.

Fig 1.1: Maps showing the study area.



1.4 SIZE OF THE PROJECT

The total area covered by the project is 5.746 hectares.

1.5 ORDER OF THE PROJECT

The project is a third order job accuracy.

1.6 AIM AND OBJECTIVE OF THE PROJECT

The aim was to carry out topographic survey of Government Girls Day Secondary School, Pakata, Ilorin, Kwara State,by producing an up to date topographic map for the planning and designing of engineering and architectural works on the property. While the objectives are:

- ❖ To carry out planning and reconnaissance survey.
- ❖ To carry out instrument test and in-situ check of controls.
- ❖ To acquire geometry and attribute data on the perimeter boundary to confirm project location.
- ❖ To carry out spot heighten and fixing of details like, roads, tress, building etc.
- ❖ To carry out data processing.
- ❖ To produce an up to date topographical plan of the site.

1.7 SCOPES OF THE PROJECT

The scope of the project includes:

- ❖ Reconnaissance
- ❖ Connection survey
- ❖ Spot elevation acquisition
- ❖ Data processing

- Analysis of data
- Plotting and plan production
- Comprehensive report writing.

1.8 SPECIFICATION OF THE PROJECT

The specifications for the project were in accordance with survey rules and regulation and departmental instructions. However, these requirements were strictly guided by the Specifications for Large Scale Cadastral and Engineering Surveys in Nigeria. The department specifications were as follows: -

- Provision of Spot heights to depict the nature of the terrain.
- Production of Contour plan at 0.5m contour interval.
- Production of topographical plan.
- Production of perimeter and detail plan to depict the features of the project site
- The final co-ordinates of the boundary.
- Technical report writing.

1.9 PERSONNEL

The following persons were involved in the supervision and execution of the project: -

Table 1.1: Table showing the personnel

S/N	NAMES	MATRIC NUMBER	ROLE PLAYED
1.	Surv. Abdulsallam Ayuba		Supervisor
2.	Faniwa Elizabeth Bright	HND/23/SGI/FT/0035	Author
3.	Ojutalayo Praise Timileyin	HND/23/SGI/FT/0036	Group leader/Member
4.	Smart Opeyemi Ewaoluwa	HND/23/SGI/FT/0037	Member
5.	Agbeni Oluwatoyin Ameenat	HND/23/SGI/FT/0008	Member
6.	Ahmmed Qudus Opeyemi	HND/23/SGI/FT/0040	Member
7.	Abdulwaheed Lawal Olanrewanju	HND/23/SGI/FT/0039	Member

As a group, I participated in all planning, field observations, processing of all field records, management and ensuring of safety of both personnel and equipment. All was done under my supervisor's guidance and supervision.

CHAPTER TWO

2.0 LITERATURE REVIEW

Surveying, which has recently also been interchangeably called “geomatics” has traditionally been defined as the science, art and technology of determining the relative positions of points above, on, or beneath the Earth’s surface, or of establishing such points. In a more general sense, however, surveying can be regarded as that discipline which encompasses all methods for measuring and collecting information about the physical earth and our environment, processing that information, and disseminating a variety of resulting products to a wide range of clients. Surveying has been important since the beginning of civilization. Its earliest applications were in measuring and marking boundaries of property ownership. Throughout the years, its importance has steadily increased with the growing demand for a variety of maps and other spatially related types of information and the expanding need for establishing accurate line and grade to guide construction operations.(***Charles and Paul, 2012***)

Geomatics is a relatively new term that is now commonly being applied to encompass the areas of practice formerly identified as surveying.

The name has gained widespread acceptance in the United States, as well as in other English-speaking countries of the world, especially in Canada, the United Kingdom, and Australia. In the United States, the Surveying Engineering Division of The American Society of Civil Engineers changed its name to the Geomatics Division. Many college and university programs in the United States that were formerly identified as “Surveying” or “Surveying Engineering” are now called “Geomatics” or “Geomatics Engineering.”(***Charles and Paul, 2012***)

The principal reason cited for making the name change is that the manner and scope of practice in surveying have changed dramatically in recent years. This has occurred in part because of recent technological developments that have provided surveyors with new tools for measuring and/or collecting information, for computing, and for displaying and disseminating information. It has also been driven by increasing concerns about the environment locally, regionally, and globally, which have greatly exacerbated efforts in monitoring, managing, and regulating the use of our land, water, air, and other natural resources. These circumstances, and others, have brought about a vast increase in demands for new spatially related information. (***Charles and Paul, 2012***).

Surveying is a mathematical science used to determine and delineate the form, extent, and position of features on or beneath the surface of the earth for control purposes—that is, for aligning land and construction boundaries, and for providing checks of construction dimensions. (***Wikipedia, 2012***).

Surveying helps to determine accurately the terrestrial or three-dimensional space position of points and the distances and angles between them using various kind of surveying instruments. Instruments such as:- theodolite, total station, G.P.S, level instrument in various combinations, tape, etc.

Land surveying may be required for geographical, agricultural, geological, mineral, ecological, construction, land ownership or other purposes. More so, the end-product of land survey is a drawn plan, although survey information can be done in digital form. Surveying method of determining accurately points and lines of direction (bearings) on the earth's surface and preparing from them maps or plans. Boundaries, areas, elevations, construction lines, and geographical and artificial features are determined by the measurement of horizontal and vertical distances and angles and by computations based on geometry and trigonometry. (***Wikipedia, 2012***).

Surveying is typically used to locate and measure property lines; lay out buildings, bridges, channels, highways, sewers and pipelines for construction; to locate stations for launching and tracking satellites; and to obtain topographical information for mapping and charting. Before plans and estimates are prepared, boundaries should be determined and the topography of the site should be ascertained. After plans are made, the structures must be staked out on the ground. As the work progresses, lines and grades must be given (***Encyclopedia free dictionary, 2013***).

For any engineering project topographic survey is a must, whether it is laying a railway or highway or design of irrigation or drainage system, the topographical features of the place must be known so that correct engineering decisions may be taken. This brought about topographical surveying. Topographical surveying is the type of surveying done to produce a topographical map showing elevations, natural and artificial features and forms of the earth's surface. It is drawn from field survey data or aerial photographs. (***S.K Roy, 2008***)

Topographical surveying as a three-dimension, they employ the techniques of plane surveying and other special techniques to establish both horizontal and vertical control. The relief or configuration of the terrain and the natural or artificial features are located by measurement and depicted on a flat sheet to form a topographical map. Contour lines, connecting points of the same elevation, are used to portray elevations at any one of various intervals measured in meters or feet. (**Microsoft Encarta 2009**)

Topography specifically involves the recording of relief or terrain, the three-dimensional quality of the surface, and the identification of specific landforms. This is also known as geomorphometry. In modern usage, this involves generation of elevation data in electronic form.

It is often considered to include the graphic representation of the landform on a map by a variety of techniques, including contour lines, hypsometric tints, and relief shading. (***Wikipedia 2008***).

A topographic map is used to depict terrain relief showing ground elevation, usually through either contour lines or spot elevations. The map represents the horizontal and vertical positions of the features represented. The scale of the topographic survey will conform to the needs of the client. A smaller contour interval will result in more field measurements and higher cost. (***Nationwide Surveying, 2013***).

The end-product of a topographical survey is the production of either a topographical map or plan. There are no clear distinctions between a topographical map and plan, but it is generally accepted that in a plan, details are drawn such that it is true to scale, while in a map many features have to be represented by symbols, the scale being small, hence, details are generalized. Elevation information can be added either as spot heights, which are individual height of points, or as contours, which gives less detail but more features representation of the area. Frequently spot heights only are shown on plans.

Plans tend to be used for engineering design and administration purposes only, but maps have a variety of uses such as: - navigational, recreational, geographical, geological, military, exploration their scale ranging from 1:25000 to 1:1,000,000.

Field work in Topographical surveying consists of three aspects. These are: Establishing horizontal and vertical control points, Locating the contour, Locating the details such as rivers, lakes, valleys etc. (***B.C Punmia 2005***).

