PROJECT REPORT

ON

ROUTE SURVEY OF MANDALA TO AWE , MORO LOCAL GOVERNMENT AREA, ILORIN, KWARA STATE

BY:
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HND/22/SGI/FT/0118

BEING A RESEARCH PROJECT SUBMITTED TO THE

DEPARTMENT OF SURVEYING AND GEO-INFORMATICS

INSTITUTE OF ENVIRONMENTAL STUDIES

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

JUNE 2025

CERTIFICATE

I hereby certify that all the information contained in this project report was obtained as a result of the observations and measurements made by me on the field and that the survey was executed in accordance with survey rules, regulations and departmental instructions.

……..…….
YEKIN RAUF OLUWAFEMI
DATE ……

CERTIFICATION

This is to certify that **YEKIN RAUF OLUWAFEMI** with Matric No **HND/22/SGI/FT/0118** has satisfactorily carried out the survey duties contained in this project report under my instructions and direct supervision.

I hereby declare that he has conducted himself with the due diligence, honesty and sobriety on the said duties.

…. …… **DATE: ……**

SURV. R.O ASHONIBARE

(SUPERVISOR)

…. …… **DATE: ……**

MR. ISAU IBRAHIM ABIMBOLA

(H.O.D)

…. …… **DATE: ……**

SURV. R. AWOLEYE

(PROJECT COORDINATOR)

…… **DATE: ……**

EXTERNAL SUPERVISOR

DEDICATION

This project write up is dedicated to the Almighty Allah, the lord of the universe and my loving and wonderful family **(THE YEKIN'S)**.

ACKNOWLEDGEMENTS

I give glory, honor and adoration to Almighty Allah,the author and the finisher, who has made me to endure the vigor of my study, I return all glory back to Him.

My profound gratitude goes to my able supervisor **SURV. R.O ASONIBARE** I pray that God will continue to bless you, your family and all yours. Special appreciation goes to all the members of staff in the department of Surveying and Geo Informatics, **MR.ABIMBOLA I. ISAU, SURV. A. ABDULSALAM, SURV. R.S AWOLEYE, SURV. A.O AKINYEDE, SURV. BELLO F. DIRAN, MR BOLA** for their intellectual impact and support one way or the other during the course of my study in the institution, may your wisdom, knowledge and understanding never seize, may God continue to bless you and all that concerns you (amin).

My sincere gratitude and unreserved appreciation goes to my wonderful, incomparable, optimistic, outstanding, golden, dynamic, able and responsible parents **MRS YEKIN SHAKIRA OLAWUYI**, who has been my sponsor for their prayers, provisions and support both financially and morally and the great confidence she deposited in me, her unrelenting efforts and piece of advice in spurring me to be the best I can, which led to the success in my academics, thank you very much, may you live long in good health and peace of mind and may the good Lord crown all your And appreciate to all friends that makes school life easy and fun **EMMANUEL,IFEOLUWA, AMEENA(IYA ZAYYAH), HABEEB, ZUGLOOL, IREMIDE, ADEMIDE.**

Thank you all.

YEKIN RAUF OLUWAFEMI

JUNE2025

ABSTRACT

The project was focused on the execution of route surveying for the purpose of road construction from Mandala to Awe, Moro Local Government Area, Ilorin, Kwara state. The total length covered is 3.5km and control Points were established and coordinated using GPS to minimize error. Stations were selected along the existing route at regular interval of 25m and pegging of cross section points were done at 8m to the left and right at 4m interval as in the specifications. Traverse was run over stations using Topcon (ES-103) total station, while levels were observed along the longitudinal and cross-sections of the traverse lines. All data were gathered with effective orientation from the controls. The data acquired were processed using AutoCAD 2010 and CivilCAD 2010, these data were used to produce the plans using the scale of 1:2500 showing horizontal alignment, profile and cross-sections.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Engineering Surveying is one of the branches of surveying which from the general express for any survey work carried out in connection with construction engineering and building project, it is a large scale topographical map survey which the basis for design of engineering works such as highways, railways, canals, tunnels, dams, pipelines and transmission lines.

In the word of engineering and environmental studies, surveying has been recognized as the inevitable operation been described as be the bedrock of every meaningful development. The greater part of its responsibility is seen from the various types of surveying which are all geared toward promoting route ways, convenience, accessibility and spatial declination of both natural and social environment. In addition, surveying means the activities of planning, designing, constructions, development and rehabilitation of roads, depending on the survey data required by the surveyor.

Route survey which is an aspect of engineering survey may be defined as the survey operation that is done for the establishment of the horizontal and vertical alignment of transportation facilities. It involved: planning, design and setting out of any route such as railways, highways, pipelines and canals etc. as obtained by a surveyor and it also involved the proper assessment of natural and man-made features.

In addition, this type of survey should be applied when there is need for alignment, expansion, or rehabilitation at any existing route (road) e.g. for traffic purposes. The reason is that route survey provides a plan/map that shows the alignment, details, profile and cross sectional leveling which depicts the nature of the terrain of a given strip of land which serves the purpose of location, design and construction of route networks.

Good road network is one of the basic amenities needed by human being as movement is one of the characteristics of living things. There are needs for people to move from one place to the other and transportation of goods and services. Therefore for any meaningful development in a country, good road is a must.

1.2 SIGNIFICANT OF THE PROJECT

It was discovered that the route from Mandala to Awe Village Moro Local Government Ilorin, Kwara State, had been badly eroded and full of potholes; also, the road is found to be too narrow and needed to be extended considering the volume of traffic plying the road. Rehabilitation of this road should be carried out in other to increase its carrying capacity thereby increase the physical development and human activities therein. Due to these, certain information about the road must be acquired which calls for route survey so as to get the baseline data necessary for the road design.

1.3 AIM(S) AND OBJECTIVES

1.3.1 AIM OF THE STUDY AREA

The main aim of this project is to carry-out Route Survey of Mandala to Awe Village in Moro Local Government Area, Kwara State. This is to provide geospatial information necessary for the rehabilitation of the road.

1.3.2 OBJECTIVES

To achieve the stated aim of the project, the following objectives were systematically executed:

1) Reconnaissance:

Conducted office planning and field reconnaissance to assess the project area.

2) Control Verification:

Checked the stability and accuracy of control points to be used for orientation.

3) Centerline Determination:

Established the centerline and marked chainages at 25-meter intervals along it.

4) Cross-Sectioning:

Marked selected points for cross-sectioning at 8m and 4m intervals to the right and left on the profile.

5) Alignment Determination:

Determined the alignment of the proposed road.

6) Detailing:

Carried out detailed surveying using Topcon (ES-103) total station to obtain precise data.

7) Plan Production:

Produced a graphical representation of the surveyed roadway, scaled appropriately to reflect the findings accurately.

8) Report Writing:

Documented all project activities in a comprehensive report, following the prescribed guidelines.

1.4 PROJECT SPECIFICATIONS

The following are the specification to be ascertained in the project:

Traverse must commence on two coordinated (known) controls and closed on another set of two coordinated controls which must be confirmed undisturbed by necessary measurement (control checks).

Third order theodolite traverse must be run along the route on all turning points at one zero observation and the angular difference from both faces should not be more than thirty seconds (30"), the angular misclosure is determined by 30"$\sqrt{n}$,

Where ‘n’ is the total number of station observed.

Establishing traverse points by using pegs together with nails and bottle corks.

