

**TOPOGRAPHIC SURVEY**  
**OF**  
**PART OF KWARA STATE POLYTECHNIC MAIN CAMPUS**  
**(FORMER INSTITUTE OF ENVIROMENTAL STUDIES)**  
**ALONG OLD JEBBA ROAD, MORO LOCAL GOVERNMENT AREA,**  
**KWARA STATE.**

**BY**

**MUBARAK MUHAMMAD**  
**Matric No. ND/23/SGI/FT/0045**

**BEING FINAL YEAR PROJECT SUBMITTED TO THE**  
**DEPARTMENT OF SURVEYING AND GEOINFORMATICS**  
**INSTITUTE OF ENVIRONMENTAL STUDIES**  
**KWARA STATE POLYTECHNIC, ILORIN.**

**IN PARTIAL FUFILMENT OF THE REQUIRMENT FOR THE AWARD OF**  
**NATIONAL DIPLOMA (ND) IN SURVEYING AND GEO-INFORMATICS.**

**JUNE,2025.**

## **CERTIFICATION**

This is to certify that MUBARAK MUHAMMAD **with Matric No. ND/23/SGI/FT/0045**

has satisfactorily carried out his project under my instructions and direct supervision.

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

.....

**ABUBAKAR KUDUS O.**

**Matric No. ND/23/SGI/FT/0045**

.....

**Date    &    Sign**

## CERTIFICATION

This is to certify that MUBARAK MUHAMMAD **with Matric No. ND/23/SGL/FT/0045** has satisfactorily carried out his project under my instructions and direct supervision. I hereby declare that he has conducted himself with diligence, honesty and sobriety on the project.

.....  
Surv. Babatunde kabir  
(Project Supervisor)

.....  
Date and Sign

.....  
**Surv. R. S. Awolaye**  
Project Coordinator

.....  
Sign and Date

.....  
**Surv. I. I. Abimbola**  
Head of the Department

.....  
Sign and Date

.....  
External Examiner

.....  
Sign and Date

## **DEDICATION**

I dedicate this project report to my parents

## ACKNOWLEDGEMENT

I give thanks to almighty Allah, for his merciful, beneficent and protection over me throughout my national diploma (ND) program

My acknowledgement also goes to my wonderful supervisor Surv KABIR for his guidance throughout this project work and her motherly support . I also honour my assistant supervisor Surv. Abimbola Isau and all lecturers, Surv Banji, Surv Felix Diran, Surv. Kazeem and others.

Finally, I give many thanks to those who supported me financially and morally through the duration of this course, may Allah continue to bless you all abundantly.

## **ABSTRACT**

*Topographical Survey of Part of Kwara State Polytechnic Landed Property (I.E.S.) situated along Old Ilorin Jebba road in Moro Local Government Area of Kwara State, was carried out in order to define the extent of the boundary by carrying out perimeter survey and to produce detailed topographical plan of the land area that will aid in effective planning and design of future development. The procedure involves: Planning, Reconnaissance survey, Monumentation, Traversing, Detailing, spot heighten to produce the spot height of the entire area and along the boundary line. The total area covered was 4.768 hectares over six traverse stations. KOLIDA KTS Total station (KTS-400L) and handheld GPS were employed for the execution of the project. After the completion of the field work, all the data obtained from the field operations were downloaded, processed, analyzed and plotted using Auto CAD 2007 Software and Surfer 8.0 Software at a scale of 1: 2,500. All measurements, observations, computations and plotting were done in strict compliance with the survey rules and regulations.*

## **TABLE OF CONTENTS**

### **CHAPTER ONE**

- 1.0 Introduction
- 1.1. Statement of the problem
- 1.2. Aim of the project
- 1.3. Objectives of the project
- 1.4. Scopes of the project
- 1.5. Specifications of the project
- 1.6. Project location area
- 1.7. Personnel involve

### **CHAPTER TWO**

- 2.0. Literature review

### **CHAPTER THREE**

- 3.0 Project Planning
- 3.1 Office Planning
- 3.2 Field Recce
- 3.3 Schedule of the field work
- 3.4 instruments /equipments used
- 3.5 test of instrument
- 3.6 data acquisition/field operation
- 3.7 Monumentation
- 3.8 traversing procedure
- 3.9 Detail survey and Spot heightens

### **CHAPTER FOUR**

- 4.0 Data Processing
- 4.1 Data Downloading

- 4.2 Computation of Survey Data
- 4.3 Area and Back Computation
- 4.4 Plan Production and Presentation

#### Chapter five

- 5.0 Summary, Conclusion, Problem Encountered and Recommendation
- 5.1 Summary
- 5.2 conclusion
- 5.3 Problem Encountered
- 5.4 Recommendation

#### Appendix

##### List of tables

- 3.1 Control Points Data
- 3.2 Horizontal and Vertical Collimation test reading
- 3.3 Comparism of old and new values

##### List of figures

- 3.1 Recce diagram
- 3.2 Pre-cast property beacon
- 3.3 Diagram of spot height



## **1.0 INTRODUCTION**

A topographic survey is a detailed and precise method of mapping the surface of the land and its various physical characteristics. This type of survey captures a comprehensive array of both natural and man-made features, including variations in terrain elevations, contour lines, vegetation, roadways, and built structures. Specifically, a topographic survey conducted at the former Institute of Environmental Studies site will document the current state of buildings, green spaces, plants, and utility service lines present on the Polytechnic campus. By accurately establishing ground elevations and locating all site features, this survey will provide critical support for any future planning or development efforts. Research made it known that some of the earlier known maps were made in Mesopotamia, in the area now known as Iraq, where a series of maps showing property boundaries were drawn in about 2400BC for the purpose of land taxation. A topographical map is a two dimensional representation of a three dimensional land surface on sheet known as plan or map. Topographical maps are differentiated from other maps because they shown both the horizontal and vertical position of the terrain.

A topographical plan is a large scale representation of a portion of the earth's surface showing the culture relief, hydrograph and vegetation; it shows the natural and man-made features using convenient signs and symbols. Topographical plans and maps are drawings which show the main physical features on the ground such as building, fence, roads, rivers, lakes and forest as well as the change in elevation between land; such as valleys and hills called vertical relief. Topographical survey are usually carried out in order to have an accurate record of the existing condition of a parcel of land that is about to undergo some type of construction activity. Design engineers use a topographical map

as the beginning of their design and then plan what the proposed final surface will be like. Having this original surface allow the design engineer to calculate the amount of earthwork that might be needed to bring the site to final grade.

