PROJECT REPORT

ON

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

BY:
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HND/23/SGI/FT/0089

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.

……..…….

OMOLABI MARVELOUS TAIWO

DATE ……

CERTIFICATION

This is to certify that **OMOLABI MARVELOUS TAIWO** with Matric No **HND/23/SGI/FT/0089** 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: ……**

SURV. ISAU IBRAHIM ABIMBOLA

(H.O.D)

…. …… **DATE: ……**

SURV. R. AWOLEYE

(PROJECT COORDINATOR)

…….. **DATE: ……**

EXTERNAL SUPERVISOR

DEDICATION

This project is dedicated to God Almighty and to my Parents **MR. AND MRS. OMOLABI'S** and the entire family.

ACKNOWLEDGEMENTS

I will Lift up my eyes unto the hills from witness whence Comet my help. My help Comet from the Lord who made heaven and earth (Psalm 121: (-2) so that the Lord who lifted me up will not Let me down(Amen).

All glory praise and adoration be to the author and the finisher of my faith, the ancient of days and Almighty God, for his unrelenting effort toward me, his infinite mercy grace and opportunity given to me move forward against any Obstacles and for the successful completion of this prospect may the peace and the blessing of God be upon our God, his Family, Companion and those who follow the right path till the day of Judgement (Amen).

My special appreciation regards to my able and amiable supervisor in Person of **SURV.ASONIBARE ROTIMI** For his assistance and professional advice given to me during we Completion of the project that led to the completion of the exercise.

Also, my Special thanks goes to the head Of department **SURVEYING AND GEO-INFORMATICS** of Kwara State Polytechnic in Person of **SURV.ISAU ABIMBOLA** and also to the director of Consultancy of Kwara State Polytechnic in person of **Surv. A.G AREMU** also to all my Lecturers who directly or indirectly guided me to Successfully Complete my Higher National Diploma Programme.

My special thanes goes to my Beloved, Loving, energetic, dearest, hardworking, caring Parent **MR. and MRS OMOLABI** for their unflinching support prayers, Comforting words, Financial assistant, moral advice and their Unrelenting effort which have helped a lot in transforming my life better pray almighty God grant them long life in god health and wealth to enable them reap the fruit of their labor.

My uttermost appreciation to my Mentor who have always been supporting me in Prayer in Person pastor **JOSEPH IDOWU AKANDE - 1** Prayer pray the Lord will Continue to bless your ministry.

My special greetings also goes to my Loving and Dearest Brothers, sisters. and Siblings in Person **OMOLABI GLADYS, OMOLABI PRECIOUS, OMOLABI TIJESUNIMI** and also to my lovely twins brother In Person of **OMOLABI PROMISE KEHINDE** and to everyone who has contributed morally and Financially towards the completion of this program and from the beginning of my Pursuit for My Higher National Diploma in Surveying and Geo-Informatics to this point.

It is my prayer that good things will never Cease in Your Various homes - (AMEN) Finally to my friends, course mates and my hostel mate who are always

there to assist me, I pray you find Favour in the signout of God and men. May God bless each and everyone in Jesus name (AMEN)

OMOLABI MARVELOUS TAIWO

JUNE 2025

ABSTRACT

This project topic route survey is an engineering survey carried out to acquire base line data required for the rehabilitation of route along Mandala to Awe Village Moro Local Government Area Ilorin Kwara State. Ground survey method was adopted in the data acquisition with the use of both digital Topcon (ES-103) total station and analog (dumpy level) instruments. The exercise involved traversing and leveling. Traversing was carried out to adequately locate the path of the route while leveling was used to determine the height of points at 25m interval along the centre line and for cross-section at offset distance of 4m (8m) intervals on both sides of the centre line. Also leveling was used to determine the heights of drainage edges. The data acquired were processed manually and by the use of computer system and some applications like AutoCAD Land Development and Microsoft Office Excel software. The end result was the production of the location plan of the route, longitudinal profile and the cross section plans of the route all at suitable scale both in digital and graphic formats. Finally a project report was written.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Surveying has been and would always be the bedrock of every meaningful development in any nation because it plays a vital role in human development and always precedes every human/societal development activities. It has various branches of which engineering survey is one.