Spirit leveling must commence on a known benchmark and closed back on another known benchmark. Formulae for its misclosure are ±24mm√k, where 'k' is the total distance covered in kilometers.

Leveling must be observed at every 25m intervals on the centre line and at 3.25m intervals on both sides of the centre line for the cross sectioning. Edges of drainage at both sides should be heightened.

Fixing of relevant features to enhance assessment and necessary composition for good interpretation of plan.

The accuracy of the project must fall within the order of the project.

1.5 SCOPE OF THE PROJECT

The entire project covered the following:-

1. Reconnaissance (both office planning and field reconnaissance).
2. Data acquisition:
    i. Selection of stations.
    ii. Traverse angular observation and data recording.
    iii. Linear measurement with the aid of Dumpy Level.
    iv. Topcon (ES-103) total station for traverse centre line and adjacent sides (longitudinal or profile and cross sectioning).
    v. Fixing of details by tacheometry method.
3. Computations to determine:

i. Horizontal coordinates (i.e. x and y coordinates)

ii. Vertical coordinates (i.e. z coordinates) by level reduction.

iii. Setting out angles and distance for the curve.

iv. Data analysis i.e. comparing result obtained with the required accuracy.

4. Data presentation :

i. Production of horizontal alignment (i.e. plan showing existing features and the propose route).

ii. Production of longitudinal section plan

iii. Production of cross section plan

iv. Project report writing: - This involves writing of detail report in connection with entire project done in conformity with the outline given by the project supervisor.

1.6 *PERSONNEL*

The underlisted students of HND II 2024/2025 set are the personnel that participated in the execution of this project. They are:

YEKIN RAUF OLUWAFEMI (WRITTER)	**HND/22/SGI/FT/0118**
PIUS RACHEAL NAOMI	HND/23/SGI/FT/0087
OMOLABI MARVELOUS TAIWO	HND/23/SGI/FT/0089
FADUMILA KAYODE OLUWATUBOSUN	HND/23/SGI/FT/0082
MOHAMMED NAFISAT	HND/23/SGI/FT/0088
AKINPELU OLASHILE RIDWAN	HND/23/SGI/FT/0085
AHMED SAHEED TOYYIB	HND/23/SGI/FT/0084
ADEDEWE VIVIAN ODUNAYO	HND/23/SGI/FT/0115

1.7 PROJECT AREA

The project site is the route of Mandala to Awe Village Moro Local Government Area Ilorin Kwara State. It cover approximately 3.5km extent of land. With geographical coordinates of :

Long. 004°28’07”

Lat. 008°32’55”

Long. 004°28’07”

Lat. 008°32’55”

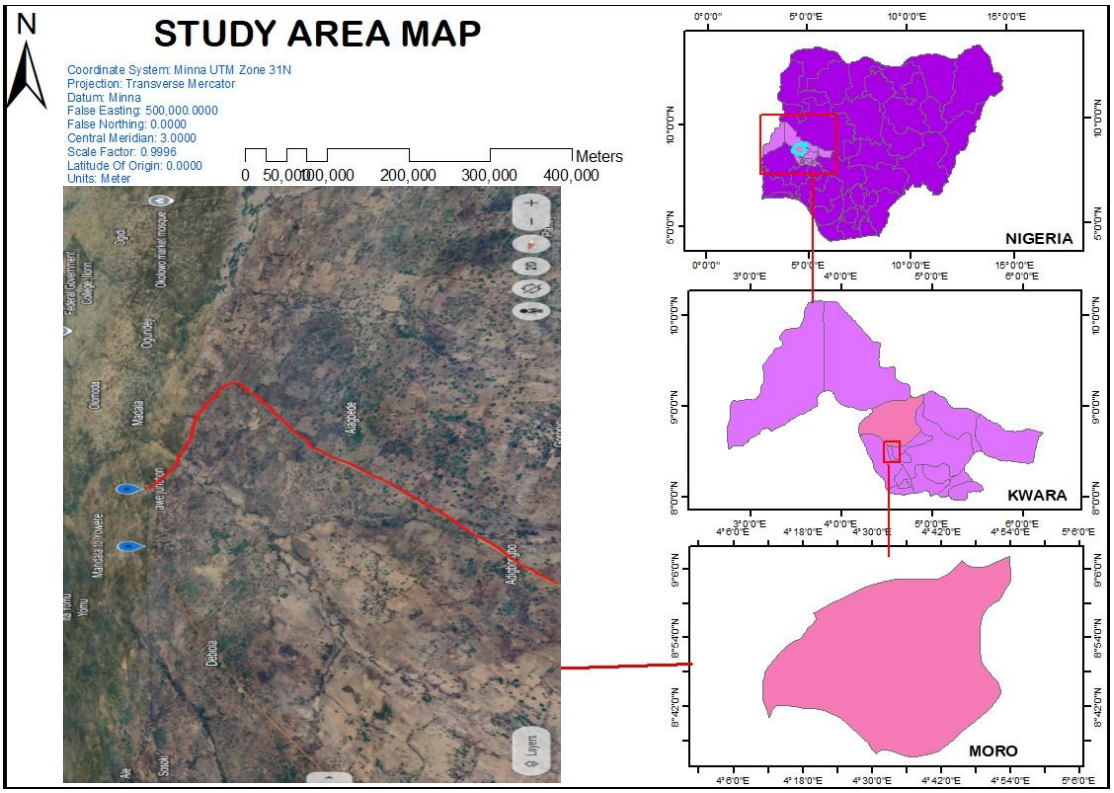


Fig 1.1: Study Area

Source:-GoogleEarth

CHAPTER TWO

2.0 LITERATURE REVIEW

Surveying has to do with the determination of the relative spatial location of points on or near the surface of the earth. It is the art of measuring horizontal and vertical distances between objects, measuring angles between lines, determining the direction of lines and establishing points by predetermined angular and linear measurements. Distances, angles, directions, locations, elevations, areas and volumes are thus determined from the data of survey. Survey data Is portrayed graphically by the construction of maps, profiles, cross sections and diagrams (Oregon Department of Transportation, 2000).

Schofield (2001) defined surveying as the science of determining the position, in three dimension of natural and man made features on or beneath the surface of the earth. These features may then be represented in analog form as a contoured map, plan or chart, or in digital form as a three dimensional mathematical model stored in the computer.

There are different operations in surveying namely; Control survey, Boundary survey, Topographical survey, Hydrographic survey and Route survey.

Route survey is therefore defined as the survey done along a comparatively narrow strip of territory for the location, design and construction of any route of transportation. Oregon Department of Transportation (2000), while presenting a seminar also stated that it refers to those controls, topographical and construction surveys necessary for the location and construction of highways, railroads, canals, transmission lines and pipelines. Route survey is very useful in the determination and establishment of difference in elevation between two or more points. It includes the field and office work required to plan, design and lay out any “long and narrow" transportation facilities. Also, it deals with earthwork which covers the movement of soil or rock from one location to the other for construction purposes. (Harry.L.Field and Michael T. 2006).

The need for surveying as a base for planning and the process of acquiring data of route alignment with special attention on road network, construction and

rehabilitation cannot be overemphasized. In view of this, the principle of surveying in general and route surveying in particular is the comprehensive aim of the project.

Transportation being a great function and purpose of route survey is regarded as the fulcrum upon which every other sector of the economy revolves. It is as well the movement of people, goods and services from one place to another, be it on land, water or by air. (Microsoft Encarta Encyclopedia, 2009).