METHODS USED TO CONDUCT TOPOGRAPHIC SURVEYS

Topographical surveying comprises of horizontal and vertical plane surveys. It can be carried out using a variety of techniques. Some popular techniques include:

- Geographic Information System (GIS) - They have contributed a lot to the mapping revolution. GIS makes it possible to combine layers of digital data from different sources and to manipulate and analyze how the different layers relate to each other. The process of converting 3D topographic maps to digital form involves raster to vector conversion using CAD-based software such as AutoCAD.

- Theodolite Survey - The theodolite measures the angles, and the distances are measured with either steel measuring tape or, more commonly, an electronic distance measuring instrument (EDM). An EDM can measure great distances (several kilometers) very quickly and accurately. It measures distance with the usage of light and radio waves. Its development was a milestone in survey measurement methods.

- GPS - A constellation of Global Positioning System (GPS) satellites orbiting the earth is used to determine the position(s) of GPS ground receivers as they are moved from point to point. Collected data may either be processed in the office to produce GPS receiver positions (control surveys) or in the field to give the field surveyor immediate receiver positions (real time GPS surveys) for use for example in construction or for subdivision layout surveys.

- LIDAR - Airborne LIDAR (Light Detection and Ranging) systems can produce extremely accurate elevation models for terrain (even measuring ground elevation through trees), while offering a quick and efficient method of surveying terrain that is not easily accessible. LIDAR, like the similar radar technology (which uses radio waves instead of light), determines the range to an object by measuring the time delay between transmission of a pulse and detection of the reflected signal.

- Photogrammetry - In this method, stereographic pairs of photographs are used to indirectly measure objects on the ground and then calculate point coordinates and height differences. (***Nationwide Surveying, 2013***)

In the course of this project, ground survey method will be employed so as to obtain the ground configuration of the study area. Basically, in carrying out a topographical survey using ground surveying method, four operations are involved in the fieldwork. They are:

- Perimeter Traversing
- Perimeter Levelling
- Spot heightening
- Detailing
- Traversing: A traverse is a series of consecutive lines whose ends have been marked in the field and whose lengths and directions have been determined from observations.(***Charles and Paul, 2012***).

A traverse is a series of connected straight lines whose bearing and distances has been known. Each line joins two points on the ground; each point is called a traverse station. In carrying out third order traverse, the perimeter connection is made of three set of controls (horizontal ground controls) and from them, the positions of all perimeter stations were located. According to the nature of closing station, a traverse could be classified as either a closed or open traverse.

A closed traverse is that which starts from the known station and closes back on the same station or on another known station. (***Agor 1992***)

An open traverse is a traverse that is geometrically and mathematically open and consists of a series of lines that are connected but do not return to the starting point or closes upon a point of equal or greater order accuracy. Open traverses should be avoided because they offer no means of checking for observational errors and mistakes. If they must be used, observations should be repeated carefully to guard against mistakes.(***Charles and Paul, 2012***).

Leveling:- Leveling is an art of determining the relative height or elevation of points above the surface of the earth, (***Gupter et al 2005***), while (***Brinker 1978***) pointed that leveling is the general term applied to any of the various processes by which elevation of points are determined. The leveling operation of the perimeter boundary of the project site was started from a known control.

Detailing:- This is the process whereby features on the ground are surveyed and represented by conventional signs with a suitable scale on a plan. It could be carried out using various methods or techniques, such as radiation method, tachometry method, offset lines, tie lines, use of compass, plane table, intersection method, etc. In the cause of this project, Radiation method was adopted in fixing the details within the project site.

APPLICATION OF TOPOGRAPHICAL SURVEYING

The end product of topographical surveying could be applied in so many ways which are summarized as follows:

- ❖ It is used in military intelligence for detection and location of safe position especially during war time and other necessary information needed for planning military operation(advances surveying)
- ❖ In relating to existing property boundaries by identifying such boundaries and relocating them to the existing details on the ground (***Dashe 1987 p.18***)
- ❖ To geologist, in investigating mineral oil, water resources and studying different layers of the earth surface (***Brinck and wolf 1778***)
- ❖ Used by engineers for location of most accurate and economic route for roads, railways, pipelines, transmission lines, dams etc. and preparation of irrigation system (***Clerk 1956 p. 170***)

CHAPTER THREE

3.1 METHODOLOGY

The methodology adopted for this topographic survey involved the use of a Total Station to establish the perimeter, fix details, and capture spot heights for terrain representation. The science behind the process relies on geodetic principles, trigonometry, and electronic distance measurement (EDM) to determine precise locations, elevations, and feature positions. The Total Station, an advanced surveying instrument, integrates an electronic theodolite, EDM, and a data processor to measure angles and distances with high accuracy. The data collected was later processed using specialized software to produce topographic maps and elevation models.

3.2 EQUIPMENT AND MATERIALS

The equipment used to carried out the Topographic Information System of Government Day Secondary School, Pakata are;

i. Differential Global Positioning System (DGPS)
ii. Total Station (South Total Station)
iii. Prism
iv. Cutlass
v. Survey Beacon
vi. Field Book
vii. Computer System

The primary instrument used was a Total Station, which operates on the principle of trigonometric distance measurement. It emits an infrared or laser beam that reflects off a prism placed at the target point. By analyzing the time taken for the signal to return, the Total

Station calculates distances and, together with angular measurements, determines the precise position of each point. A tripod provided stability for the Total Station, ensuring measurement accuracy. A prism and prism pole were used as target reflectors, allowing the Total Station to lock onto and measure the position of survey points.

Benchmarks and control points provided a reference framework, ensuring all measurements were relative to a fixed coordinate system. A field book was used to manually record observations, sketches, and any necessary adjustments during the survey. Finally, data processing software such as AutoCAD Civil 3D and ArcGIS was employed to analyze and visualize the collected data, transforming it into usable topographic outputs.

3.3 SURVEY PROCEDURE

The survey was conducted in a systematic manner to ensure precision. It involved pre-survey planning, control point establishment, perimeter measurement, detail fixing, spot height recording, and data processing.

3.3.1 RECONNAISSANCE SURVEY

A reconnaissance survey is the preliminary stage of a topographic survey that involves gathering essential information about the site both in the office and in the field. The goal is to assess the terrain, identify potential challenges, plan the survey workflow, and ensure all necessary resources are available before the detailed survey begins.

Office Planning

The office reconnaissance involves researching existing data, reviewing maps, and planning the fieldwork to improve efficiency and accuracy. This step ensures that surveyors are well-prepared before stepping into the field.

1. Gathering Existing Data

- Available maps, and previous survey records of the area are collected and reviewed.

2. Identifying Control Points

- Existing geodetic control points are identified from national or local survey databases.

- Since control points are unavailable, plans are made to establish new ones within the survey area.

3. Planning Survey Workflow

- The survey approach, including the use of Total Stations, GPS, and leveling instruments, is determined.

- Team roles and responsibilities are assigned, and required equipment is listed.

- Potential challenges such as dense vegetation, water bodies, or built-up areas are noted for field adaptation.

4. Preparation of Field Materials

- Field sketches, coordinate lists, and necessary software for data collection are prepared.

- Batteries, tripods, and measuring tools are checked and calibrated.

Field Reconnaissance

The field reconnaissance involves physically visiting the site to verify office findings and assess real-time conditions that may impact the survey.

1. Site Visit and Visual Assessment

- The team walks through the survey area, confirming boundaries, terrain conditions, and accessibility.

- The presence of obstacles like water bodies, dense forests, or buildings is noted.

2. Verification of Control Points

- New control point locations are selected for proper coverage of the survey area.

3. Identifying Suitable Instrument Stations

- Locations for Total Station setups are chosen based on line-of-sight and coverage.

- Safe and stable positions for survey equipment are determined to minimize measurement errors.

3.3.2 ESTABLISHMENT OF CONTROL POINTS

Control points are the foundation of any survey, providing fixed reference positions that all subsequent measurements rely upon. These points ensure that the survey maintains consistency and accuracy across the entire area. The process of establishing control points involves setting up known reference stations from which measurements of boundaries, details, and elevations can be made.

Scientific and Technological Basis

Control points are based on geodetic and trigonometric principles. The positions of these points are determined using total stations, ensuring their precise locations in relation to a coordinate system. The Total Station works by measuring the horizontal and vertical angles, along with the slope distances to reference targets, and calculating the X, Y, and Z coordinates using trigonometry and EDM (Electronic Distance Measurement).