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 STATEMENT OF PROBLEMS

It was discovered that the route from Mandala to Awe Village Moro Local Government Area 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 OF THE STUDY

1.3.1 AIM(S)

The main aims of this project are as follows:

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

i. To acquire necessary data required for the engineering design of the road.

ii. To produce both horizontal, vertical alignment and cross section plans of the route survey running from Mandala to Awe Village Moro Local Government Area Ilorin Kwara State.

iii. To serve as a requisite for the award of Higher National Diploma in Surveying and Geo-informatics at Kwara State Polytechnics Ilorin Kwara State.

1.3.2 OBJECTIVES

In actualization of the said aim of the project, the following objectives

Were followed sequentially:

i. Reconnaissance which include office planning and field reconnaissance.

ii. Identification of existing features and adjoining roads.

iii. Stability of the ground controls to be use for orientation.

iv. Determination of centre line and marking of chainages along the centre line at an interval of 25m.

v. Marking out some selected points for the cross-sectioning at 4m (8m) intervals on both sides of the centre line and also the edges of drainage was marked.

vi. EDM traverse to determine the reallocation and orientation of the road way.

vii. Topcon (ES-103) total station to determine the height of some selected points along the road and the detailing.

viii. Plan production (graphical representation of the surveyed road way) drawn with appropriate scale.

ix. Reports write up.

1.4 PROJECT SPECIFICATIONS

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

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

Third order EDM 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 $\pm 24mm\sqrt{k}$, where 'k' is the total distance covered in kilometers.

Leveling must be observed at every 25m intervals on the centre line and at 3,3m (6m) 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:-

Reconnaissance (both office planning and field reconnaissance).

i. Data acquisition:

ii. Selection of stations.

iii. Linear measurement with the aid Topcon (ES-103) total station.

iv. leveling of traverse centre line and adjacent sides (longitudinal or profile and cross sectioning).

v. Fixing of details both temporary and permanent by the Topcon (ES-103) total station.

vi. Computations to determine :

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

b. Vertical coordinates (i.e. **z** coordinates) by level reduction.

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

viii. Data presentation :

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

b. Production of longitudinal section plan

c. Production of cross section plan

ix. 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 2023/2024 set are the personnel that participated in the execution of this project. They are:

OMOLABI MARVELOUS TAIWO (AUTHOR)	**HND/23/SGI/FT/0089**
YEKIN RAUF OLUWAFEMI	HND/22/SGI/FT/0118
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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 to 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”