However, the implementation and application of topographical surveys are not without challenges. The financial investment required for advanced surveying equipment and the specialized training necessary to operate such tools can be substantial. Smaller firms or community-based projects may find it challenging to afford these resources, potentially limiting their capacity for comprehensive site assessments. Additionally, the process of integrating varying datasets from topographical surveys with other geographic and environmental data can be complex, requiring expertise to ensure compatibility and accuracy. Recognizing these challenges, it becomes increasingly clear that collaboration among various professionals surveyors, engineers, urban planners, and environmental scientists is essential. Working as a cohesive unit allows for the synthesis of data and maximizes the potential benefits that can be derived from topographical surveys.

As the landscape of land use continues to evolve, the demand for precise, high-quality topographical data will only escalate, propelling innovations in surveying methods and further solidifying the relevance of topographical surveys in our ongoing dialogue about environmental stewardship, sustainable development, and responsible land management. In summary, topographical surveys are instrumental in shaping the future of construction and land management by providing essential data that informs various sectors. By bridging the gap between technology and traditional surveying practices, these surveys facilitate a more profound understanding of land characteristics, ultimately leading to more thoughtful, sustainable, and informed decision-making in the

face of modern challenges. As we progress into a future marked by urban growth and environmental change, the role of topographical surveys will undoubtedly remain central to the successful navigation of our increasingly complex interaction with the land.

#### 1.1 STATEMENT OF PROBLEM

Currently, there is an absence of an updated and detailed map for the grounds of the former Institute of Environmental Studies. The available site plans are either outdated or incomplete, resulting in a lack of reliable information pertaining to the site's contours and the locations of its features. This deficiency in data complicates effective design and planning processes. Without an accurate, current survey, any proposed layouts risk misalignment with the actual terrain, utility lines, or existing structures on the site. Therefore, executing a comprehensive topographic survey will directly address these issues by delivering essential foundational data required for engineering and construction tasks.

#### 1.3 AIM OF THE PROJECT

The aim of this project is to conduct a comprehensive topographic survey of the former Institute of Environmental Studies part Kwara State Polytechnic Main Campus. In other to produce an up to date map of the area also to provide the essential terrain information needed for future planning, design, or development of the area.

#### 1.4 OBJECTIVES OF THE PROJECT

- i. Measure horizontal positions and elevations of all key points.
- ii. Record the locations of significant features on the ground (e.g. building corners, trees, fences, drainage structures, paved areas, utility poles).
- iii. Compute and draw contour lines at regular intervals to represent terrain slopes and relief.

- iv. Produce final deliverables: a plan (2D) Topographical map, contour plan, and a digital file of the surveyed data.

## 1.5 SCOPES OF THE PROJECT

The scopes involved in this project work are listed below;

- i. Project planning
- ii. Site selection and Recce survey
- iii. Instrumentation
- iv. Field data Acquisition
- v. Data processing
- vi. Plan production and presentation
- vii. Technical report writing

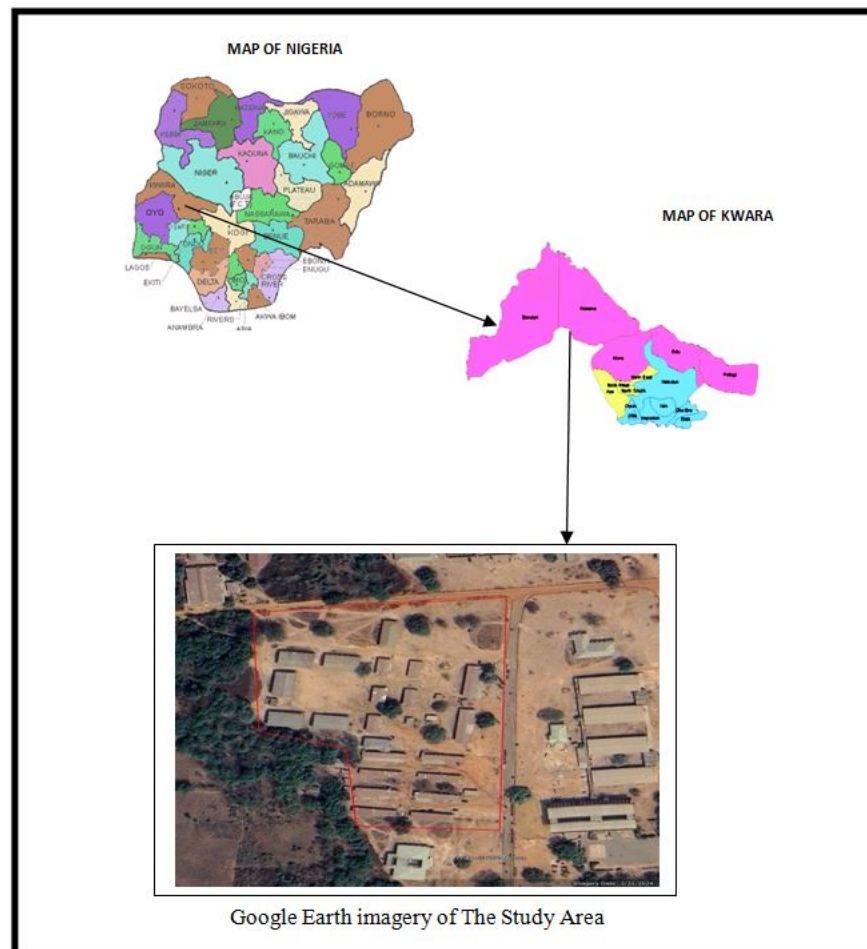
## 1.6 PROJECT SPECIFICATIONS

The technical specifications adhered to in this project are as follows:-

- i. Survey Scale: 1:2,000-
- ii. Contour Interval: 0.2 meters-
- iii. Projection: Universal Transverse Mercator (UTM), Zone 31
- iv. Equipment: Total Station, GNSS Receiver, Automatic Level-
- v. Data Processing Software: AutoCAD CivilCAD2014
- vi. Horizontal Accuracy:  $\pm 10$  mm- Vertical Accuracy:  $\pm 5$  mm

## 1.7 PROJECT LOCATION

The project is located within the Kwara State Polytechnic main Campus, along old Jebba road, in Moro Local Government Area, Kwara State, Nigeria. The location is characterized by moderate vegetation, gentle slopes, and existing academic and administrative structures. The land is accessible and lies within a growing educational hub, making it suitable for academic and infrastructural development. Its geographical coordinates fall  $8^{\circ}33'39.06''\text{N}$  ;  $4^{\circ}37'56.14''\text{E}$  and  $8^{\circ}33'30.83''\text{N}$  ;  $4^{\circ}37'51.06''\text{E}$  within the WGS84 datum as shown on the figure below.