Step-by-Step Procedure

1. Selection of Control Point Locations

- The first step is to identify existing geodetic control points near the site.

- Since, no existing control points are available, new ones are established in stable, accessible locations.

- The locations are selected based on visibility, accessibility, and security, ensuring that the points can be used throughout the survey.

- The equipment used for the establishment of the control point is Differential Global Positioning System (DGPS)

Table 3.1: Table showing the new established control points

Control Station	Northing	Easting
KP 001	938 774.336	666 705.731
KP 002	938 668.328	666 518.319
KP 003	938 665.326	666 559.394

2. Setting up the Total Station

- A tripod is placed over the control point and carefully leveled to ensure stability.

- The Total Station is mounted on the tripod and centered over the control point using the built-in optical plummet or laser plummet.

- Fine adjustments are made using the leveling screws and circular bubble to ensure accuracy.

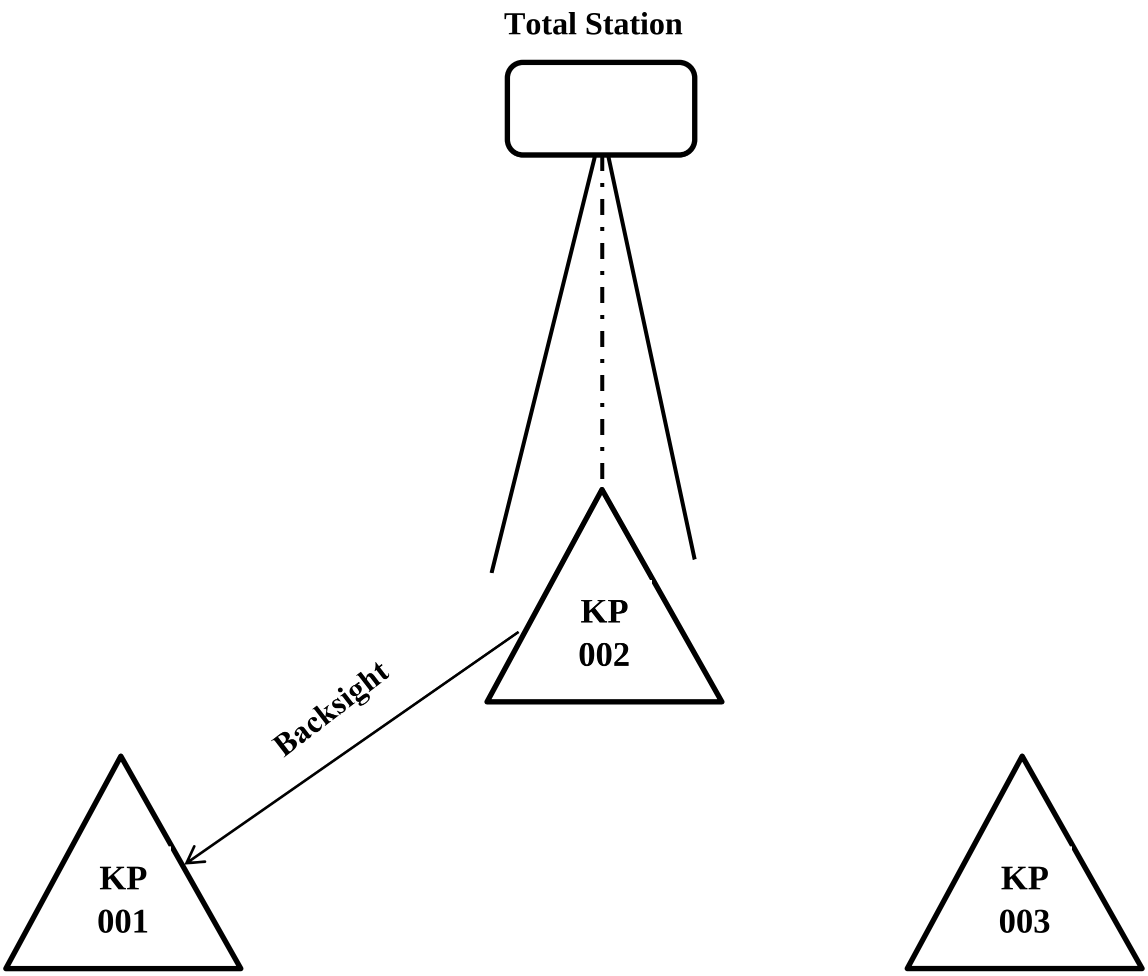
3. Backsighting to a Known Point

- The instrument is aligned to a known reference point (geodetic benchmark or previously established control point).

- A prism is placed at the reference point, and a backsight measurement is taken to establish orientation.

- This ensures that all subsequent measurements are tied to the correct coordinate system.

Fig. 3.1: Diagram showing the control station connection



4. Measurement of New Control Points

- The Total Station emits a laser or infrared beam toward the prism held at the target control point location.

- The instrument measures the angle and distance and automatically calculates the X, Y, and Z coordinates of the new control point.

- Multiple readings are taken for accuracy.

5. Checking and Adjustment of Control Points

- A closed traverse is conducted, ensuring that the last control point connects back to the first one, forming a loop.

- Any misclosure errors are adjusted using the Bowditch method or Least Squares Adjustment, ensuring consistency and reliability of control points.

These control points now serve as the reference framework for all subsequent survey operations.

Table 3.2: Table showing the coordinate of the control point after the orientation

Control Station	Northing	Easting
KP 001	938 774.214	666 705.643
KP 002	938 668.328	666 518.319
KP 003	938 665.200	666 559.254

3.3.3 PERIMETER SURVEYING (BOUNDARY MEASUREMENT)

Once control points have been established, the next step is to determine the exact perimeter of the survey area. This involves measuring all boundary points to create an accurate map of the land extent.

Scientific and Technological Basis

Perimeter surveying relies on traverse computations and geospatial mapping. Using the Total Station, precise angular and distance measurements are taken from control points to define the boundary. The EDM system in the Total Station measures distances by calculating the travel time of an emitted laser beam, while the internal processor applies trigonometric calculations to determine the boundary points' exact coordinates.

Step-by-Step Procedure

1. Setting Up the Total Station

- The Total Station is positioned at a control point and carefully leveled.

- A backsight measurement is taken to orient the instrument correctly to the established control network.

2. Marking Boundary Points

- The boundary points are identified in the field using physical markers (wooden pegs, iron rods, or concrete beacons).

- Each boundary corner is assigned a unique point number.

3. Measuring Boundary Points

- The prism reflector is placed at each boundary corner.

- The Total Station records horizontal angles, vertical angles, and slope distances to compute the exact location of each boundary point.

- If the distance is too far, the instrument is repositioned at a new control point to continue measurements.

4. Closing the Perimeter Traverse

- To ensure accuracy, the last boundary point is connected back to the first boundary point, creating a closed traverse.

- If errors exist in the traverse, adjustments are made using a traverse adjustment technique.

The perimeter survey ensures that the land boundaries are accurately mapped and legally verifiable.

3.3.4 FIXING OF DETAILS

After defining the perimeter, the next step is to fix natural and man-made details within the site, such as buildings, roads, trees, drainage channels, power poles, fences, and water bodies.

Scientific and Technological Basis

Fixing details involves topographic feature mapping, using the Total Station to determine the precise locations of objects within the survey area. The coordinate geometry (COGO) principles and EDM technology allow for highly accurate spatial positioning of objects.

Step-by-Step Procedure

1. Total Station Setup at a Control Point

- The Total Station is placed at a known control point, and backsighting is performed for orientation.

2. Detail Point Identification

- A prism pole is placed at specific feature locations, such as corners of buildings, road edges, electric poles, and trees.

- For linear features such as roads and drainage channels, multiple points are measured along their alignment.

3. Measurement of Features

- The Total Station records angles, distances, and elevations, calculating the precise X, Y, and Z coordinates of each detail point.

- Each recorded feature is assigned a category, ensuring organized mapping.

4. Verification and Cross-Checking

- The recorded points are plotted on a real-time sketch or digital map to verify their correctness.