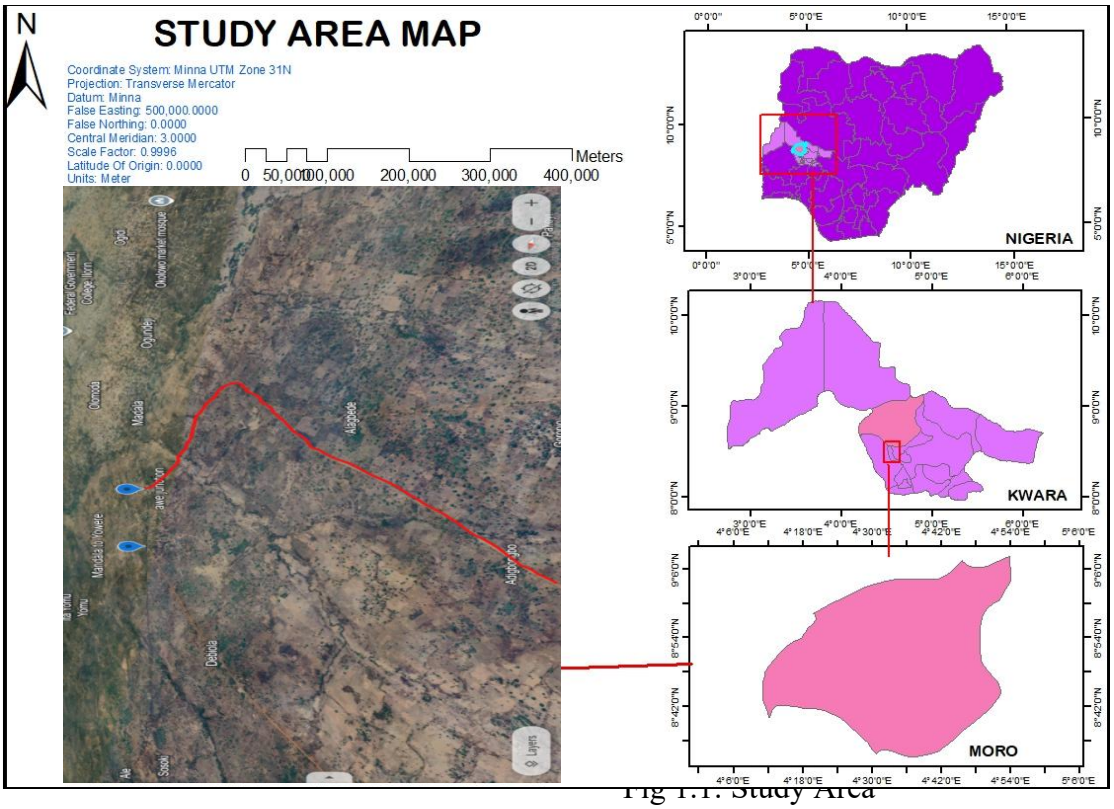


Fig 1.1: Study Area

Source:-GoogleEarth

CHAPTER TWO

2.0 LITERATURE REVIEW

A route survey is an aspect of engineering works which deals with road construction like high ways, rail roads and pipe lines. A route survey system usually contains four separate but interrelated processes which include:

i. reconnaissance and planning

ii. Works design

iii. right of way acquisition

iv. construction of works

However, this chapter deals on the review of works carried out on these area and equally some scholars research on some project and definition of some relevant terms.

N. N. Basak (2006) carried a primary investigation to examine whether the road is necessary. The following points are to be kept in mind at the time of such investigation:

1. Total population benefited by the project
2. Number of villages, towns, industrial places, etc. to be connected.
3. Agricultural products, industrial products, minerals etc are likely to be conveyed through the proposed road.
4. Any other information related to the project should be noted.

After primary investigation regarding the justification of constructing a new road the tentative alignments are marked on the map of the area through which it is expected to pass. The proposed road should connect a sufficient number of village, towns industrial places, and places of religious important.

According to Ramsey, Y.R. Wilson (1977) believed that when there is need for design of route to be carried out different types of plan must be acquired to enable such design to be approximately done, such plan are cadastral and topographical map.

According to Charles D. Ghilani and Paul R. Wolf, when and where? An accurate topographic survey and site map are the first requirements in designing streets, sewer and water lines and structure. Survey then lay out and position these facilities according to the design plan. A final as built map, incorporating any

modification made to the design plans, is prepared during and after construction and field. Such maps are extremely important, especially where undergraduate utilities are involved, to assure that they can be located quickly if double developed and that they later will not be disturbed by later improvements.

Route surveying is needed for the purpose of selecting the best route between 2 termini or end stations, and to find the most suitable combination of alignment, gradient and other details of the selected route.

DIVISION OF ROUTE SURVEYING

Route surveying can be divided into the following

i. Reconnaissance
ii. Preliminary survey
iii. Location survey
iv. Construction survey

The details of surveying used on a particular project depends on the nature of the project, the topography and many other factors.