In this wise, transportation has contributed immensely to the economic development of nations in which our dear country (Nigeria) is involved. Here are some benefits derived as a result of good transportation network.

I. It aids movement of goods and services
II. It assists in the dissemination of ideas as well as technology
III. Opening up of new land and abandoned areas
IV. It assists in national integration

Besides, route survey has contributed immensely as touching construction sectors of the engineering surveying.

Engineering surveying which breeds both route and construction survey involves the application of knowledge to the analysis, design and execution of surveying and mapping projects, and the design of land mapping and information system. Mikhail. E (1977) opined that surveyors rely on an understanding of the science of surveying measurements and the surveying principles.

Moreover, it is vividly seen that surveying plays extremely important role in any construction project. Surveying can take many forms, it aids in establishing the location and alignment of highways, buildings, pipes and other man made or cultural projects. (James C. 1985).

A route survey as the name implies is a survey that deals with the route or course that imaginary road or utility line will follow while the end product of a route survey for a highway certainly differs from that of a utility line. The major reason for carrying out route surveying is to facilitate movement of people, yielding to socioeconomic benefits (i.e by determining the best general route between terminals).

Reginnal (1968) defined route survey as the topographical and construction survey necessary for the location and construction of lines of transportation or communication such as highways, canals, transmission lines and pipelines. He stated that the location and construction survey may consist of:

i. Establishing the centre line by setting at intervals and running level to determine profile of the ground along the centre line.
ii. Taking cross section.
iii. Plotting such profile and fixing grades.
iv. Calculation volume of earthwork.
v. Measurement of drainage areas.
vi. Laying out structures such as bridges and culvert.

It is a reality that surveyors are the major professionals needed when it comes to working on any engineering project, for example, Building project. They provide special information such as; site location, size of the parcel, the dimension and total area. The finished product (plan) forms the basis upon which further development depends.

The line projected by preliminary surveys, after it has been carefully studied and compared with regards to the cost and operating expenses would be made of the scheme to be adopted. Final location may be performed entirely on the field whereby the surveyors use the gradients shown in the profile as a guide seeking for improvement in the alignment. The detailed work would be performed by traversing (David, 1983).

The execution of route surveying entails some basic processes as far as data acquisition is concerned. These are outlined as follows:

i. Traversing
ii. Leveling
iii. Detailing
iv. Curve designation

Traverse is a sequence of connected straight lines whose direction and distances have been measured. Traverse is also the process of connecting series of lines with known bearings and distances. It is subdivided into first order for precise

measurement and second order for the establishment of secondary controls while the third order is meant for survey of tertiary and topographical features.

Furthermore, route surveying consists of the following sequence of survey :

i. Reconnaissance of the terrain between the terminals
ii. Preliminary survey over one more location along the general route recommended in the reconnaissance report
iii. Location survey
iv. Construction survey.

i. **Reconnaissance survey:** it is a rapid but thorough examination of an area or a stripe of territory between the terminal of the project to determine which of the several possible routes may be worthy of a detailed survey. Reconnaissance survey is the most important of the series of surveys mentioned above. A very thorough and exhaustive examination of the whole area should be made to ensure that no possible route has been overlooked.

ii. **Preliminary survey:** it is the detailed survey of a strip of territory through which the proposed line is expected to run. The preliminary survey is made of the best several lines of directions investigated previously on the reconnaissance survey. The purpose is to prepare an accurate topographic map of the belt of country along the selected route, and thus arrive at fairly close estimate of the cost of the line/direction surveyed.

iii. **Location survey:** The location survey is the ground location of the proposed. Line marked on the map. The main purpose of location survey is to make minor improvements on the line as may appear desirable on the ground, and to fix up the final grades. Profile levels are run over the centerline, benchmark is established, and profile which shows the existing ground level and the grade line is attained. Cross section notes are taken in order that the quantity of earth work for filling or cutting may be computed.

iv. **Construction surveys:** The purpose of construction survey is to re-establish points, lines and grades on the ground during construction. It also consists of

staking out various details culverts and bridges and in carrying out such other surveying as may be needed for the purpose of construction. (Schofield 2001).

At the concept and design stage, large scale topographical surveys are produced and other measurements upon which projects are designed. Since this data forms basis to a great extent on the precision and thoroughness with which the survey is carried out.

Profile leveling (longitudinal leveling) is an operation performed to determine the elevation points spaced apart at known distances along given line in order to obtain the accurate outline of the surface of the ground along the line. It is very useful for projects like construction and design of sewer, pipelines etc., and to determine the cut and fill. It is frequently essential to run a longitudinal section along various proposed centerlines and to compare their costs to select a suitable one (Duggal S.k, 2006).

Cross sectioning, according to Duggal (2006), is a leveling operation performed to determine the elevation of the points at right angles on either side of the centerline of the proposed road and radially on the curves. This is done to find out the vertical sections of the surface of the earth on the ground. The detailed information regarding the levels of the ground on either side of the longitudinal section helps in computing the quantity of the earth work. The cross sections are plotted in the same manner as longitudinal sections.

Flying leveling (checking leveling) should be done to connect the bench mark (BM) to the starting point of the work. The records pertaining to profile leveling are entered accordingly along with the cross sectional leveling while the leveling work is in progress. The cross sections are taken perpendicular to the center line of the alignment at some regular intervals. The purpose of cross section is to know the undulation of the ground surface.

According to Anderson and Edward (1985), route survey refers to those controls and construction surveys necessary for the location and construction of line transportation and communication which may include highways, railways, canals, transmission lines, pipelines.

Finally, Route survey involves the determination of ground configuration and location of physical features both natural and artificial along the proposed route, establishing the line on the ground and computing volumes of earthwork involved where applicable (Schofield, 2001).

This kind of survey operation is very important on all road networks and in construction of new road which will increase the durability and carrying capacity of road networks.

CHAPTER THREE

3.0 METHODOLOGY

Methodology comprises of the method and procedure employed in executing the project both in office and on the field. The method adopted for this project was based on the principle of surveying which was working from whole to part, aim at acquiring reliable and accurate data needed for the computation and presentation of information in form of a plan.

The procedure adopted in carrying out the project followed a pattern in which one step leads to another, for easy execution and for the aims and objectives of the project to be realized, it was planned as under listed;

I. Reconnaissance survey
II. Chainage marking
III. Control establishment
IV. Data acquisition
V. Data downloading and processing
VI. Data analysis
VII. Road design
VIII. Information presentation

3.1 RECONNAISSANCE

This is a very important aspect of surveying that involves planning and preliminary inspection of the area before the commencement of the actual data acquisition of the project site, this is done for the purpose of planning on how to execute the project, fixing stations, locating controls etc. its importance to the actual survey operation that cannot be underestimated as it enable it to give the best method to carry out the task.

The two phases of reconnaissance are;

v. Office planning
vi. Field reconnaissance

3.1.1 OFFICE RECONNAISANCE

This involved the office work carried out before the actual field work. This aspect involved the computation and study of the available information the project site as this helped in yielding result within the expected accuracy. It comprises of the following

I. Understanding the purpose of the survey from the project instructions.
II. Obtaining the specification for the accuracy required leading to the choice of a suitable scale.
III. Deciding the method to be employed for the measurement.
IV. The kind of instruments to be used in executing the project.