Fixing details ensures that all site features are mapped accurately for design, analysis, or documentation.

3.3.5 SPOT HEIGHT MEASUREMENT

Spot height measurement is essential for understanding the elevation variations across the survey area. It involves recording the altitude (Z-coordinates) of multiple locations, which is crucial for terrain modelling, contour mapping, and engineering design.

Scientific and Technological Basis

Spot height measurement uses trigonometric leveling and terrain modeling principles. The Total Station calculates elevations by measuring vertical angles and slope distances to the prism, computing the precise height difference between the instrument and each point.

Step-by-Step Procedure

1. Setting Up the Total Station and Backsighting

- The instrument is placed on a control point with a known elevation (benchmark).
- A backsight is taken on another reference point to ensure correct height reference.

2. Grid-Based Spot Height Measurement

- A grid system is established, where spot heights are measured at uniform intervals across the site.
- The prism pole is placed at each grid point, and the Total Station records the elevation.

3. Recording Breakline Heights

- Additional spot heights are taken at breaklines (significant slope changes) such as road edges, embankments, and depressions.

4. Processing and Contour Mapping

- The collected elevations are used to generate contour lines and Digital Elevation Models (DEM), which visually represent the terrain.

Spot height measurements are essential for engineering design, flood analysis, and landscape assessment.

3.4 DELIVERABLES AND OUTPUT

The final deliverables of the topographic survey included:

1. Topographic Map – A detailed representation of the survey area, including contour lines, elevation points, and fixed features.

2. Digital Elevation Model (DEM) – A 3D visualization of the terrain, useful for hydrological and engineering analysis.

3. GIS and CAD Files – Digital data compatible with GIS and CAD software for further analysis and integration into project designs.

CHAPTER FOUR

RESULTS AND ANALYSIS

This chapter presents the results derived from the topographic survey carried out using Total Station equipment. The survey generated key outputs that include the defined perimeter of the site, fixed planimetric features, measured spot heights, a topographic map, and a digital terrain model (DTM). These outcomes were analyzed to evaluate the spatial characteristics, elevation dynamics, and surface morphology of the project site. The interpretations presented in this chapter are intended to aid physical planning, civil engineering design, land assessment, and environmental appraisal.

4.1 PERIMETER SURVEY RESULT

The first deliverable from the survey was the precise demarcation of the boundary enclosing the project area. Using Total Station equipment, angular and linear measurements were recorded along traverse lines connecting perimeter points. A closed traverse was executed, and adjustments were applied to eliminate angular and linear misclosures using Bowditch’s method. After corrections, coordinate computation yielded a total enclosed area of 5.746 hectares.

Each traverse station was referenced to a consistent datum, and coordinates were computed in a Universal Traverse Mercator (UTM) coordinate system. Bearings between stations and line distances were recorded with high accuracy, and redundant checks (backsight and foresight readings) confirmed data integrity.

Interpretation

The perimeter defines the legal footprint of the land parcel and forms the spatial foundation for all subsequent surveying and design activities. Its accuracy is critical for preventing encroachment and for ensuring compliance with planning laws. The 5.746-hectare area size is moderately expansive and suitable for mixed land uses, such as institutional development, housing schemes, or infrastructural expansion. The successful closure of the traverse with minimal misclosure values indicates a high level of precision in the control framework.

4.2 DETAILED (PLANIMETRIC) SURVEY RESULT

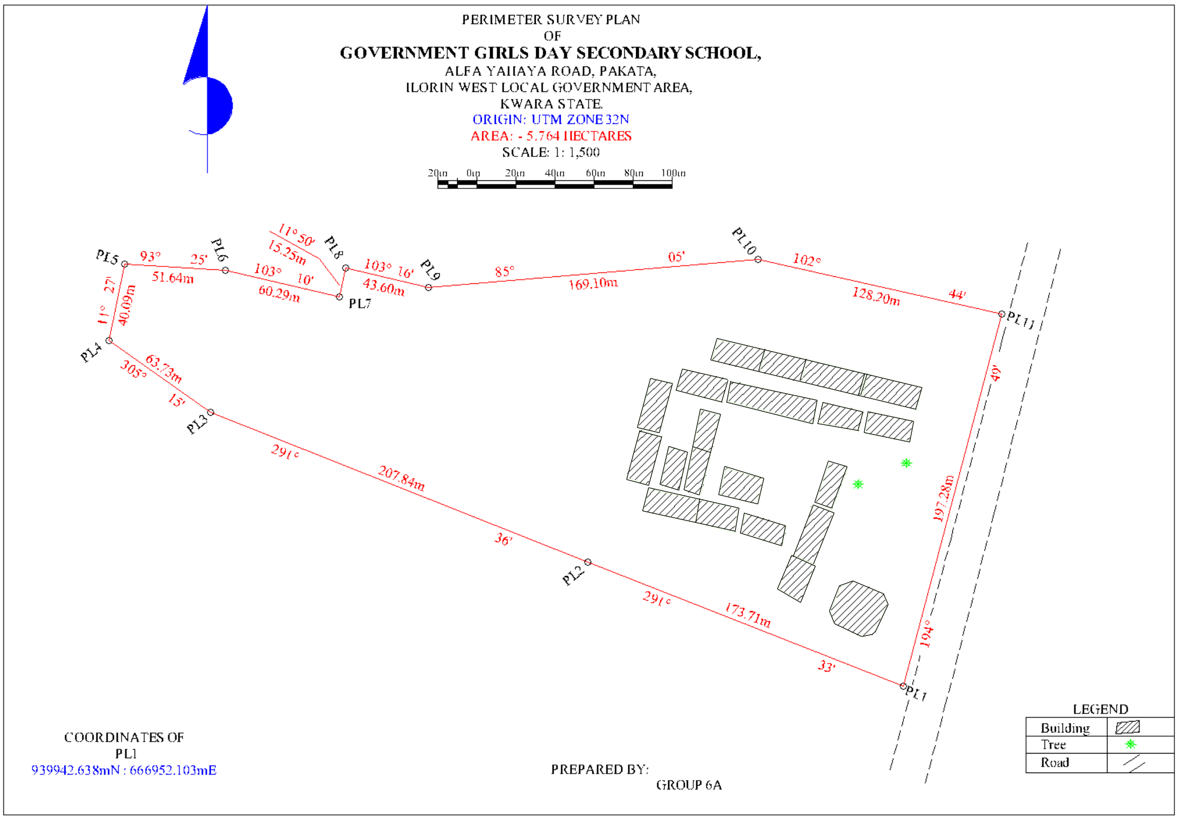
Following perimeter control, planimetric detail features were fixed within the site. This involved the identification and coordinate measurement of all physical features, both natural and man-made. The detail survey recorded 21 existing buildings, all of which were measured using reflector-based Total Station shots to capture at least three to four defining corners per building. This allowed for accurate plotting of their geometries.

Additionally, two mature trees were observed within the site. These were recorded with their coordinates and plotted for spatial awareness and environmental relevance. The survey also documented the adjoining road infrastructure along the stretch between PL11 and PL1, providing vital context for access and transport planning.

Interpretation:

The detailed feature inventory is essential for base mapping, land-use classification, and infrastructure alignment. The presence of 21 structures indicates active or past land usage, which must be considered in any redevelopment or land allocation strategy. Their layout can also inform site zoning, access corridors, and utility planning. The inclusion of tree positions aids in environmental impact assessments and landscaping design. Moreover, the bordering road increases the site's connectivity and suitability for development by ensuring access and linking the site to external infrastructure networks.