RECONNAISSANCE

Generally done in other to be familiar with the area. The main objective of reconnaissance is to collect information about the topography between 2 termini for the purpose of the selection of a narrow band along which the route can be located. it is a rapid and rough survey job. Step in reconnaissance are:

i. collect and study information about the area

Ii. visit to the site to examine the area\determine approximate elevation & distances.

ii. Preparing a preliminary report.

PRELIMINARY SURVEY

Based from the previous stage, a narrow strip corridor that contains the final location of the route is selected. The width will also depend upon the terrain through which the route to pass.

An accurate control traverse of the narrow strip is conducted. The longitudinal and cross sections are also determined along the traverse.

On preliminary survey, surveyors should have the following information

a. Location of the bench mark near the route
b. Location of the primary and secondary control
c. Access to the route
d. Availability of local labour.

LOCATION SURVEY

This is avoided into two namely

i. Paper location done in the office
ii. Field location done in field

OFFICE WORK

(Paper location done in the office)

a. Total land required is marked on the route survey map
b. Estimate of road surface construction
c. Total cost of project for the tentative alignment.

FIELD WORK (field location done in the field)

The process of transferring the alignment marked on map on the ground (setting out)

CONSTRUCTION SURVEY

This survey consist of setting out the details of the route on the ground such as checking the stakes location, checking the level, establishing TBM, complete all horizontal, transition and vertical curve, establishing offset stakes and others.

DETAIL SURVEY

All important details within 5o meters must be observed. Some of the details which are permanent must be observed such as

i. Drainage system

ii. Centre road

iii. Electrical and water boxes

iv. Electric posts

v. Culverts and manholes.

PROCESSING DATA

Raw data will be key in CDS software to obtain simple DTM. The output is them transferred to AutoCAD for data processing process.

According to R.B. Gupt (2005) leveling method which is an important aspect of route survey used mainly for the execution of engineering projects includes.

i. Knowing the topography of the area.

ii. In the design of highways, canals,e.t.c.

iii. Locating the gradient line for drainage characteristics of an area.

iv. Setting out construction projects

v. Calculation of earthworks volume.

TOPOGRAPHIC FEATURES

All topographic features on a particular site will be located this includes man-made and natural terrain features that the survey will come across. Elevation data will be obtained as needed for project design, quantity computation and drainage studies.

DIGITAL TERRAIN MODELLING

A digital terrain model is a collection of elevations over a site which represents the characteristics of the terrain or ground. There are numerous data collection techniques that the surveyor can use with total stations, data are normally collected in a random mode. The instrument will record all of the requisite data for subsequent processing. It is important that all critical terrain features be measured and to a sufficient density so that the software will properly portray the terrain features within the program. It is also necessary to observe a sufficient number of points that will aid in the processing of the digital terrain data.

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;