## 1.8 PROJECT MEMBERS

| SN | Names                   | Matric No.       | Role    |
|----|-------------------------|------------------|---------|
| 1. | Mubarak Muhammad        | ND/23/SGI/FT/045 | Author  |
| 2. | Onisola Ayomide Mercy   | ND/23/SGI/FT/042 | Members |
| 3. | Bello Taiwo Abosede     | ND/23/SGI/FT/043 | Members |
| 4. | Amusa Raimot Ashabi     | ND/23/SGI/FT/049 | Members |
| 5. | Abubakar Kudus . O      | ND/23/SGI/FT/051 | Members |
| 6. | Alabi Leah Olamide      | ND/23/SGI/FT/044 | Members |
| 7. | Haroon Abdulmutolib . O | ND/22/SGI/FT/018 | Members |

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

Topographic surveys are essential tools in various fields, including civil engineering, architecture, environmental management, and urban planning. They provide detailed information about the Earth's surface and represent both natural and human-made features. A topographic survey is defined as a precise method of mapping the contours of land and delineating physical features, such as elevations, depressions, vegetation, water bodies, and existing structures. According to McGowan (2018), these surveys form the foundational data necessary for effective land-use planning, engineering design, and environmental analysis. The practice of topographic surveying dates back to ancient civilizations, where rudimentary forms of land mapping were utilized for

agriculture and settlement planning. Historical texts, such as those by the ancient Greeks and Romans, highlight the initial methods of land measurement (Harvey, 2020).

The development of trigonometric surveying in the 16th century marked a significant advancement, allowing surveyors to understand the relationship between angles and distances. The introduction of more precise instruments during the Enlightenment, such as the theodolite, revolutionized the field of surveying (Baker, 2019). Modern topographic surveying methods have evolved significantly with the advent of technology, offering enhanced precision and efficiency.

Topographic surveys can be categorized into traditional and modern methodologies. Traditional surveys involve ground-based measurement techniques utilizing total stations, levels, and tape measures. Surveyors establish a network of control points, marked by benchmarks, to ensure data accuracy (Parker, 2021). Horizontal and vertical controls are crucial components of the surveying process. Horizontal control is established by measuring angles and distances between fixed points, while vertical control relies on leveling techniques to ascertain height differences. Recent advancements in technology have introduced modern surveying techniques such as Global Navigation Satellite Systems (GNSS) and Light Detection and Ranging (LiDAR). GNSS technology permits rapid collection of accurate positional data over large areas, while LiDAR, as described by Zhang et al. (2022), provides high-resolution elevation data, even in inaccessible terrains. The integration of these technologies has significantly improved the accuracy and speed of topographic surveys, enabling surveyors to gather large datasets efficiently.

Topographical maps usually portray both natural and artificial man made features. They show and name works of nature including mountains, valleys, plains, lakes, rivers, and vegetation. They also identify the principle works of man, such as roads, boundaries, transmission lines, and major buildings. The wide range of information provided by topographic maps make them extremely useful to professional and recreational map users. Topographic maps are used for Engineering, Energy exploration, Natural resources conservation, Environmental management, Public works design, Commercial and residential planning, and outdoor activities like hiking, camping and fishing. According to Assur and Filabr (1989), Surveying is a branch of applied mathematics which deals with the measuring and recording of the size and shape of any portion of the earth's surface and its declination on a map or plan.

Punmia (2005) defines surveying as the art of determining the active position of points on, above or beneath the surface of the earth by taking direct distance measurement, direction and elevation. According to Duggar (2006), Surveying is an art of determining the relative position of point on, above or beneath the surface of the earth with respect to each other, by measurement of horizontal and vertical distance, angles and direction. Agor (1992), defines topographical surveying as the survey made to determine the configuration (relief) of surface of terrain. Higgins (1970) expatiate that topographical surveying depict the topography or laying of land of specific parcel and its elevation are taking with survey equipment at several points on the property and then practical and the line called contour are drawn to connect identical points of elevation. Research made it known that, Topographic maps are used which is a two dimensional representation of a



three land surface; is the bedrock of any physical and structural design which can simply mean: no topographic maps are, no physical development.

The USGS widely adopted photogrammetry as a part of the mapping process after the World War II and USGS employee developed innovation in the production of workflow and in the instrumentation. Russell. K. Bean of the USGS invented the Ellipsoidal Reflector Projector. Many innovations affected the mapping process such the measurement of angles in the field with instruments including theodolite. Distance were measured with electronic distance measuring (EDM) unit. (125 history of Topographical mapping by E Lynn Ustry and others). According to Charles and Paul (2008), Topographic surveying is an art system of which determine the position of natural or artificial features.

Ramsey (1978) argue that, for any engineering project topographic surveying is a must, whether it is laying a railway, highway, design of irrigation or drainage system; the Topographic features of the place must be known so that correct engineering decisions can taken.

The data collected during topographic surveys is processed using specialized software, allowing for the generation of comprehensive 2D and 3D maps. Geographic Information Systems (GIS) are frequently employed in this phase, enabling the analysis and visualization of spatial data (Rodriguez, 2020). By using GIS, topographic data can be layered with other relevant information such as zoning laws, land use, and environmental constraints, facilitating informed decision-making for development projects. The ability to generate detailed contour maps is one of the most significant

outputs of a topographic survey, depicting variations in terrain elevation and assisting engineers and planners in understanding site conditions (King & O'Reilly, 2021).