The coordinates of control stations around the project area were collected from the SOUTH GALAXY G1 (GNSS receiver).

Table 3.1 coordinates of the existing ground control used origin (U.T.M)

Control id	Easting (Nm)	Nothing (Nm)	Height (m)
BM1	661425.0232	945950.9002	324.7349
BM2	661402.8991	945939.4238	324.8356
BM3	661457.0369	945934.9219	324.0516

3.1.2 FIELD RECONNAISSANCE

The field reconnaissance was done after the office planning it involved a visitation to the project site by all the group numbers to have a pre requisite knowledge of how it looks like and how the field operations would be carried out.

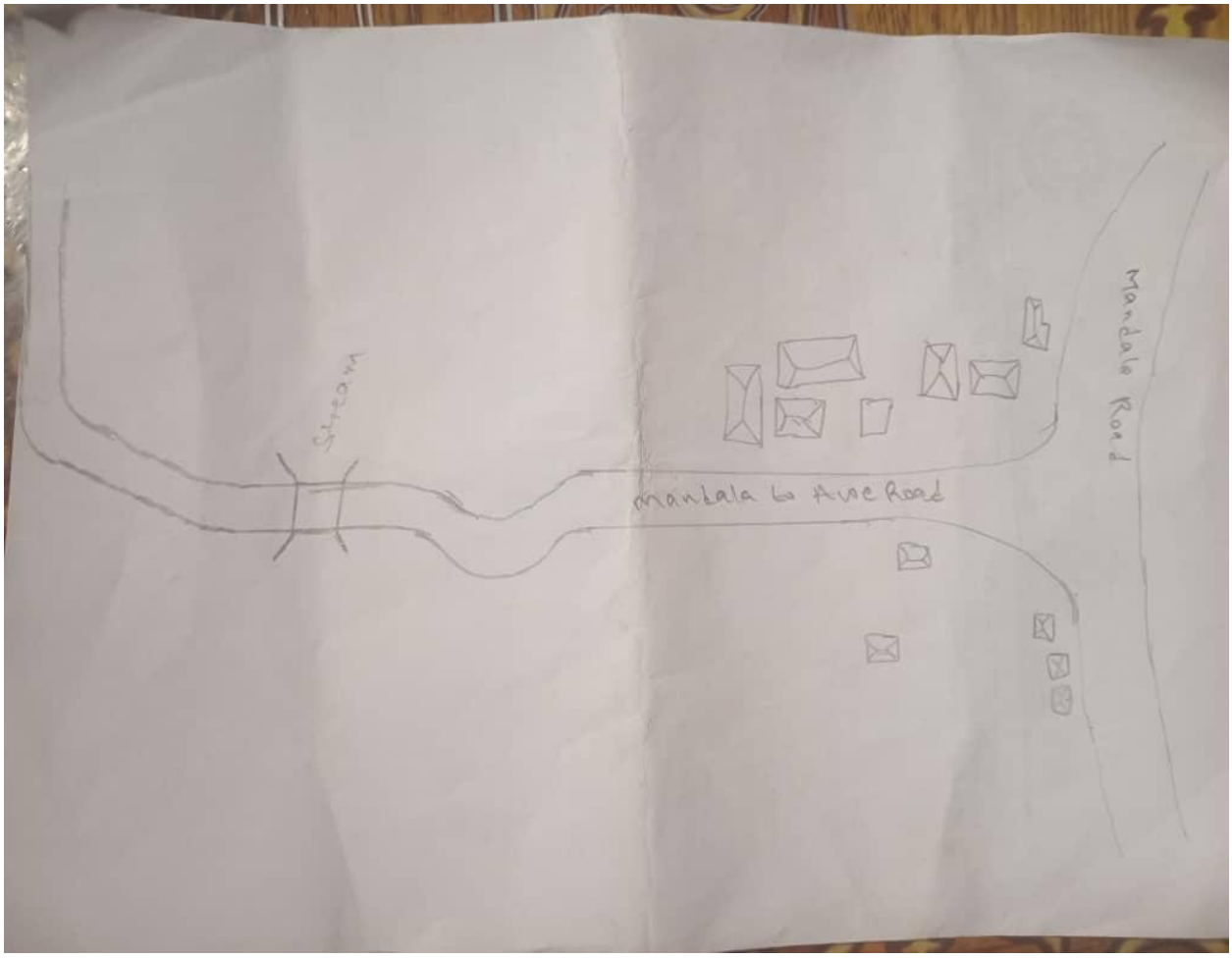
During the visit the control pillars planned to be used were located, traverse stations which were to form the traverse framework were selected and marked using pegs and nails, inter visibility between successive traverse station were ensured.

At the end of the visit, a sketch diagram known as “recce diagram” showing the physical appearance of the project site was drawn.

To sum up the reconnaissance facilitated the planning and execution of the actual survey as it was taking into consideration the possible problems that are likely

to be encountered, how such problems can be overcome or reduced to the barest minimum.

Fig. 3.1.1 Field Recci diagram Mandala Via Awe to Adigongo Route.



3.1.2 A TYPICAL PEG USED

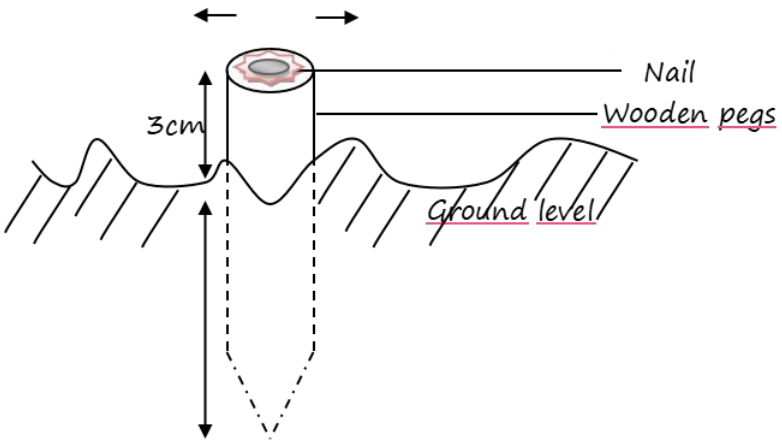


Fig 3.2 An Illustration diagram of peg

3.3 DATA ACQUISITION

This entails all activities involved in the collection of data for the successful execution of the project. This was carried out in chronological order using mode digital surveying equipment such that: they were coordinated using Topcon(ES-103) total station, the position of the center line was determined using Topcon(ES-103) total station and also both national and man-made features were observed and determined.

3.3.1 EQUIPMENT USED

I. Topcon (ES-103) total station
II. Tripod stand
III. S50mm steel tape
IV. 5m packet tape
V. Plumb pop
VI. Nails with crown corks
VII. Downloading cables
VIII. Writing materials

3.3.1.1 HARDWARE USED

The hardware used for this project includes.

vii. Laptop computer for data processing

viii. An Hp desk set for the printing of hard copy

3.3.1.2 SOFTWARE USED

I. Note pad
II. Microsoft excel 2010
III. Civil cad 2010
IV. Hp printer devices

3.3.2 CONTROL CHECK

The essence of carrying out the operation was to ascertain the reliability of all the controls used for the project whether they were in situ. The check was carried out by setting total station instrument on BM1 and all the necessary temporary station adjustment(i.e catering; leveling and focusing) was carried out, the reflector at back station on BM2 was then bisected, read and recorded, the instrument was turn to fore station BM3 and the reflector was also bisected read and recorded and on getting to every 500m interval where there are 2 benchmarks on the both side of the road same procedures where adopted in until the end of the road.