I. Office planning
II. 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.

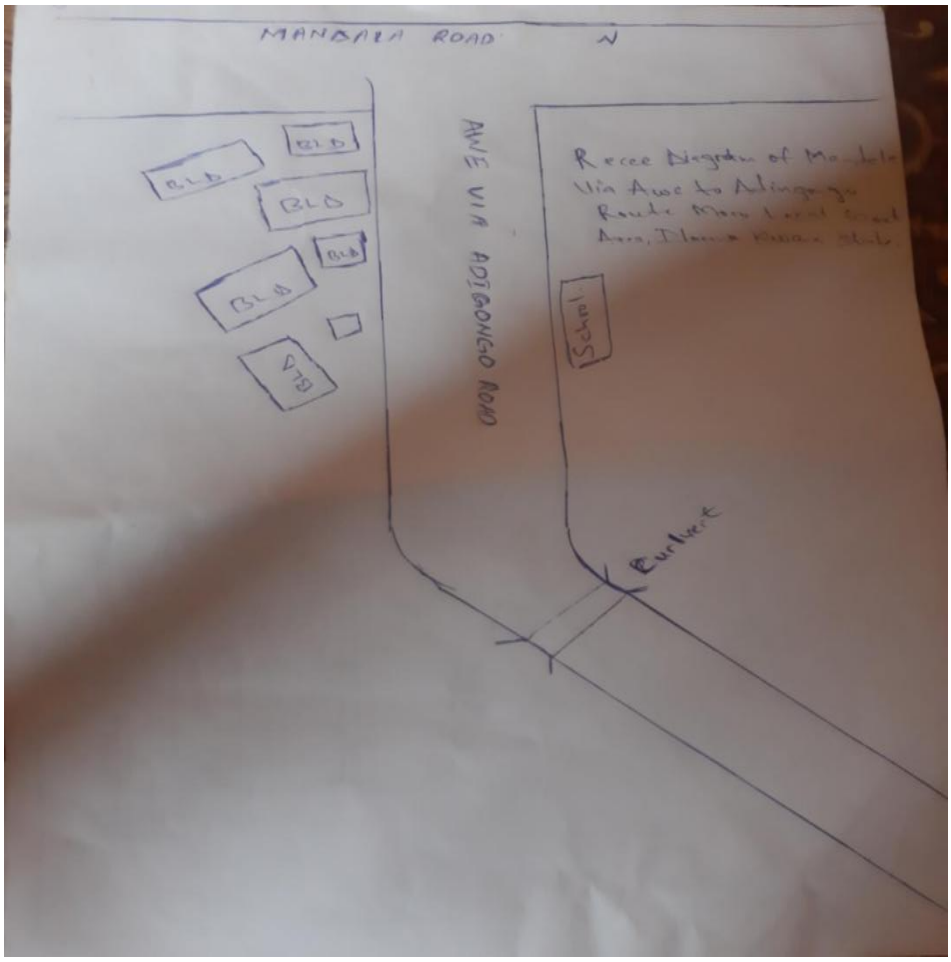
During the visit the control pillars planned to be used were located, traverse stations which were to form the traverse framework were selected and marked using pegs and nails, inter visibility between successive traverse station were ensured.

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. 1 Field Recci diagram Mandala Via Awe to Adigongo Route.



3.2 A TYPICAL PEG USED

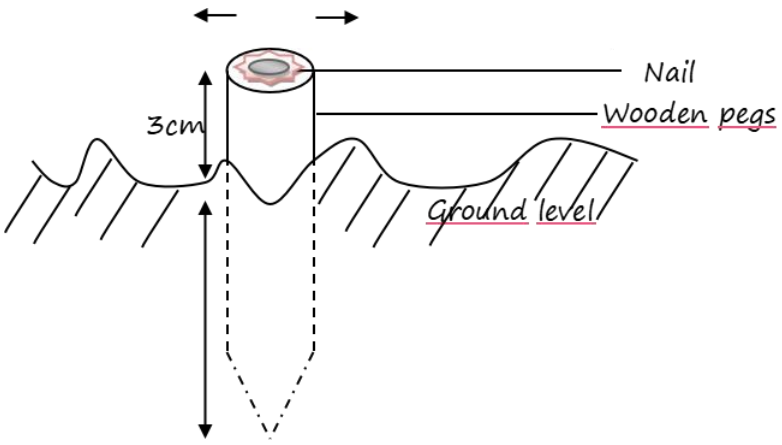


Fig 3.2 An Illustration diagram of peg

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.