Topographic surveys have a wide array of applications. In civil engineering, the data gathered is used to inform the design and planning of transportation infrastructures such as roads, bridges, and drainage systems. They play a crucial role in site planning for new developments by providing the necessary information to evaluate site suitability and to address potential challenges (Smith et al., 2023). In environmental management, topographic surveys assist in assessing landscapes to evaluate ecological impacts, manage resources, and plan conservation strategies. For instance, they are vital in flood risk assessments, where understanding the topography of a region can inform mitigation measures and emergency planning (Wright, 2022). Land-use planning also significantly relies on accurate topographic data. Urban planners utilize this information to design urban spaces, ensuring that developments respect natural features and conform to zoning regulations. Moreover, topographic surveys are essential for agricultural land assessments, allowing for effective land management practices.

Despite the advancements in topographic surveying, several challenges persist. Issues such as limited access to specific terrains, the requirement for skilled professionals, and the high costs associated with new technologies can impact the efficiency of surveys. Additionally, the constant evolution of land use requires ongoing updates to topographic data, creating demand for frequent surveys (Johnson, 2023). Looking ahead, the future of topographic surveys lies in adopting emerging technologies, such as drone photogrammetry, which allows for quicker and more efficient data collection over extensive areas, coupled with machine learning algorithms to analyze

large datasets swiftly (Nguyen et al., 2023). These innovations can lead to even greater accuracy in representation and facilitate real-time updates to topographic information.

In conclusion, topographic surveys are fundamental in understanding the nature of the land and its features for various applications in engineering, urban planning, and environmental management. The evolution of surveying techniques from traditional methods to modern technology has significantly enhanced the accuracy and efficiency of these surveys. As the demand for accurate land information continues to grow, it is essential for practitioners in the field to embrace new technologies and methodologies to keep pace with these requirements. Continued research and innovation will be crucial to overcoming existing challenges and meeting the dynamic needs of land use and management in the future.

## **CHAPTER THREE**

### **3.0 PROJECT PLANNING**

Planning is one of the most important aspects of any surveying operation and must always be undertaken before any observations are made. The essence of planning enables the surveyor to have an overall picture of the whole area to be surveyed in mind so as to work economically to manage time, energy and fund. A poorly executed planning can result in difficulties at later stages, which may lead to waste of time, money, inefficiency on the part of Survey Team and obtain poor result (inaccurate work).

In planning, the surveyor needs to think on how to execute the project successfully in terms of selecting the instrument and equipments to be used, locating the

suitable and registered controls, selecting suitable positions for traverse station, making use of available records such as existing maps or plans and other relevant information about the project site. For this project to be successfully carried out it underwent two major phases of planning; which were Office Reconnaissance and Field Reconnaissance.

### 3.1 OFFICE PLANNING

During the office planning both the list of instrument and equipments to be used for the project and the project accuracy and other logistics such as means of transportation, accommodation and welfare of the personnel were considered. The activities involved in executing the task were scheduled and the necessary information needed was itemized, such as the coordinates of the control pillars and the specification for the project were strictly adhered to.

The coordinates of control points very close to project site were obtained from the department of Surveying and Geoinformatic, Kwara State polytechnic, ilorin.

The list of controls and their coordinates are as tabulated in table 3.1 below.

**Table 3.1: Control Points Data.**

| REGISTER VALUE OF EXISTING CONTROLS |              |             |            |
|-------------------------------------|--------------|-------------|------------|
| Pillar                              | Northing (m) | Easting (m) | Height (m) |
| KWPT.732                            | 946270.767   | 679688.177  | 345.400    |
| HND04.111                           | 946468.268   | 679733.135  | 352.414    |
| KWPT.733                            | 946561.866   | 679735.315  | 358.812    |

**Source: Survey Dept., Kwara State Polytechnic, Ilorin.**

### 3.2 FIELD RECONNAISSANCE

This involved the physical appearance of the survey party at the site in company of the client's engineer. The entire area of the project site was inspected so as to be familiar with the site and to identify prominent features that are of important to the client. Also essential is the drawing of reconnaissance diagram in order to give good knowledge of the site. The approximate position of the control points was traced with the use of hand held GPS (Garmin 76csx map) receiver.

The positions of those control points were checked to confirm whether they are 'in situ' or not. The intervisibility of the two lines formed by the three control stations were ensured with some bush cutting and observations. The reconnaissance diagram is as shown in figure 3.1 below.

**Figure 3.1: Reconnaissance Diagram.**

### **3.3 SCHEDULE OF FIELD WORK**

Having completed the reconnaissance, the schedule of field work was designed as follows:

- \* Station selection and clearing of obstruction along the survey lines
- \* Moulding of beacons
- \* Perimeter Traversing and Detailing
- \* Spot Heighting

### **3.4 INSTRUMENT / EQUIPMENT USED**

The instrument and equipments deployed for the execution of this project are:

1. 1 No South Total Station (South NTS – 350R series) serial no. S71071 and its accessories
2. 1 No GARMIN 76CSX hand – held GPS
3. Field book and writing material (pen)
4. 2 Nos Survey Tripod with plumb – bobs
5. 2 Nos Tribrachs
6. 3 Nos Reflectors / prisms
7. 3 Nos Tracking Rods
8. 1 No Survey Umbrella
9. 1 No Digger
10. 2 Nos Shovels
11. 1 No Hammer
12. 2 Nos Hand Trowels
13. 1 No 5m measuring Tape
14. No 100m steel tape
15. 5 Nos. Cutlasses
16. 2 Nos. Head pans

**3.4.1 Hardware:** The Hardware Components used were:

- i) 1 No pro Book 4530 laptop with its following configuration:

Processor: Intel (R) core (TM) i3 – 2330M

CPU: @ 2.20 GHZ

RAM: 4.00GB

System type: 32- bit Operating System

- ii) HP (Design jet T1300) plotter
- iii) HP officejet K7100 printer

**3.4.2 Software:** The Software Components used were:

- i) AutoCAD 2007 – for graphic plotting
- ii) South Data Transfer – for downloading field Data from Total Station
- iii) Surfer 8.0 – for generating of contour
- iv) Microsoft Office; which includes MS Excel, Note pad and MS word for report writing.

**3.5 TEST OF INSTRUMENT**

**3.5.1 SOUTH (NTS-350R) TOTAL STATION TEST**

Various tests were conducted on the South (NTS-350R) Total Station used, to ascertain its working condition prior to the commencement of the project execution.

These tests are as follows:

**3.5.2 PLATE LEVEL TEST**

This test was to verify that the vertical axis of the instrument used was truly vertical when the plate level was at the centre of its run.