The coordinates obtained were compared with the coordinates extracted from the use of SOUTH GALAXY G1(GNSS receiver) which the result shows that the discrepancy was very little and lower than the allowable standard for the specification of this project which shows that BM1, BM2 and BM3project were reliable enough for the third order survey project given.

Table 3.3.2.1 showing the collected co-ordinates of the controls

STATION	EASTING (Nm)	NORTHING (Nm)	DISTANCE (M)	BEARING
BM1	661425.0232	945950.9002	324.7349	
BM2	661402.8991	945939.4238	324.8356	$179^0$14’ 9”
BM3	661457.0369	945934.9219	324.0516	$24^0$27’ 53”

Source: Supervisor (May 2025)

Table 3.3.2.2 showing the observed co-ordinates of the controls

STATION	EASTING (Nm)	NORTHING (Nm)	DISTANCE (M)	BEARING
BM1	661425.0232	945950.9002	324.7349	
BM2	661402.8991	945939.4238	324.8356	$179^0$14’ 9”
BM3	661457.0369	945934.9219	324.0516	$24^0$27’ 53”

The included angle = bearing of bm2 to bm1 minus bearing of bm2 to bm3

Table 3.3.2.3.showing the Comparison of observed and computed data

	Bearing	Back dist (m)
Computed value	179^0 14’ 09”	220.590
Observed value	24^0 27’ 53”	14.6427
Error	$00^0$01’ 06”	0.006

For the control points, the allowable heights misclosure were lesser than obtained misclosure for each control point. There, the set of controls (bm1, bm2and bm3) were in situ vertically and could be used as benchmark for height determination of profile and cross sectional points.

3.3.3 SELECTION OF STATION

The station selected were ensured to be inter visible to each other, accessible and firmly pegged to the ground with wooden pegs and bottle corks carrying mills at the centre point to denotes its exact point on the earth surface.

3.4 FIELD OBSERVATION

3.4.1 HORIZONTAL ALIGNMENT

This way carried out on loops with the aid of Topcon (ES-103) total station which has the capability to capture all the three dimensional (3d) terrain characteristics (easting, northing and height) concurrently. To control swing, the observation we carried out by commencing it on a set of controls and ending on another control from loops.

The instrument was set up on Bm2 and the reflector was placed on Bm1and the orientation was performed, the reflector was placed at change 0+000, which was the starting point of the route survey. The chainage 0+000 served as nail.

The target (reflector) was properly leveled and the coordinate of all the changes in the direction were observed and recorded in the internal memory of the instruments; other points which were visible from this instrument station were bisected and coordinated. This was done repeatedly until the entire section of the route was covered.

3.4.2 LONGITUDINAL / PROFILING

This was carried out with the aid of Topcon (ES-103) total station as well. The instrument was set on Bm2 and the reflector was placed on Bm1and the orientation was at every 25m interval. Whenever the target from the instrument station is too far and cannot be sighted from the instrument which might affect the accuracy of data, another stations were coordinated station where same procedures were repeated until all the data were captured.

CHAPTER FOUR

4.0 DATA PROCESSING AND RESULT ANALYSIS

4.1 DATA PROCESSING PROCEDURE

This is the process that follows downloading of data into the computer system. It is the manipulation of data into a more used form. Data processing includes numerical calculation, classification of data and the transmission of data from one place to another.

This stage involves downloading of the acquired data on field from the digital equipment (total station) to the personal computer for further processing.

The data obtained using Topcon(ES-103) total station were downloaded in sequential arrangement. After successful download and process using notepad for sorting them into desired arrangements.

The file was opened and point data were displayed. This was then copied to Microsoft excel environment for further processing.

On Microsoft excel, data were prepared for scripting purpose in AutoCad. A small program was written to prepare point and text scripts files.

The coordinates obtained were x,y,z format which were used for plotting the routes longitudinal profile and cross sections.

4.2 TOTAL STATION DATA PROCESSING

The downloaded data from the total station was further edited using Microsoft excel, the final copy was saved as text file containing x,y,z coordinates of all points observe in the field.

4.3 DATA EDITING

Data editing is done using the Microsoft excel. The following steps are followed to edit our data in the project:

i. The Microsoft excel was lunched.
ii. Click on file, the click on “all file” and select the group data.

iii. On open “test import wizard”, select “delimitated” and click on next.

iv. Select comma, tap and space then click on next. All the co-ordinates will be arranged then click on finish.

Cut and copy and put them in its appropriate positions if there is any misclosure.

4.4 DESIGN AND VOLUME CALCULATIONS

The design of the route was done after the creation of the longitudinal profile. The longitudinal profile was created using AutoCAD Civil 2012. The steps in the creation of the longitudinal profile are as follows:

1. The Centerlines of the entire data is first extracted and arranged in Microsoft Excel and saved with the extension txt.
2. The AutoCAD Civil 2012 Software is launched.
3. A new project is created and named
4. The Units icon is clicked to set the units of the drawing as follows:

v. Length

i) Type- Decimal

ii) Precision- three (3) places (i.e., 0.000)

vi. Insertion Scale

IX. Units to scale inserted content- Meters

vii. Angle

i) Type- Deg/Min/Sec

ii) Precision- 0d00’00”

iii) The Clockwise Box below is clicked

5. The Direction icon below is clicked and a direction control dialogue box is opened. The North is selected.
6. The icon Points is clicked, the point settings are selected. The Coordinates icon is clicked to select the method of data arrangement (i.e., Easting-Northing). The type of Marker is also selected.
7. Under the point icon, the import/export point icon is selected.
8. The import point’s icon is selected. A dialogue box opens, the format in which the data is arranged is selected (E.g., ENZ (space delimited)). Also, the source file where the data is saved and ok is clicked to continue.

9. The points are imported and are joined with the polyline drawing icon on the AutoCAD Civil 2012 Environment. The OSNAP (object snap) below the AutoCAD Civil 3D 2012 Environment is switched on so as to highlight the endpoints for ease of joining the points.
10. On the Alignment icon, the icon define from polyline is selected.
11. The line is clicked and where the alignment is to start is also clicked; a dialogue box opens and the alignment is named.
12. On the Alignment icon, the station label settings is clicked; the station label increment, station tick increment and the station label offset are edited appropriately. The perpendicular labels and plus sign location are also clicked. Then the station labels are also created.
13. The Terrain is created by clicking on the Terrain icon, Terrain Model Explorer is selected. A dialogue box opens; a new surface is created and named. The point files are added, the format in which it is arranged is selected as well as the file where it is located. The surface is built by right clicking on it and select build. When the surface is built, the dialogue box is closed.

4.4.1 PROFILE GENERATION

On the Profile icon, sampling is selected and import is clicked. The Tangent Labels, Vertical Curve Labels and the Vertical Grid Lines values are edited appropriately. The created surface is made current by clicking on surfaces and set current surface. The profile is sampled by clicking on existing ground, sample from surface and accepting the beginning and ending stations. Then the profile is created by clicking on create profile, full profile is selected; a dialogue box opens where the grid height is adjusted and ok is clicked.

When the profile is created, the route is designed by first creating the Tangents along the route and the Vertical Curves are created by selecting the incoming and outgoing tangents and inserting the K- Value (see appendix).