Fig 4.1: Detailed Plan of the Study area



4.3 SPOT HEIGHT MEASUREMENT AND ELEVATION ANALYSIS

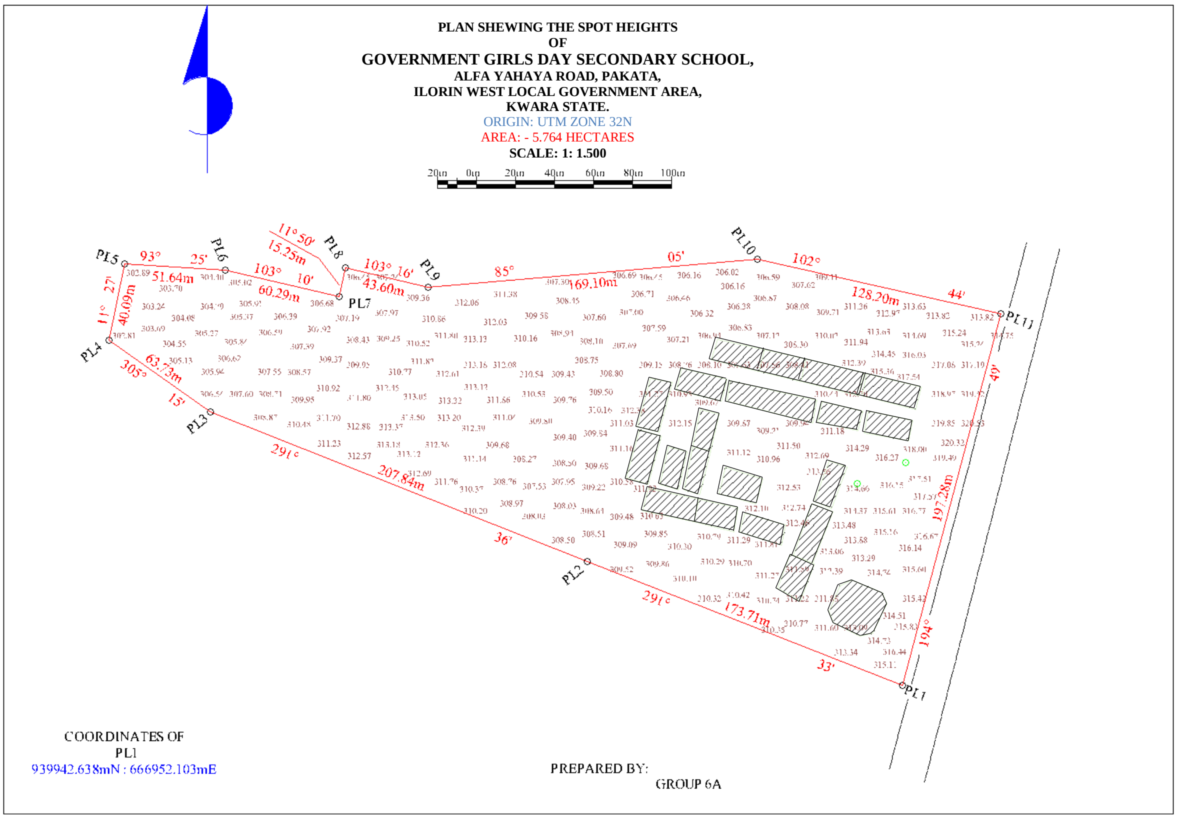
Spot height measurements were obtained at regularly spaced intervals across the terrain to capture the vertical variation of the site. The spot heights ranged from 302.00 meters to 321.00 meters above mean sea level, indicating an elevation variation of 19 meters. Readings were taken at terrain breaks, slope transitions, and grid intersections to provide a full surface elevation dataset.

From the spot heights, contour lines were interpolated at 1.00-meter intervals, generating a continuous representation of elevation change across the site. The contours illustrate gradual and moderate slope patterns, with the steepest gradients located toward the northeastern section and relatively flatter terrain to the southwest.

Interpretation:

The elevation range reflects a moderate topographic undulation, which is advantageous for natural surface drainage, minimizing the risk of waterlogging. Slopes are not extreme, suggesting that grading requirements for construction will be minimal and cost-effective. The elevation profile also guides where best to site sensitive infrastructure such as roads, buildings, and stormwater channels. High points (up to 321m) are ideal for positioning critical structures, while lower points (around 302m) should be evaluated for potential runoff collection or water retention.

Fig 4.2: Spot Height Plan of the Study area



4.4 TOPOGRAPHIC MAP RESULT

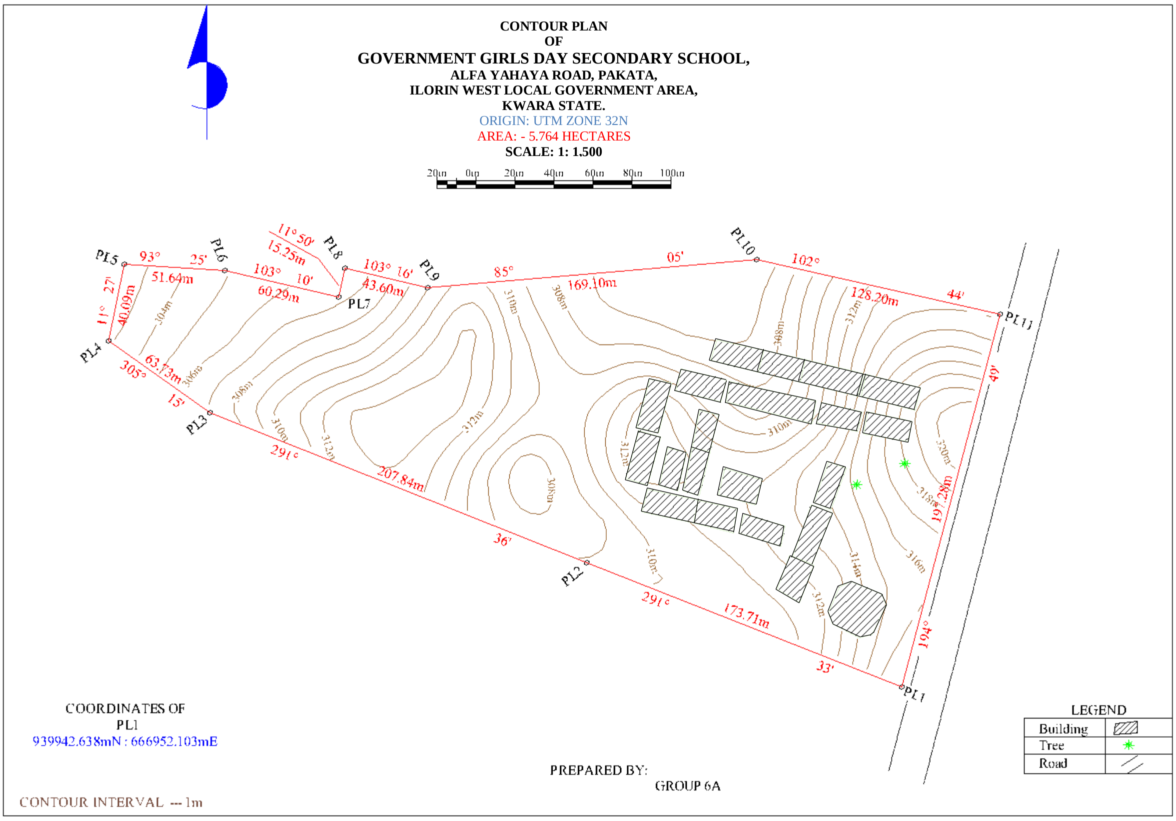
The topographic map produced combines all collected spatial data — perimeter, details, and elevation — into a georeferenced and scaled map. The map visually represents both the horizontal arrangement of features and the vertical variations in elevation. Buildings are symbolized with clearly marked outlines, trees are shown with natural feature symbols, and roads are represented with line features matching their real-world orientation.

Contour lines dominate the elevation representation, showing continuous terrain levels at 1.00-meter intervals. The map layout includes northing, easting, scale bar, legend, and title block to comply with cartographic standards.

Interpretation:

The topographic map provides a single-source spatial document that aids decision-making across various disciplines. For architects, it allows the preparation of conceptual site layouts; for engineers, it supports terrain grading and slope analysis; and for urban planners, it informs land zoning and development control. Its clarity and completeness make it useful as both a presentation and analytical tool. It also enables integration into GIS environments for further spatial modeling or overlay with satellite imagery and planning datasets.