**PROCEDURE:** The Total Station (South NTS-350R) was set up firmly on a point arbitrarily. The plate bubble tube was turned parallel to two foot screws and leveled with two foot screws; the tube was then turned through  $90^\circ$ , now over the third foot – screw and level accordingly using the third foot screw. It was then returned to its former position and accurately leveled with the pair of the two initial foot – screws. To complete the test, the instrument was rotated through  $180^\circ$  and  $360^\circ$  and the bubble was still at the centre of its run, hence the plate bubble was in order.

### **3.5.3 HORIZONTAL COLLIMATION TEST**

The aim of this test was to make sure that the line of sight is truly perpendicular to the trunion axis.

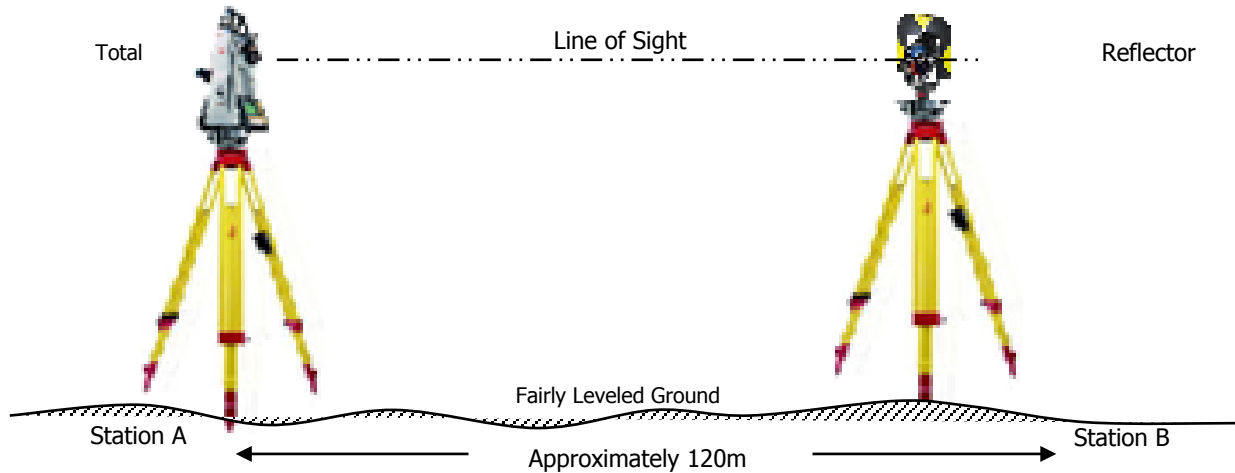
**PROCEDURE:** The Total Station instrument was set up on a point and all necessary temporary adjustments performed. The instrument was switched on, collimation program was selected from the menu and consequently the horizontal collimation test was chosen. This test was done by bisecting a well defined vertical target about 100m away and taking the horizontal readings on Face Left and Face Right. From the analysis of the results, the Total Station was in good adjustment.

### **3.5.4 VERTICAL INDEX ERROR TEST**

This adjustment ensures that the vertical circle reading is exactly  $90^\circ$  when the line of sight is horizontal. Any deviation from this figure is termed vertical index error.

**PROCEDURE:** The instrument was set over a station point and all necessary temporary adjustments (centering, levelling and focusing) were performed. The vertical index error test was carried out by sighting a target at a distance of about 120m on Face

Left. The Vertical Circle reading was recorded and the target was sighted and bisected again on Face Right and the vertical circle reading was recorded.



**Figure 1.6. : Instrument set-up for horizontal collimation test and vertical index test**

### 3.5.5 ANALYSIS OF COLLIMATION AND VERTICAL INDEX DATA

The readings obtained during the calibration were reduced to obtain the new horizontal collimation and vertical index errors. The results of the calibration data acquired for the total station used for this project are shown in the table below;

**Table 1.2: Horizontal and Vertical Collimation Test Reading**

| Inst Stn. | Sight (Reflector) | Face | Hor.Circle Reading  | Ver. Circle Reading |
|-----------|-------------------|------|---------------------|---------------------|
|           | B                 | L    | 87° 35' 10''        | 88° 26' 15''        |
| A         | B                 | R    | 267° 35' 12''       | 271° 33' 46''       |
|           |                   |      | Diff= 180° 00' 02'' | Sum= 360° 00' 01'   |

$$\text{Horizontal Collimation} = [(FR - FL) - 180^\circ]/2$$

$$= [(180^{\circ} 00' 02'' - 180^{\circ} 00' 00'') / 2]$$

$$= 00^{\circ} 00' 02'' / 2$$

$$= 00^{\circ} 00' 01''$$

$$\text{Vertical Collimation} = [(FR - FL) - 360^{\circ}] / 2$$

$$= [(360^{\circ} 00' 01'' - 360^{\circ} 00' 00'') / 2]$$

$$= 00^{\circ} 00' 01'' / 2$$

$$= 00^{\circ} 00' 01''$$

**Table 1.3: Comparison of Old and New Values.**

|                        | OLD            | NEW            |
|------------------------|----------------|----------------|
| HORIZONTAL COLLIMATION | + 00° 00' 02'' | +00° 00' 01''  |
| VERTICAL INDEX         | +00° 00' 00''  | + 00' 00' 01'' |

With the result obtained, it is evident that the instrument is in good working condition. Therefore, the new readings were adopted for the instruments Horizontal Collimation Error and Vertical Index Error respectively.

### **3.6 DATA ACQUISITION / FIELD OPERATIONS**

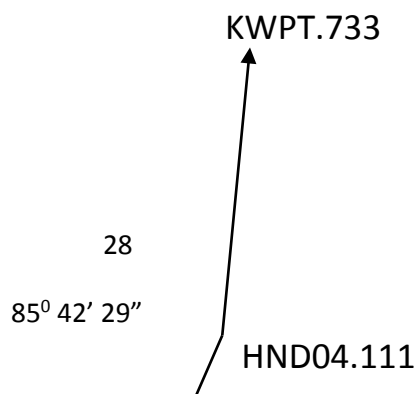
This aspect involved the various methods/procedures adopted in executing the project. The field observation procedures adopted were as follows:

- \* In-situ check for the controls
- \* Monumentation of the beacons according to required standard
- \* Perimeter Traversing
- \* Acquisition of Spot Heights and Detailing of the existing features.