4.4.2 CALCULATION OF THE VOLUME OF EARTHWORK

One of the applications of survey products (profile and cross section) is in determining the estimate of the volume or quantity of earthworks, it is necessary to know the volume of materials which would be required to cut and to fill in road construction. For the scope of this project, the volume and fill were determined from

the cross section using AutoCAD land development software. This is done also for subsequent cross-sections and the volume is cumulatively summed up to obtain the final cut and fill (see appendix)

4.4.3 CUT AND FILL ANALYSIS

This is an important aspect in route survey data analysis. The volume of earthwork needed can be calculated to a high degree of accuracy. It helps in the area of project costing to determine earthwork and materials quantity. The cut and fill table is shown in the appendices. The total cut was estimated to be 16803.12m3 while the total fill is estimated to be 10563.82m3. Having subtract the total fill from the total cut, therefore, the volume of material needed to be cut is 6239.30m3

Refer to the appendix for the entire cut and fill data (Appendix).

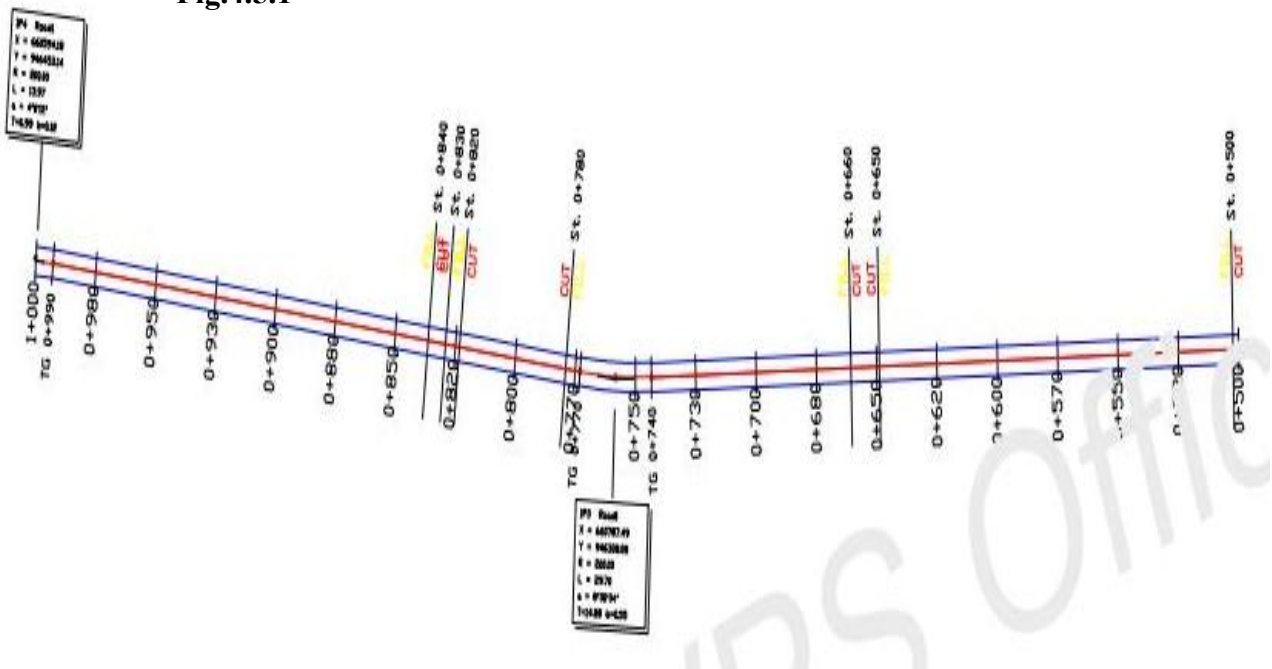
4.5 INFORMATION PRESENTATION/ PLAN PRODUCTION

The adjusted coordinates (X, Y, Z) were plotted in AutoCAD Civil 2012 Environment to generate the centerline of the road, longitudinal profile and cross-section. The details were also plotted.

4.5.1 DETAIL PLAN

The essence of obtaining a detail plan is to provide a platform for horizontal curve and alignment design for the road expansion/rehabilitation. Geometric information is also shown on the detail plan making a vivid representation of the land mass for easy understanding of the route.

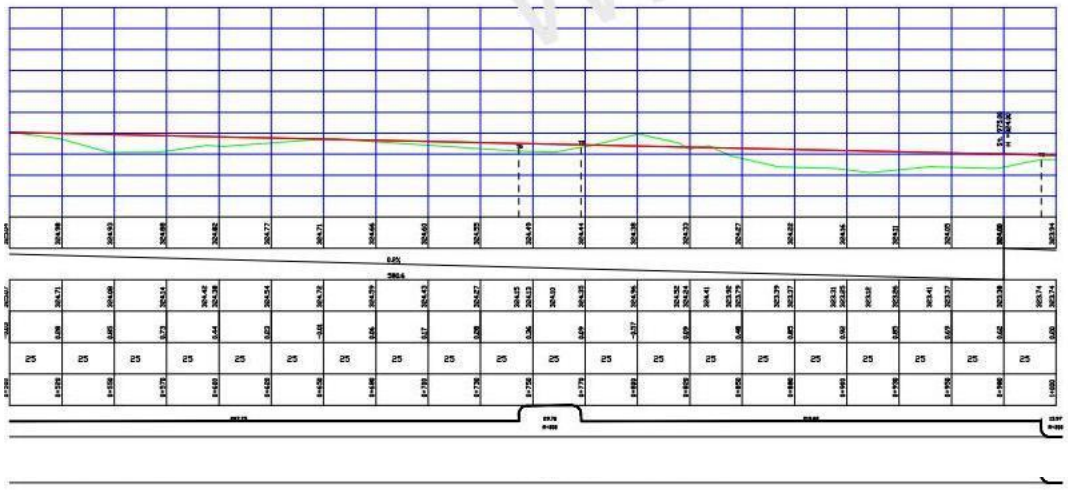
Fig.4.5.1



4.5.2 LONGITUDINAL PROFILE

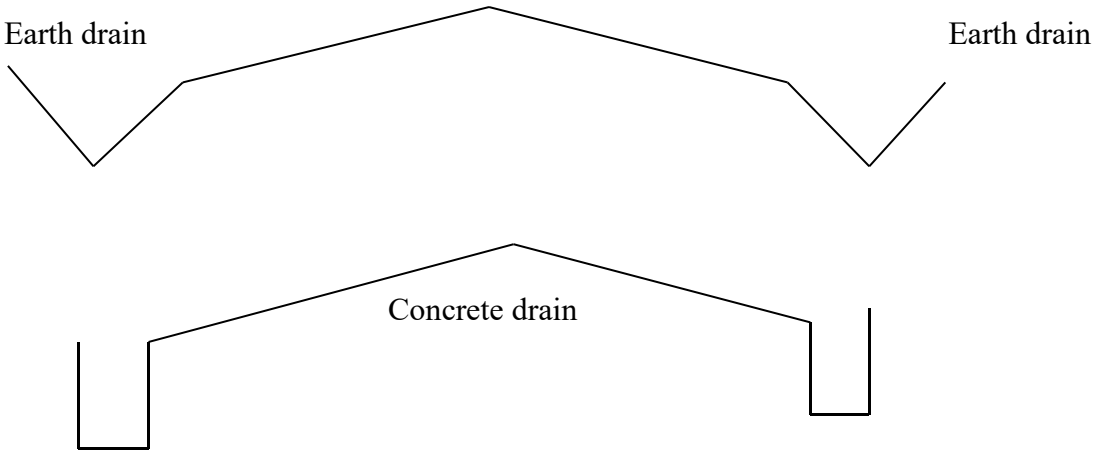
Profile was generated to provide vertical height/terrain information along a route for vertical alignment/curve design. It provides a vivid picture of the terrain and decisions of where to cut or fill was determined. It provides information such as the grade percent, tangent points, existing level and formation level.