I. Laptop computer for data processing
II. 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	00^001’ 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:

4 Length

i) Type- Decimal

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

5 Insertion Scale

IX. Units to scale inserted content- Meters

6 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

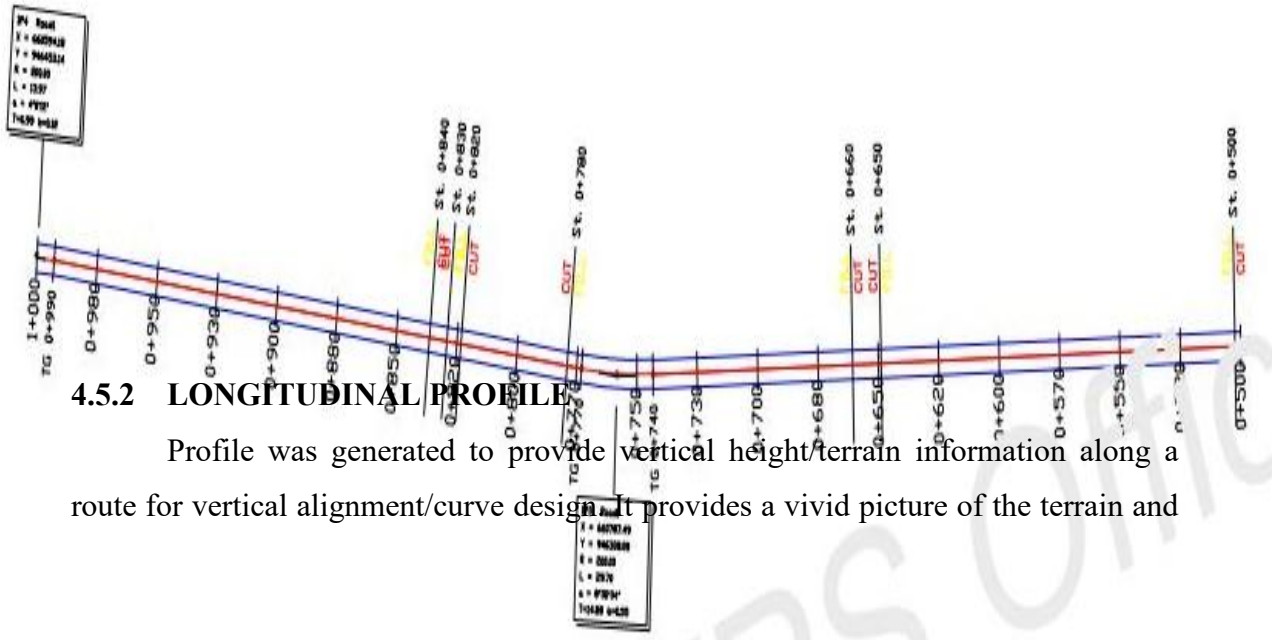
Refer to the appendix for the entire cut and fill data (Appendix).

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

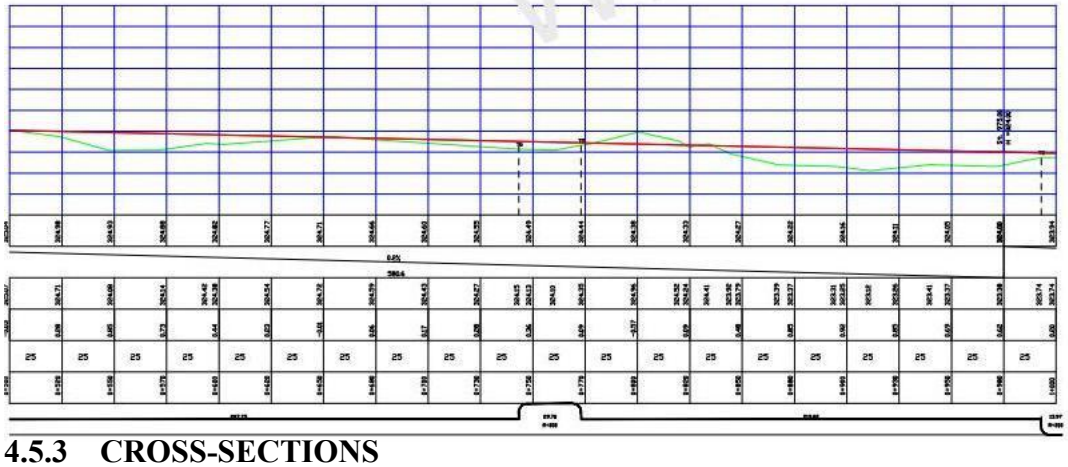
The essence of obtaining a detail plan is to provide a platform for horizontal curve and alignment design for the road expansion/rehabilitation. Geometric information is also shown on the detail plan making a vivid representation of the land mass for easy understanding of the route.