### **3.6.1 IN-SITU CHECK FOR THE CONTROLS**

In-situ check was carried out to check the positions and reliability of the control pillars to ascertain that they were still in-situ. The instrument was set up on beacon KWP.1409, while two reflectors were also set up on beacons HND04.111 and KWPT.733. Then, the temporary adjustment (Centering, Leveling and Elimination of parallax) were performed on the instrument before observations were carried out as thus;

- i) The instrument was oriented by sighting the target (back sight) at station KWPT.733, the coordinates, the height of the instrument and the target were keyed into the Total Station, then the “ALL” button was pressed to take the measurement.
- ii) Thereafter, the instrument was turned to focus, bisect and a Foresight Observation to the target at KWPT.732. were made. The telescope of the instrument was transited to measure on the other Face. See figure 1.8 for the control check diagram.



**Figure 3.3: In-situ check Diagram (not drawn to scale).**

The values observed were compared with the known values, and the result of the comparison depicted shows that the controls were found to be in-situ. The summary is as shown in the table 1.6 below.

### **3.6.2 CLEARING OF SURVEY LINE**

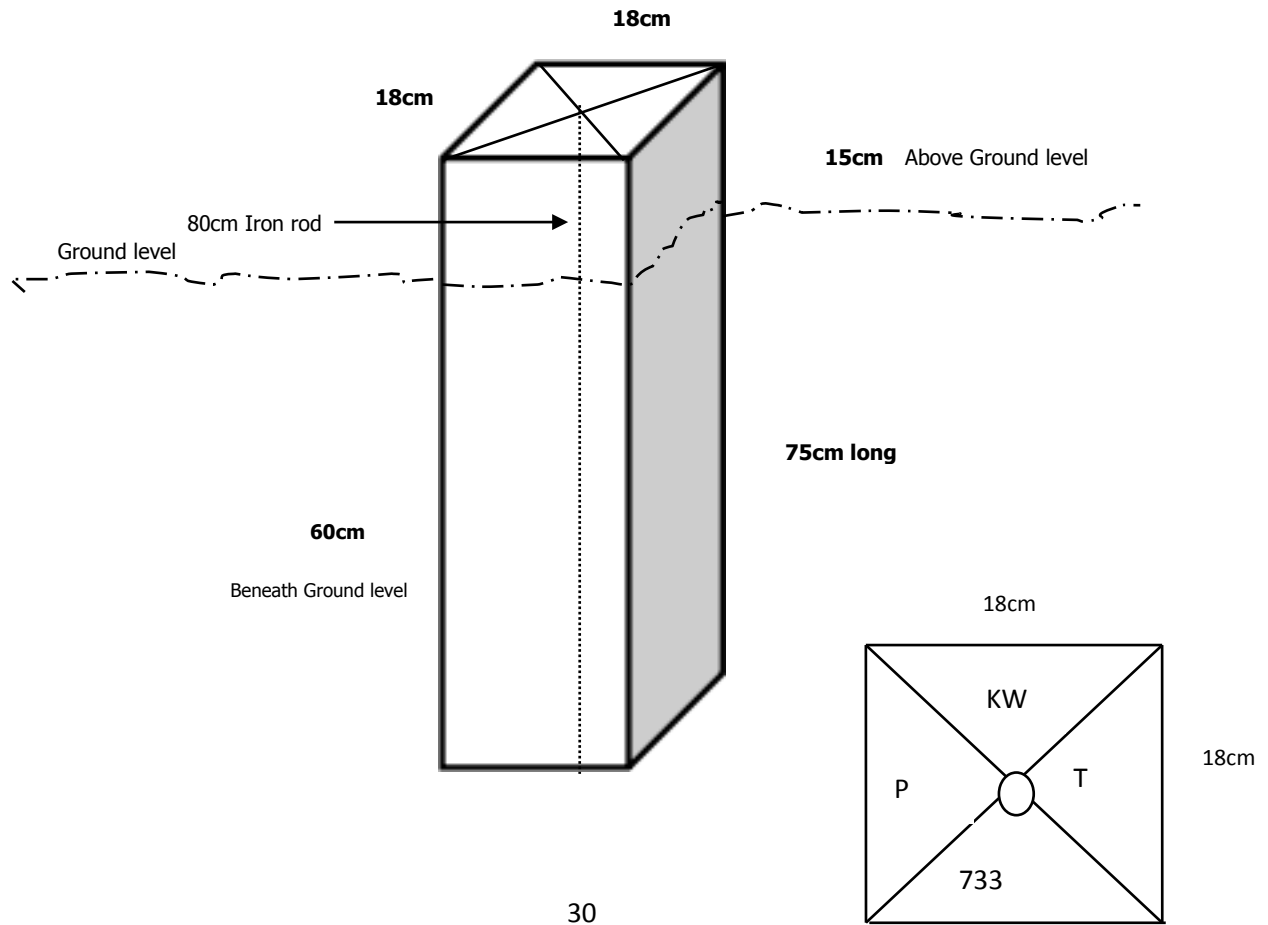
The site visit (field recce) and acquisition of data during data search exercise, however, facilitated the clearing of Survey line. The perimeter boundaries of the land were thoroughly cleared to a width of about 1 meter and stations were selected and intervisibility was ensured. Selection and Marking of stations from the control points to the project site were also carried out. The survey lines were cleared of any obstruction/obstacles which could hinder the line of sight of the deployed instrument.

### **3.7 MONUMENTATION**

Pre-cast property beacons made of 18cm x 18cm x 75cm were used for the demarcation of the project site. In compliance with the specification for cadastral Survey as specified in CAP 194 of law of the Federation of Nigeria, the Beacons were made of

concrete mixture of ratio 3:2:1 (3 parts of sand to 2 parts of granite to 1 part of cement) with water, so as to ensure that the pillars were strong. The beacons protruded 15cm above ground level, while the remaining part was inserted and fixed firmly into an undercut hole. An iron rod (80cm in lengths and 10mm in diameter) protruding at the centre of the beacon represents the centre of the station mark.

A total number of Five (5) beacons were emplaced and prefixed with identification mark “KW” where “PT” represent property beacon, KW represent Kwara and PT represent Polytechnic. The beacons were capped and numbered from kwpt733 to kwpt736 as obtained from the department of surveying, Kwara State polytechnic, ilorin and they were numbered in a clockwise direction with stencil.