Fig.4.5.2



4.5.3 CROSS-SECTIONS

Cross-section depicts the terrain information across the road chainage. Information such as the height of existing and proposed center line and embankments were shown. The cross-section parameters were used to generate the area and hence, volumes of earthwork in cut and fill analysis (see appendix).



Earth drainage was used throughout except where we have culvert, concrete drainage was used 150m before and 150m after each culvert, the culvert used was 800mm by 800mm because the volume of the water that will be flowing there is much. The concrete drainage used was 0.10cm thick and 0.60cm by 0.60cm for easy flowing of waters.

Having carried out the flying method to checks on the linear accuracy of the closing control, it was discovered that the linear accuracy conforms with third order accuracy which show that the closing controls could still be used for this project.

CHAPTER FIVE

5.0 COSTING, SUMMARY, PROBLEM ENCOUNTERED, RECOMMENDATION AND CONCLUSION

5.1 PROJECT COSTING

To achieve this, the various project parameters were considered and their cost calculated to arrive at the total cost of the project. The costs are determined according to the project phases which are as follows;

i. Reconnaissance
ii. Field operation
iii. Data Processing
iv. Information presentation

Each of these aspects was cost based on the following components

i. Personnel
ii. Equipment
iii. Transportation
iv. Accommodation
v. Beaconing

COST AND ESTIMATION

1(a) RECONNAISSANCE

Duration (Estimated number of days = 2)

Personnel Daily Rate ₦	**Amount ₦**
1 Senior Surveyor	25,814.00
1 Technical Officer	20,542.00
4 Skill Laborers	5,078.00

1(b) TRANSPORTATION

Field Vehicle	
Mechanic	15,000.00
Driver	30,162.24
Fuel	20,432.91

1(c) FEEDING

Feeding for four person	₦10,000.00
TOTAL COST FOR RECONNAISSANCE	**₦208,931.1**

FIELD OPERATIONS

2(a) MONUMENTATION

Duration Estimated (Number of days) = 1

Personnel Daily	**Amount ₦**
1 Assistant Tech. of Officer	18,542.00
2 Labourers	4,076.00
3,000 Standard pegs	400.00
Basic Tools (Digger, Shovels, trowels, nail, hammer etc.)	15,000.00

2(b)TRANSPORTATION

Fuel	20,432.91
Driver	30,162.24
TOTAL COST OF MONUMENTATION	**₦1,288,213.1**

3(a) DATA ACQUISITION

Duration estimated number of days = 5 days

Personnel Daily	Amount₦
1 Surveyor	25,934.00
1 Assistant Surveyor	22,501.00
4 Labourers	4,078.00
Sub Total	**₦323,735.00**

3(b) EQUIPMENT LEASING

1 Total Station (With its accessories)	40,000.00
5 Ranging Poles	1,000.00 - 5,000.00
2 Cutlasses	2,000.00 - 4,000.00
Sub Total	**₦49,000.00**

3(c) FEEDING

5Days	5,000.00 -25,000.00
Sub Total	**₦25,000,00**

3(d) TRANSPORTATION

Duration estimated number of days = 5 days

Fuel	20,432.91- 102,164.5
Driver	5 Days
TOTAL COST OF DATA ACQUISITION	**₦510,822.75**

4. DATA PROCESSING AND PRODUCT GENERATION

Duration (Estimated number of days = 3 days)

Personnel Daily	Amount ₦
1 Surveyor	25,814.00 - 77,442.00
1 Computer Analyst	25,000 - 75,000.00
1 Computer hardware	12,000.00 - 36,000.00
Total	**₦565,326.00**

5. PLOTTING/TECHNICAL REPORTS

Duration (Estimated number of days = 2 days)

Personnel Daily	Amount ₦
1 Surveyor	25,814.00 - 51,628.00
1 CAD Operator	20,000.00 - 40,000.00
1 Clerical Officer	10,000 - 20,000.00
Total	**223,256.00**

6 ROUTE DESIGN

Duration estimated number of days = 2days

Personnel Daily	**Amount ₦**
1 Surveyor	25,814.00 - 51,628.00
1(one)Cad Operator	20,000.00 - 40,000.00
1 (one)Computer Hardware	12,000.00 - 24,000.00
Software used	10,000.00 - 20,000.00

Sub Total	**₦271,256.00**

7. PLAN PRINTING

Duration estimated number of days = 2day

Quantity Rate	Amount ₦
10 copies computer printing	1,200.00 - 12,000.00
10 copies of report	6,000.00 - 60,000.00
Binding	3,000.00 - 30,000.00
Sub Total	**₦102,000.00**

COST OF PROJECT EXECUTION	**₦3,567,539.95**
CONSULTANT FEES 20% OF TOTALCOST OF PROJECT	**₦713,507.90**
CONTINGENCE 5% OF TOTAL COST OF PROJECT	**₦178,376.9975**
VAT = 5% OF TOTAL COST OF PROJECT	**₦178,376.9975**
TOTAL COST OF PROJECT	**₦4,637,801.845**

5.2 SUMMARY

The project covered a total length of 3km. The field work however involved the following processes; Reconnaissance, Monumentation, Traversing, and Detailing. topcon (es-103) total station was used for the data acquisition and its software for downloading and transforming the acquired data respectively. The adjusted coordinates were used for the production of the final plans.

5.3 PROBLEM ENCOUNTER

During the cause of the project, the following problems were encountered

viii. Obstruction of the chain-man by dust and

ix. Movement of vehicles along the project site.

5.4 RECOMMENDATION

Having successfully carried out the project exercise, I hereby recommend the following,

v. The data and results obtained from this project could be used for further construction analysis

vi. The results obtained can further be used for more research work along/within the road limit

vii. Practical of such should be given to students not for final year project alone as it broaden student knowledge of engineering aspect of surveying

viii. Application of computer programming should be fully implemented so as to make the student carry out the data processing exercise faster and efficiently

ix. The school authority should provide adequate equipment especially, digital instruments to the students so as to improve the accuracy and the speed of the project execution

5.5 CONCLUSION

The field work, processing and presentation was a success and this was due to proper planning and precaution taken at every stage of the project, and the entire information for the design and construction of the road was obtained within a short period.

The aim of this project was achieved at the end of the exercise whereby a vertical, horizontal alignment and cross section plan was produced.