4.5.2 LONGITUDINAL PROFILE

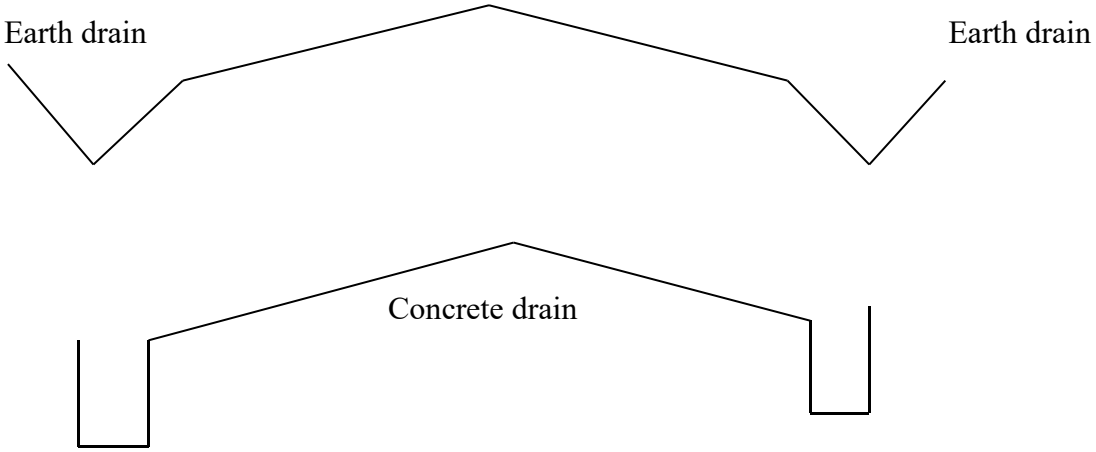
Profile was generated to provide vertical height/terrain information along a route for vertical alignment/curve design. It provides a vivid picture of the terrain and

decisions of where to cut or fill was determined. It provides information such as the grade percent, tangent points, existing level and formation level.



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, PROBLEMEN COUNTERED, 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	8,000.00

Driver	27,166.24
Fuel	12,638.12

1(c) FEEDING

Feeding for four person	₦12,000.00

TOTAL COST FOR RECONNAISSANCE **₦200,144.36**

FIELD OPERATIONS

2(a) MONUMENTATION

Duration Estimated (Number of days) = 1

Personnel Daily	**Amount ₦**
1 Assistant Tech. of Officer	15,742.00
2 Labourers	2,061.00
3,00 Standard pegs	530.00
Basic Tools (Digger, Shovels, trowels, nail, hammer etc.)	19,000.00

2(b)TRANSPORTATION

Fuel	12,638.12
Driver	27,166.24

TOTAL COST OF MONUMENTATION **₦182,608.36**

3(a) DATA ACQUISITION

Duration estimated number of days = 5 days

Personnel Daily	Amount₦
1 Surveyor	23,814.00
1 Assistant Surveyor	22,571.00
4 Labourers	2,078.00

Sub Total **₦749,760.00**

3(b) EQUIPMENT LEASING

1 Total Station (With its accessories)	25,000.00
5 Ranging Poles	1,000.00 - 5,000.00

2 Cutlasses	1,700.00 - 3,400.00
Sub Total	**₦33,400.00**

3(c) FEEDING

5Days	3,000.00 -15,000.00
Sub Total	**₦15,000,00**

3(d) TRANSPORTATION

Duration estimated number of days = 5 days

Fuel	12,638.12- 63,190.60
Driver	5 Days
TOTAL COST OF DATA ACQUISITION	**₦199,021.80**