Fig 4.3: Contour Map of the Study area



4.5 DIGITAL TERRAIN MODEL (DTM) OUTPUT

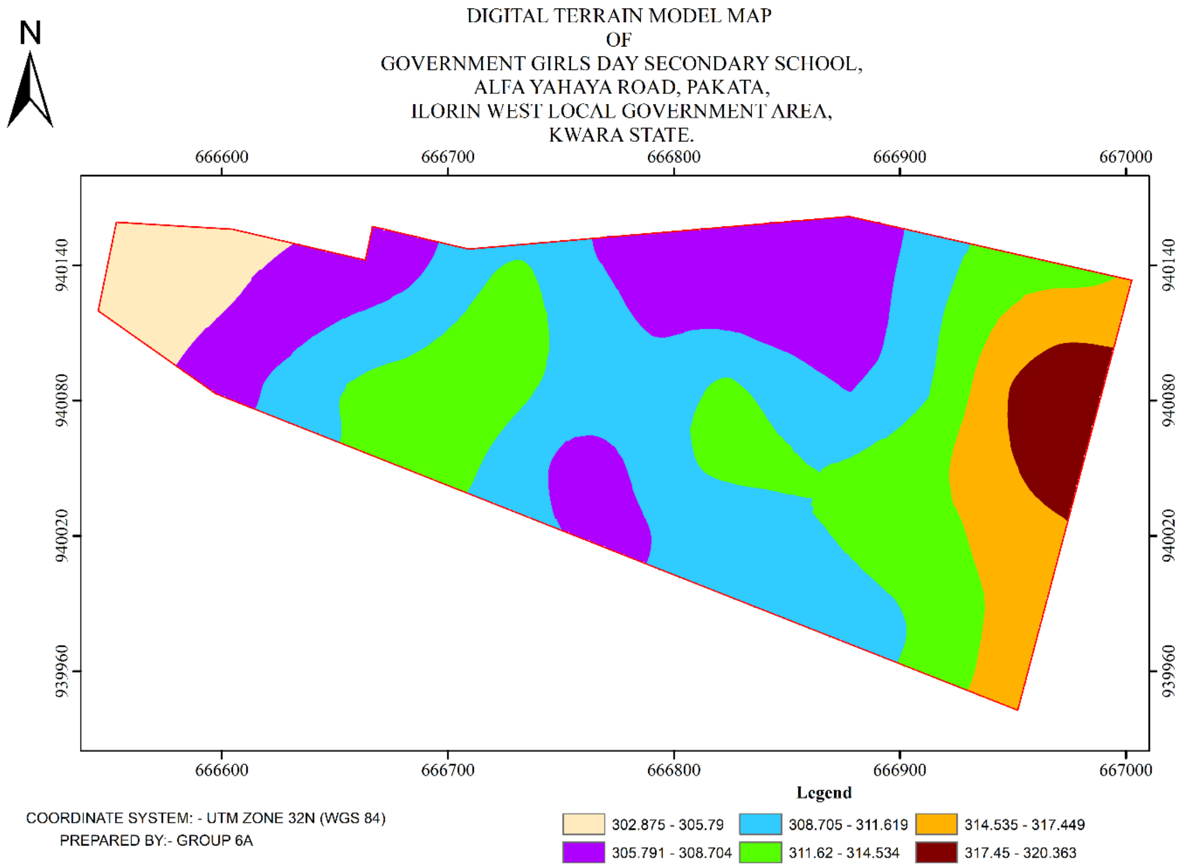
Using the spot height dataset, a Digital Terrain Model (DTM) was generated to present the terrain as a continuous, 3D surface. The DTM was developed using interpolation techniques (e.g., Triangulated Irregular Network or Inverse Distance Weighting), and surface rendering was applied to visualize elevation differences, slope directions, and terrain curvature.

The DTM reveals subtle terrain changes not always visible on contour maps, such as micro-depressions or ridgelines. It is capable of supporting 3D visualization, fly-throughs, and terrain profiling, thereby enabling more advanced engineering applications.

Interpretation:

The DTM is a powerful tool for simulating hydrological flow, estimating earthwork quantities, and visualizing site development impact. It is especially useful for road design, cut-and-fill balancing, and modeling surface runoff. The 19-meter elevation range, when analyzed in the DTM, supports the identification of natural drainage paths and areas of potential erosion. The use of the DTM improves efficiency and reduces risks during planning and construction.

Fig 4.4: Digital Terrain Model Map of the Study area



4.6 INTEGRATED SPATIAL INTERPRETATION AND SITE ASSESSMENT

From the compiled results, it is evident that the site exhibits a balanced terrain with mild slopes, active land use, and strong access potential due to the bordering road. The presence of several buildings suggests partial occupation or previous use, while the terrain characteristics support new development with minimal site modification.

The combination of perimeter survey, detailed feature fixing, spot height data, contour mapping, and digital modeling ensures a comprehensive understanding of the site. The overall dataset can be used for:

- Land-use planning and zoning (based on building distribution and access routes)
- Engineering design (based on elevation and slope analysis)
- Drainage and stormwater design (from DTM slope flow directions)
- Construction layout and supervision

Integration into a GIS-based land information system

CHAPTER FIVE

COSTING, SUMMARY, PROBLEM ENCOUNTERED CONCLUSION AND RECOMMENDATIONS.

5.1 COST ESTIMATION

This stage the total cost spent on the project from day one to the final stage.

Table 5.1.1: Direct cost parameters

S/N	DIRECT COST		
1	**Reconnaissance (1 day)**		
	PERSONNEL	**Rate**	**Total Amount (₦:K)**
	1 x surveyor	10500	10500
	1 x assistant surveyor	7500	7500
	1 x technical officer	6500	6500
	3 x skilled labour	4000	12000
	basic equipment	5000	5000:00
	transportation (vehicle, Driver and fuel)	10000	10000:00
		sub-total	**51,500**
2	**Monumentation (1 day)**		
	PERSONNEL		
	1 x assistant surveyor	7500	7500
	1 skilled labour	4000	4000
	transportation (vehicle, Driver and fuel)	10000	10000
	basic equipment	5000	5000:00

	Beacon (6)	1000	6000
		sub-total	**32,500**
3	**Data acquisition (2 days)**		
	PERSONNEL		
	1 x assistant surveyor	7500	7500
	1 x technical officer	6500	6500
	3 x skilled labour	4000	12000
	Total Station and accessories	15000	15000
	transportation (vehicle, Driver and fuel)	10000	10000
		sub-total	**51,000**
5	**Data Processing (2 days)**		
	PERSONNEL		
	1 x surveyor	10500	10500
	1 x assistant surveyor	7500	7500
	1 x technical officer	6500	6500
	computer / accessories	15000	15000
		sub-total	**39,500**
7	**Technical Report (1 day)**		
	PERSONNEL		
	1 x surveyor	10500	10500
	1 x assistant surveyor	7500	7500

	1 x secretary	5000	5000:00
	computer / accessories	15000	15000:00
		sub-total	**38,000**

TOTAL (DIRECT COST) 212,500 MOBILIZATION/DEMOBILIZATION = 5% of Direct Cost

= 0.05 × 212,500

= **₦10,625**

CONTINGENCY ALLOWANCE

= 5% of Direct Cost

= 0.05 × 212,500

= **₦10,225**

GRAND TOTAL = **₦212,500 + ₦10,625 + ₦10,625**

= ₦233,750

VAT (@5% GRAND TOTAL) = 0.05 × 233750

= **₦11,687.5**

TOTAL COST PAYABLE = GRAND TOTAL + VAT

= ₦233,750+ ₦11,687.5 = ₦245,437.5

5.2 SUMMARY

The application of **Topographic Information Systems (TIS)** to the study of part of the Government Girls Day Secondary School, Pakata, Ilorin West (LGA), Kwara State, represents an important step towards modernizing urban planning, infrastructure development, and environmental management in the region. TIS, through the integration of advanced tools such as **Digital Elevation Models (DEMs)**, satellite imagery, and geospatial data analysis, provides a comprehensive understanding of the terrain characteristics of the area, including elevation, slope, and landforms. This information is critical for planning and development in urban zones like the Government Girls Day Secondary School, where the population density is increasing, and there is a need for sustainable infrastructure development.