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APPENDIX

POINT ID	EASTING	NORTHING	HEIGHT
tbm1	661425.0232	945950.9002	324.7349
tbm2	661402.8991	945939.4238	324.8356
0+00	661442.200	945926.970	324.735
0+25	661420.000	945938.470	324.836
0+50	661398.690	945951.520	324.052
0+75	661378.780	945966.520	324.381
0+100	661359.372	945982.380	324.975
0+125	661339.530	945997.580	324.401
0+150	661319.190	946012.120	324.517
Bld1	661298.380	946025.970	324.721
Bld2	661220.130	946039.130	324.038
ep1	661255.720	946052.050	325.034
0+175	661234.310	946064.960	325.367
0+200	661212.910	946077.870	325.296
0+225	661191.370	946097.560	325.744
0+250	661169.380	946102.460	325.889
0+275	661147.310	946114.200	325.735
0+300	661125.240	946125.950	325.836
0+325	661100.170	946137.690	325.052
epl2	661038.110	946149.440	325.381
0+350	661059.090	946161.280	325.975
0+375	661037.130	946173.240	325.401
0+400	661015.220	946165.270	325.517
0+425	660993.310	946197.310	324.721

0+450	660971.400	946209.350	324.038
tbm3	661457.0369	945934.9291	324.0516
tbm4	659614.397	946950.4665	325.3805
epl3	660949.490	946221.300	324.034
sch1	660927.600	946233.430	324.367
sch2	660275.670	946245.470	324.296
0+475	660883.760	946257.510	324.744
0+500	660661.840	946282.230	324.735
0+525	660618.840	946295.060	324.836
0+550	660787.490	946308.077	324.052
0+575	660776.140	946321.080	324.381
0+600	660754.860	946334.190	324.975
0+625	660733.920	946347.850	324.401
tbm5	659610.4873	946908.8838	325.975
tbm6	657863.5358	947370.1275	325.407
0+650	660713.372	946362.080	323.517
0+675	660693.220	946376.870	323.721
rd1	660673.400	946392.120	323.038
rd2	660653.620	946407.400	323.034
0+700	660633.830	946422.680	323.367
0+725	660614.050	946437.960	323.296
0+750	660594.180	946453.140	323.744
0+757	660574.100	946468.030	323.889
0+800	660553.810	946482.610	323.735
0+825	660533.310	946496.950	323.836
0+850	660512.610	946510.970	323.052
0+875	660491.720	946524.690	323.381

0+900	660470.620	946538.110	323.975
0+925	660449.340	946551.230	323.401
0+950	660427.880	946564.040	323.517
0+975	660406.230	946576.550	323.721
1+000	660384.410	946588.750	323.038
1+025	660362.410	946600.630	323.034
cul1	660340.250	946612.190	324.167
cul2	660317.930	946623.450	324.296
cul3	660295.550	946634.590	324.344
cul4	660273.170	946645.740	324.459
tbm7	660267.0369	946661.9219	323.554
tmb8	660257.0389	946663.9219	324.612
1+050	660250.790	946656.880	323.735
1+075	660228.410	946668.030	323.836
1+100	660206.030	946679.170	323.052
1+125	660183.660	946690.320	323.381
1+150	660161.280	946701.460	323.475
1+175	660138.880	946712.580	325.401
1+200	660115.600	946721.650	323.517
1+225	660092.050	946730.040	323.721
1+250	660068.500	946738.430	323.738
1+275	660044.950	946746.820	323.804
1+300	660021.400	946755.210	323.817
1+325	659997.850	946763.600	323.826
1+350	659974.300	946771.990	323.844
1+375	659950.750	946780.380	323.871
1+400	659927.370	946789.230	324.035

1+425	659904.320	946798.910	324.036
1+450	659881.640	946809.410	324.052
1+475	659859.250	946820.550	324.081
1+500	659836.900	946831.740	324.175
1+525	659814.540	946842.930	324.201
1+550	659792.180	946854.100	324.417
1+575	659769.700	946865.040	324.721
1+600	659747.090	946875.700	325.038
1+625	659724.340	946886.070	325.046
1+650	659701.470	946895.160	325.267
1+675	659678.470	946905.970	325.316
tbm8	661457.0369	945934.921	324.0516
tbm9	661461.1865	945967.091	324.9271
1+700	659655.350	946915.480	325.744
1+725	659632.120	946924.710	325.889
1+750	659632.120	946924.710	325.889
1+775	659585.310	946942.290	326.003
1+800	659561.740	946950.630	326.052
1+825	659538.080	946958.690	326.081
1+850	659514.310	946966.440	326.123
1+875	659490.450	946973.900	326.154
1+900	659466.500	946981.060	326.047
1+925	659442.460	946987.920	326.026
1+950	659418.360	946994.570	326.018
1+975	659394.260	947001.220	325.998
2+000	659370.150	947007.880	325.982
2+025	659346.050	947012.500	325.886

tbm10	659337.091	947014.378	325.873
tbm11	65935.981	947018.285	325.859
2+050	659321.950	947021.140	325.844
2+075	659297.850	947027.780	325.829
2+100	659273.690	947034.200	325.798
2+125	659249.450	947040.310	325.736
2+150	659225.130	947046.130	324.052
2+175	659200.750	947051.640	325.381
2+200	659176.290	947056.840	325.975
2+225	659151.780	947061.740	325.401
2+250	659127.200	947066.330	325.317
2+275	659102.570	947070.610	325.276
2+300	659077.900	947074.620	325.288
2+325	659053.210	947078.580	325.263
2+350	659028.530	947082.540	325.206
2+375	659003.840	947086.500	325.174
2+400	659003.840	947090.460	325.144
2+425	658979.160	947090.460	325.089
2+450	658954.480	947094.420	324.935
2+475	658929.790	947098.380	324.896
2+500	658905.110	947102.340	324.852
2+525	658880.420	947106.300	324.791
2+550	658855.740	947101.260	324.775
tbm12	658849.440	947114.252	324.729
tbm13	658838.195	947118.239	324.712
2+575	658831.050	947114.220	324.701
2+600	658806.370	947118.180	324.617

2+625	658781.580	947121.360	324.591
2+650	658756.620	947122.800	324.582
2+675	658731.670	947124.400	324.534
2+700	658706.790	947126.760	324.467
2+725	658881.990	947129.890	324.296
2+750	658657.290	947133.780	324.644
2+775	658632.630	947137.870	524.889
2+800	658607.970	947141.960	324.935
2+825	658583.300	947146.060	325.036
2+850	658558.640	947150.150	325.052
2+875	658533.980	947154.250	325.281
2+900	658509.320	947158.340	325.375
2+925	658484.650	947162.430	325.401
2+950	658459.990	947166.530	325.517
tbm14	658447.981	947168.590	325.542
tbm15	658439.695	947169.611	325.663
2+975	658435.330	947170.620	325.721
3+000	658410.670	947174.720	325.838
3+025	658386.020	947178.910	325.934
3+050	658361.500	947183.790	326.067
3+075	658337.150	947189.440	326.196
3+100	658312.980	947210.840	326.244
3+125	658289.030	947202.990	326.389
3+150	658265.310	947210.880	326.435
3+175	658241.840	947219.500	326.536
3+200	658218.440	947228.300	326.652
3+225	658194.890	947236.670	326.681

3+250	658171.160	947244.550	326.775
3+275	658147.300	947252.020	326.801
3+300	658123.430	947259.440	326.817
3+325	658099.560	947266.860	326.921
3+350	658075.680	947274.290	327.002
3+375	658051.810	947281.710	327.014
3+400	658027.940	947289.130	327.067
3+425	658004.060	947296.550	327.146
3+450	657980.080	947303.600	327.174
3+475	657955.970	948731.200	327.189
3+500	657931.850	947316.790	327.235
tbm12	657918.640	947304.190	327.251