4. DATA PROCESSING AND PRODUCT GENERATION

Duration (Estimated number of days = 3 days)

Personnel Daily	Amount ₦
1 Surveyor	23,814.00- 71,442.00
1 Computer Analyst	23,000 - 69,000.00
1 Computer hardware	9,000.00 - 27,000.00
Total	**₦167,442.00**

5. PLOTTING/TECHNICAL REPORTS

Duration (Estimated number of days = 2 days)

Personnel Daily	Amount ₦
1 Surveyor	23,814.00- 47,628.00
1 CAD Operator	13,000.00 - 26,000.00
1 Clerical Officer	9,000 - 18,000.00
Total	**115,442.00**

6 ROUTE DESIGN

Duration estimated number of days = 2days

Personnel Daily	**Amount ₦**
1 Surveyor	23,814.00- 47,628.00
1(one)Cad Operator	13,000.00 - 26,000.00
1 (one)Computer Hardware	10,000.00 - 20,000.00

Software used	10,000.00 - 20,000.00
Sub Total	**₦113,628.00**

7. PLAN PRINTING

Duration estimated number of days = 2day

Quantity Rate	Amount ₦
10 copies computer printing	7,000.00 - 7,000.00
7 copies of report	7,000.00 - 49,000.00
Binding	3,500 - 49,000.00
Sub Total	**₦105,000.00**

COST OF PROJECT EXECUTION	**₦1,881,446.52**
CONSULTANT FEES 20% OF TOTALCOST OF PROJECT	**₦376,289.304**
CONTINGENCE 5% OF TOTAL COST OF PROJECT	**₦94,072.326**
VAT = 5% OF TOTAL COST OF PROJECT	**₦94,072.326**
TOTAL COST OF PROJECT	**₦2,445,880.476**

5.2 SUMMARY

The reconnaissance, which was the main planning, was carefully carried out because of its importance to good execution of any survey project or work. Having carried out the reconnaissance, six (9) second order control stations were located and used as connection along the given route. The total number of nineteen (19) stations excluding the controls where the angles and distances were determine by a closed traverse method. All these measurements and the observations were carried out in third order traverse method.

The prominent features closer to each station along the project site were fixed by chain survey method as specified. All necessary reductions and computations, which include forward and backward computation, leveling computation, and calculation of

curve, were done respectively in accordance with survey rules, regulation, departmental and project instructions.

Finally, plans showing location survey, profiles and cross sections and curve design were drawn to scale for visualization.

5.3 PROBLEMS ENCOUNTERED

During the execution of this project the problems encountered was that there's a lot of movement of peoples and goods by the means of transportation e.g vehicles, motorcycles and tricycles seems the road is a major road for transportation delayed the project work. After several attempt, l waited till there is no movement of vehicles, motorcycles and tricycles along the route before I could be able to start the observation where as the chain man had to wait bit a long on every point to be observed

5.4 RECOMMENDATIONS

I hereby recommended that this kind of project should continued because it covers a lot of aspect in surveying and it will even put the school in position to actualize its missions which is to produce qualified and resourceful professionals.

In addition, the school management should make digital instruments available for students to execute their project conveniently. The use of computer should be intensified for the computation, plotting and typing of the project so as to enhance the quality of the project and as well to supply electric power during project.

5.5 CONCLUSION

Despite the encountered problems during the execution of this project with the respect to the instructions, the result obtained were of accepted accuracy, these were achieve due to the precautions taken on the field during the execution.Also, at the end of the project, I was able to acquire a commendable practical techniques and skills

owing to the fact that this project has exposed me to many aspect of surveying tasks and as well, the aim and the objectives of the project were achieved.

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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