The topographic data derived from TIS can assist in a variety of applications, including **flood modeling**, **land use planning**, **drainage system design**, and **risk assessment** for potential natural hazards, particularly flooding due to the region's topographic features and seasonal rainfall patterns. The detailed mapping and analysis of the area's topography also provide insights into potential sites for future urban expansion and infrastructure projects while ensuring that the built environment is adapted to the natural terrain. Moreover, TIS can aid local authorities and stakeholders in creating policies that prioritize **environmental sustainability**, **resilient urban infrastructure**, and **public safety**, particularly in the face of climate change and population growth.

As the use of TIS in Government Girls Day Secondary School continues to grow, it will contribute to the integration of **smart city** technologies, including **real-time data integration** and **IoT-driven solutions** for more effective urban management. This could include the continuous monitoring of infrastructure health, soil conditions, and environmental changes. Additionally, the accurate terrain data generated by TIS will be instrumental in addressing **challenges related to land tenure, property disputes**, and **infrastructure maintenance**.

5.3 PROBLEM ENCOUNTERED

The following were the problems encountered during the execution of this project.

i. The project was financially expensive, energetic and time consuming.

ii. On the day of carrying out the practical, there was a delay in getting the instrument that resulted in getting to the site lately.

iii. Throughout the practical, we worked under the sun reason that we got to the site lately.

5.4 CONCLUSION

In conclusion, the integration of **Topographic Information Systems (TIS)** into the planning and development of **Government Girls Day Secondary School, Pakata, Ilorin West (LGA), Kwara State,** offers a transformative approach to understanding and managing the region's complex topographic and environmental characteristics. By leveraging advanced geospatial tools such as **Digital Elevation Models (DEMs)**, satellite imagery, and real-time data collection technologies, TIS provides crucial insights into the terrain, which are invaluable for **urban planning**, **disaster management**, and **infrastructure development**. The use of TIS in this area enables stakeholders to make informed decisions about land use, flood risk assessment, and the design of resilient infrastructure that is aligned with the natural landscape, helping to mitigate the risks associated with topographic challenges.

Furthermore, the potential of TIS to integrate with emerging technologies like **AI, IoT**, and **virtual/augmented reality** promises to enhance the system's capability for real-time monitoring and dynamic decision-making. This integration will be pivotal in addressing future challenges as the region continues to urbanize, ensuring that growth is sustainable and that urban systems can effectively adapt to environmental changes.

However, for TIS to reach its full potential in Government Girls Day Secondary School, it is essential that data accuracy, accessibility, and local expertise are prioritized. Moreover, addressing the ethical concerns related to data privacy and ensuring equitable access to TIS benefits are key considerations for the long-term success of this technology in the region. With proper implementation and continuous improvements in data integration, TIS will play a critical role in shaping a more sustainable, resilient, and efficient urban future for **Ilorin West LGA**, enhancing the quality of life for its residents and fostering more effective governance.

5.5 RECOMMENDATION

Here is the recommendation section for the topic "Topographic Information Systems (TIS) of Government Girls Day Secondary School, Pakata, Ilorin West (LGA), Kwara State, in a listed format:

i. **Enhance Data Accuracy and Resolution**: It is recommended to improve the resolution and accuracy of topographic data by using advanced technologies such as **LiDAR** and **UAV-based photogrammetry** for more detailed mapping of terrain features in Government Girls Day Secondary School. This will provide more precise information for urban planning and flood risk assessments.

ii. **Integrate Real-Time Monitoring Systems**: The integration of **Internet of Things (IoT)** sensors and other real-time monitoring systems within the TIS framework will enable continuous updates on environmental changes, infrastructure health, and disaster management. This will facilitate quicker decision-making and responses to dynamic urban challenges.

iii. **Adopt Advanced Visualization Technologies**: Utilize **Virtual Reality (VR)** and **Augmented Reality (AR)** technologies to create immersive 3D models of the topography for urban planners, engineers, and the local community. This will improve stakeholder engagement, enhance understanding of the terrain, and aid in effective spatial decision-making.

iv. **Strengthen Capacity Building and Training**: Provide training programs for local government officials, urban planners, and other stakeholders to build capacity in using TIS tools and interpreting topographic data. This will ensure better utilization of the system and foster local expertise in managing urban development challenges.

v. **Promote Public-Private Partnerships**: Foster collaborations between government agencies, private sector firms, and academic institutions to improve data collection, system development, and the long-term sustainability of TIS in the region. These partnerships can support funding, research, and the sharing of best practices.

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APPENDIX

GROUP 6A TOPO RAW DATA

P.I.D EASTING NORTHING ELEVATION	P.I.D EASTING NORTHING ELEVATION
1,PT,666559.393,938655.226,324.403	125,WT,666639.790,938767.687,325.569
2,BLD,666564.888,938655.589,324.609	126,WT,666641.358,938766.991,325.575
3,BLD,666572.856,938656.418,324.845	127,SH,666634.854,938764.789,325.446
4,BLD,666579.384,938656.990,325.081	128,SH,666637.255,938755.218,325.526
5,BLD,666587.417,938657.779,325.249	129,SH,666648.479,938750.478,326.051
6,FF,666584.030,938674.217,324.847	130,SH,666651.677,938748.545,326.060
7,FF,666578.461,938674.102,324.602	131,SH,666651.176,938743.616,325.941
8,SH,666562.850,938672.506,324.086	132,SH,666653.487,938743.635,326.074
9,SH,666548.780,938675.012,323.749	133,EP,666664.619,938749.247,326.356
10,SH,666529.505,938681.031,323.445	134,SH,666661.779,938738.151,326.352
11,WF,666509.740,938692.262,322.828	135,SH,666650.737,938734.922,326.119
12,GT,666501.195,938679.925,323.593	136,SH,666638.825,938734.261,325.675
13,GT,666500.602,938679.080,323.629	137,FF,666627.213,938729.227,325.561
14,WF,666494.023,938669.408,323.585	138,FF,666627.154,938726.027,325.519
15,PIL,666489.939,938663.250,323.784	139,FF,666652.971,938722.396,326.084
16,SH,666504.839,938663.969,323.640	140,FF,668126.774,939305.647,371.880
17,SH,666518.319,938668.328,323.512	141,CP,666731.883,938714.114,329.118
18,SH,666534.636,938665.045,323.618	142,CP,666722.880,938709.571,329.095
19,SH,666537.246,938651.342,324.351	143,CP,666731.861,938714.103,329.090
20,SH,666537.116,938640.217,324.791	144,BLD,666719.330,938776.283,328.847
21,PIL,666549.802,938626.341,325.710	145,BLD,666724.640,938775.642,329.538
22,BLD,666566.949,938635.507,325.534	146,BLD,666724.811,938777.345,329.013
23,SH,666560.052,938640.072,325.173	147,WF,666727.860,938779.930,328.852
24,SH,666551.407,938652.598,324.272	148,SH,666729.117,938765.766,328.551
25,SH,666550.568,938689.169,323.494	149,SH,666713.970,938764.828,328.315
26,SH,666538.375,938698.658,323.125	150,SH,666705.731,938774.336,328.143
27,SH,666518.282,938705.519,322.835	151,WF,666703.715,938782.214,328.655
28,TR,666530.522,938714.804,323.065	152,BLD,666707.042,938760.928,328.164