### **Figure 1.9: Pre- cast property beacon**

## **3.8 TRAVERSING PROCEDURE**

At the completion of monumentation, a perimeter traverse was run over the boundary beacons to obtain X, Y and Z coordinates for all the boundary beacons.

The South (NTS -350R) Total Station was set up at HND04.111 and underwent temporary adjustment, the target was also set up at KWPT.733 as back station while the second target was set up at KWPT.732 as forward station. The coordinates of the back station and instrument station already were stored in the internal memory of the instrument during in-situ check. The instrument was used to bisect the target at the back station, and then the telescope was swung clockwise to bisect the target at the forward station numbered KWPT.734. The instrument automatically calculates the bearing, distance and coordinates of PBL. 38005 and stored it.

Then the instrument position was shifted to KWPT.1234 while KWP.1235 and PBL.38006 became back station and forward station respectively, similar procedure was repeated throughout the course of traversing until all the stations were occupied, coordinated and the traverse was closed back on another control pillar KWPT. 734 to form a closed traverse.

South (NTS-350R) Total Station operational procedures were as follows:

1. The Total Station was set up and temporary adjustment performed
2. After the instrument was powered ON

3. MENU button was pressed to open the menu page containing list of programs on the total station.
4. “DATA COLLECT” sub menu was opened by pressing F1 button
5. File name was given as KAM and F4 button was pressed to accept the file name
6. F1 button was pressed to input the parameters for occupy occupies point (Instrument station). The following were set into the instrument under occupy point.
  - Station point e.g. PBL.38005
  - Northing coordinate
  - Easting coordinate
  - Height
7. F3 button was pressed to recall the input values for proper checking and found okay, F4 button was pressed to accept the input values.
8. F2 button was pressed to open Back sight sub menu where the Back sight point; Northing coordinate, Easting coordinate and Height parameters will be imputed.
9. The telescope of the instrument was turned to sight and bisect the target for orientation.
10. After sighting the target F3 (MEAS) button was pressed to measure the coordinate (Northing, Easting and Height) of back station, and then F4 button was pressed to accept the measured value.
11. Having completed the orientation, F3 (FS/SS) button was pressed.



12. Then the instrument was thereafter turned to sight and bisect the reflector on its tracking rod that was held vertically at fore station.
13. F4 button was pressed to track, measured and store measured value on the internal memory of the total station.

These operational procedures were repeated throughout the course of traversing at every instrument set up.

### **3.9 DETAIL SURVEY AND SPOT HEIGHTING**

This is where the need for a topographical survey is essential. The spot heights and position of all natural and artificial features within the site were determined. Since the entire site was gridded at an interval of 10m as required by client, the details and spot heights were determined from some of the traverse boundary beacons and some of the fixed pegs along the gridded lines. This approach was found to be faster and convenient. In essence, the principle of working from “whole to part” was employed in this topographical survey.

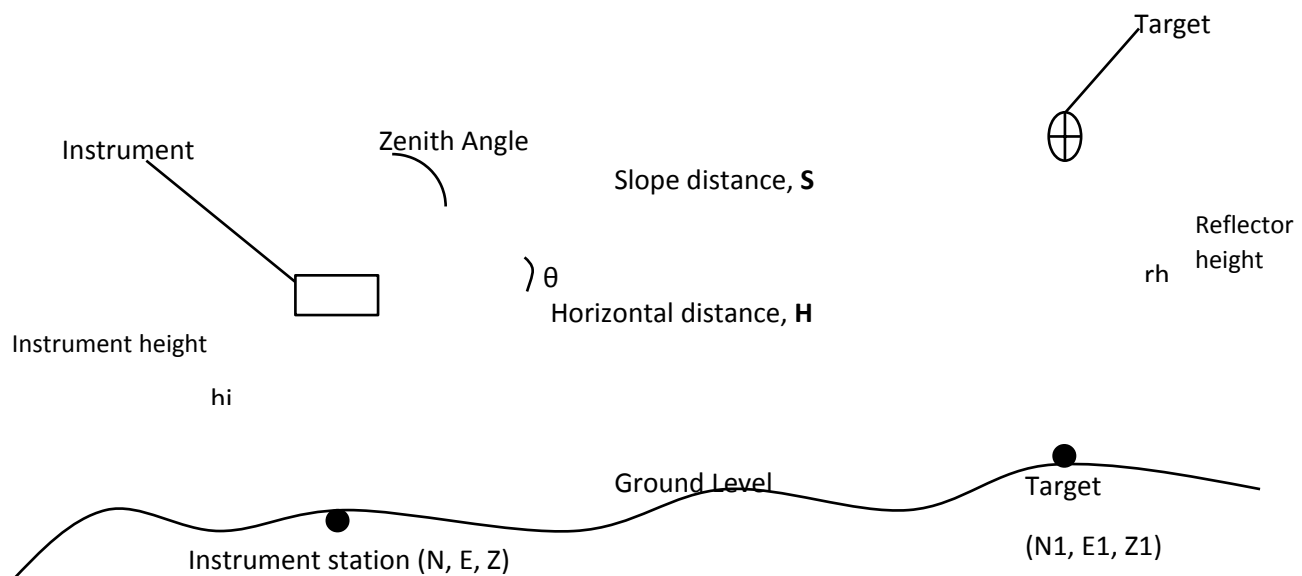
The procedure for observation was as thus:

The Total Station was set up on station kwpt.733, the instrument was switched “ON” and temporary adjustment was performed. The “file” (TOPO) was accessed and orientation was done by referencing to HND04.111 as the back station. However, the “parameters” of station KWPT.733 were recalled from the instrument’s internal memory and the height of instrument measured with 5m pocket tape was keyed into the instrument. The “parameters” of HND04.111 which served as reference station was also recalled from the instrument internal memory, then the height of reflector was determined

and keyed into the instrument. The reflector held vertically on beacon KWPT.732 was bisected for orientation. The total station automatically compute the bearing and distance between the two stations after the coordinate of the beacon KWPT.732 that was recalled for orientation was accepted by pressing the enter (F4) key on the instrument keyboard.