29,BLD,666532.985,938723.275,322.886	153,SH,666714.641,938751.563,328.524
30,BLD,666535.020,938722.153,323.014	154,SH,666711.044,938743.638,328.569
31,BLD,666536.550,938724.511,323.043	155,BLD,666708.008,938741.096,329.147
32,BLD,666537.444,938726.038,323.111	156,BLD,666708.301,938737.492,329.393
33,BLD,666538.628,938728.344,323.073	157,SH,666719.039,938737.120,328.664
34,TR,666547.428,938716.448,323.439	158,SH,666728.749,938734.462,328.506
35,SH,666561.960,938714.995,323.735	159,SH,666741.792,938741.734,328.911
36,SH,666577.398,938714.165,323.962	160,SH,666747.719,938751.513,328.909
37,SH,666588.013,938713.553,324.333	161,BLD,666740.177,938763.414,328.789
38,SH,666594.902,938733.181,324.533	162,SH,666749.275,938757.111,328.961
39,FF,666585.859,938745.789,324.080	163,BLD,666759.775,938762.004,329.385
40,FF,666580.138,938746.859,324.004	164,SH,666759.454,938748.967,329.185
41,SH,666567.418,938742.689,323.674	165,SH,666751.653,938739.045,329.162
42,BLD,666562.092,938744.078,323.581	166,SH,666753.335,938727.717,329.548
43,BLD,666553.297,938748.849,323.116	167,SH,666755.412,938716.761,329.795
44,WF,666548.166,938751.757,323.022	168,SH,666756.582,938710.874,329.914
45,BLD,666573.843,938764.473,323.318	169,BLD,666769.016,938706.899,330.306
46,SH,666582.419,938761.025,323.802	170,BLD,666749.991,938703.089,329.885
47,SH,666592.201,938757.277,323.907	171,BLD,666746.416,938702.440,329.791
48,SH,666599.902,938752.070,324.093	172,BLD,666727.171,938698.381,329.546
49,SH,666602.626,938762.939,324.184	173,BLD,666729.017,938689.493,329.729
50,SH,666596.583,938765.303,324.118	174,PIL,666727.095,938688.956,330.002
51,SH,666588.891,938769.861,323.589	175,PIL,666728.798,938676.309,330.773
52,SH,666576.869,938779.026,323.581	176,PIL,666714.192,938674.035,330.810
53,SH,666579.252,938790.592,323.338	177,BLD,666713.774,938676.953,330.512
54,PIL,666578.121,938796.557,323.355	178,BLD,666713.612,938677.901,330.458
55,WF,666591.126,938795.641,323.822	179,BLD,666712.298,938688.217,329.882
56,SH,666599.788,938791.439,324.047	180,SH,666721.299,938676.028,330.531
57,SH,666596.692,938780.969,323.967	181,SH,666721.212,938690.196,329.749
58,SH,666606.748,938775.310,324.247	182,SH,666717.543,938705.002,329.084
59,BLD,666616.773,938784.907,324.987	183,SH,666719.324,938719.819,328.830

60,BLD,666617.378,938787.730,325.240	184,BLD,666772.395,938707.875,330.401
61,WF,666617.119,938792.478,324.683	185,BLD,666791.143,938711.646,330.850
62,BLD,666619.559,938784.367,325.202	186,BLD,666796.208,938712.817,331.437
63,BLD,666622.361,938785.821,325.247	187,BLD,666815.736,938717.126,331.687
64,BLD,666621.226,938776.323,324.742	188,SH,666813.009,938726.677,331.091
65,SH,666620.229,938765.813,325.022	189,SH,666800.600,938724.265,330.640
66,SH,666612.733,938767.946,324.700	190,SH,666785.915,938721.751,330.486
67,SH,666611.600,938753.333,324.728	191,SH,666772.111,938719.587,330.221
68,SH,666612.441,938739.964,324.961	192,SH,666757.289,938716.674,329.897
69,SH,666615.825,938724.599,325.333	193,SH,666753.103,938726.211,329.572
70,TR,666621.296,938715.292,325.998	194,SH,666764.504,938730.925,329.584
71,SH,666610.096,938713.356,325.410	195,SH,666776.799,938733.664,329.930
72,SH,666609.137,938700.165,325.546	196,SH,666787.651,938734.839,330.088
73,SH,666611.831,938687.882,325.848	197,SH,666800.791,938739.366,330.340
74,SH,666615.842,938679.399,326.144	198,SH,666809.360,938743.631,330.602
75,SH,666616.033,938674.189,326.252	199,SH,666824.472,938747.742,330.967
76,BLD,666615.837,938662.628,326.442	200,SH,666814.001,938751.846,330.764
77,SH,666605.260,938663.643,326.041	201,SH,666797.995,938745.083,330.206
78,BLD,666593.748,938659.167,325.634	202,SH,666785.156,938745.079,329.911
79,SH,666592.892,938667.768,325.400	203,SH,666777.323,938745.625,329.701
80,BLD,666619.597,938663.260,326.505	204,SH,666762.019,938747.240,329.348
81,BLD,666639.099,938665.984,327.375	205,SH,666753.730,938750.513,329.096
82,BLD,666643.840,938666.654,327.485	206,BLD,666764.031,938761.616,329.347
83,BLD,666665.520,938669.765,328.330	207,BLD,666796.632,938759.832,330.269
84,BLD,666668.596,938670.268,328.448	208,BLD,666806.074,938758.626,330.484
85,BLD,666690.662,938673.491,329.178	209,BLD,666810.530,938757.750,330.603
86,BLD,666693.533,938675.060,329.155	210,CP,666837.386,938731.730,332.055
87,BLD,666691.985,938685.179,328.896	211,CP,666829.131,938729.840,331.835
88,SH,666692.573,938693.992,328.445	212,CP,666837.322,938731.715,332.032
89,SH,666695.917,938702.946,328.240	213,GT,666843.144,938741.280,331.875
90,BLD,666700.844,938707.759,328.343	214,GT,666842.294,938746.971,331.905

91,BLD,666709.733,938708.123,328.623	215,GH,666839.370,938746.798,331.704
92,SH,666710.532,938699.058,328.854	216,GH,666838.857,938750.142,331.727
93,SH,666712.030,938688.499,329.226	217,PIL,666839.251,938771.826,331.955
94,SH,666693.790,938710.254,327.952	218,BLD,666831.234,938766.354,331.569
95,SH,666686.278,938708.401,327.550	219,BLD,666830.371,938756.749,331.569
96,SH,666671.562,938706.433,327.388	220,TR,666832.903,938751.431,331.596
97,SH,666672.225,938694.999,327.675	221,TR,666805.617,938750.605,331.361
98,SH,666676.052,938681.708,328.054	222,TR,666790.209,938742.444,331.555
99,SH,666662.792,938677.496,327.654	223,BLD,666786.825,938760.003,331.241
100,SH,666652.241,938687.813,327.079	224,BLD,666783.240,938760.270,331.293
101,SH,666644.262,938681.957,327.057	225,EP,666810.029,938738.888,331.489
102,SH,666638.083,938670.981,327.071	226,BLD,666817.703,938707.898,332.618
103,SH,666628.032,938668.980,326.716	227,BLD,666818.554,938700.375,332.887
104,SH,666630.313,938687.812,326.474	228,BLD,666839.493,938700.429,333.542
105,SH,666631.197,938704.013,326.052	229,WF,666813.858,938682.646,333.753
106,SH,666642.761,938708.216,326.404	230,SH,666812.465,938693.685,333.032
107,EP,666656.192,938706.350,326.926	231,SH,666817.384,938702.759,332.763
108,SH,666661.644,938716.765,326.692	232,SH,666823.585,938706.568,332.769
109,FF,666667.418,938725.667,326.569	233,SH,666827.141,938719.144,332.147
110,FF,666667.138,938728.920,326.538	234,SH,666837.287,938714.607,332.603
111,SH,666685.351,938726.847,327.195	235,SH,666847.470,938710.193,332.886
112,BLD,666699.212,938737.115,327.714	236,SH,666849.643,938698.050,333.158
113,BLD,666698.524,938740.612,327.598	237,SH,666851.768,938687.648,333.427
114,SH,666693.983,938749.480,327.262	238,SH,666845.065,938725.354,332.337
115,BLD,666697.372,938760.585,327.093	239,SH,666843.736,938733.935,332.005
116,BLD,666700.240,938766.370,327.154	240,SH,666834.883,938741.786,331.707
117,SH,666688.669,938758.316,326.945	241,SH,666825.509,938741.317,331.440
118,SH,666677.388,938760.922,326.541	242,SH,666816.523,938749.139,331.327
119,BLD,666679.895,938768.787,326.580	243,SH,666815.465,938738.232,331.351
120,SH,666667.611,938770.000,326.252	244,SH,666808.713,938719.009,331.950
121,BLD,666655.808,938771.721,325.814	245,SH,666797.606,938718.224,331.998

122,BLD,666648.235,938772.767,325.569	246,SH,666803.858,938715.008,332.217
123,BLD,666643.650,938773.528,325.455	247,SH,666790.493,938713.012,332.421
124,WT,666640.280,938769.175,325.522	248,SH,666775.471,938711.294,332.557