After the orientation, the field data acquisition for detailing and spot heightening then commenced by placing the reflector over all the interested points by making sure it was held vertically and the telescope of the total station turned until it bisects the centre of the reflector. Having carefully bisected the reflector, the F4 “ALL” button key was pressed to measure and record the coordinates of entire points. After the spot heights and other details within the instrument’s observation range were observed, then the instrument was moved to fore station and the above procedural steps were repeated for other details and spot heights to be observed for their locations and elevations to be determined.

The (N, E, H) of each spot height was obtained by the instrument using the listed below formulae and the accompany diagram as illustration.



**Figure 1.10: Illustrative diagram of spot height determination**

$$N1 = N + (S \times \sin Z \times \cos AZ)$$

$$E1 = E + (S \times \sin Z \times \sin AZ)$$

$$H1 = H + (S \times \sin Z + h_i - r_h)$$

Where:

$N1, E1, Z1$  = Northing, Easting and Height respectively of newly determined point.

$S$  = Slope distance

$Z$  = Zenith circle

$AZ$  = Bearing of the instrument station to the reflector or target point

$H_i$  = Height of instrument

$r_h$  = Reflector height

The South (NTS – 350R) Total station uses the zenith angle to deduce the true horizontal distance from the measured distance as shown below:

$$\text{Horizontal distance (D)} = S \times \cos \theta \text{ OR } S \times \sin (90 - \theta)$$

Where:

$\theta$  = Angle of inclination

$(90 - \theta)$  = Zenith angle ( $Z$ )

## **CHAPTER FOUR**

### **4.0 DATA PROCESSING**

The Total Station itself used the data acquired and stored during observation which was stored in the internal memory to compute the final coordinates since it has in-built computation software.

### **4.1 DATA DOWNLOADING**

The acquired data were downloaded from the memory of the instrument via the Data Transfer Port into the computer. The collected data were downloaded using South

Data Transfer Software. The explanation below shows the procedures involved during the downloading from the Total Station to the computer:

- \* The South (NTS 350R) Total Station was connected to computer before switching “ON” the computer and total station.
- \* The computer was switched “ON” and allowed to complete the booting operation.
- \* The Total Station was switched “ON”
- \* On the Total Station “MENU” key was pressed to open the program page
- \* F3 key was pressed to select “Memory Manager”.
- \* In the memory manager sub-menu, F1 key was pressed on the third page to select “Data Transfer”
- \* In the data transfer dialogue box, F1 key was pressed to select NTS -300 transfer mode. Then F3 key was pressed to select “COMM. PARAMETERS” where “BAUD RATE, PROTOCOL AND PARITY” was set to have the same setting parameters on the computer and on the Total Station to allow good communication between the Total Station and the Computer.
- \* Escape (ESC) key was pressed to go back to the previous menu (DATA TRANSFER) and F1 key was pressed to select the “SEND DATA”.
- \* In the appeared dialogue box F1 key was pressed to select the measured data option and the file name “KAM” which is to be downloaded was selected and F4 key was pressed to accept the file to be downloaded.

- \* On the computer system, in the NTS Total Station software environment, “COMM” menu was clicked on the menu bar and downloads 300 data option was selected on the pull down menu.
- \* On clicking the download 300 data on the pull down menu, a small dialogue box appear given an instruction to press enter (F4 key) on the Total Station and the (Enter) key on the computer. Once this was done sequentially, the data automatically start to download.
- \* After downloading the data, Transfer menu was selected on the menu bar and “CASS survey data 300” was selected and clicked to Transfer the data from Chinese Language to English Language for better interpretation and understanding.

## **4.2 COMPUTATION OF SURVEY DATA**

Total Station Instruments, with their microprocessors, can perform a variety of computations, depending on how they are programmed. South (NTS -350R) Total Station is capable of assisting an operator, step by step, through several different types of basic surveying operations.

In addition to providing guidance to the operator, microprocessors of South (NTS -350R) Total Station can perform many different types of computations automatically and some standard computations include:

- 1) Averaging of multiple angles and distances observations;
- 2) Correcting electronically observed distances for prism constants, atmospheric pressure, and temperature;

- 3) Making curvature and refraction corrections to elevations determined by trigonometric leveling;
- 4) Reducing slope distances to their horizontal and vertical components;
- 5) Calculating point elevations from the vertical distance components (supplemented with keyboard input of instrument and reflector heights);
- 6) Making corrections to observed horizontal and vertical angles for various instrumental errors; and
- 7) Computing coordinates of surveyed points from horizontal angle and horizontal distance components (supplemented with keyboard input of coordinates for the occupied station, and a reference azimuth). Furthermore, the microprocessors of total station perform traverse computations and simultaneously calculate and store station coordinates and elevation.

#### **4.3 AREA AND BACK COMPUTATION**

The process of determining the total area and both final bearings and distances between the traverse stations were carried out using an in – house (SURVCAD) software, which was designed to carry out the area and back computation, using double latitude departure method for its computation. The area enclosed by the project site was computed

The programme is of the three segments viz:

- The execution programme: used to execute the task ahead.
- The input file: used to input all data for the area involved

- The output file: used to view the result inform of a computation sheet.

#### **4.3.1 RUNNING THE PROGRAMME**

DOS EDITOR through the MS DOS PROMPT command was launched through the following this process:

- \* Click the start menu
- \* Go to programs
- \* Search for MS DOS PROMPT and click to go to the C:\WINDOWS>
- \* C:\> type CD\
- \* Type C:\>CD TRAVERSE \_ COMP
- \* C:\TRAVERSE \_ COMP > type EDIT AREA.INP

The operation was carried out by inputting all the involved data into the input file – area.inp in the following order:

- No of stations (e.g. 10)
- Input all the point ID, Northing, Easting e.g. (PBL. 38005, 928281.120m, 684441.560m)
- Save the input file and exit the DOS EDITOR, after which the AREA.EXE file was used to execute the programme.
- At the DOS PROMPT C:\ type AREA (C:\AREA) to run the programme.
- At the EDITOR menu the OUTPUT FILE – AREA.OUT was opened to view the result or type EDIT AREA.OUT (C:\TRAVERSE \_ COMP>EDIT AREA.OUT).



Print out for area and back computation are shown in appendices respectively.

The above program for area and back computation was developed for Office of the Surveyor General, Kwara State by Surv. Felix Iyiola of Department of Geoinformatics, Federal School of Surveying, Oyo, Oyo State.

#### **4.4 PLAN PRODUCTION AND PRESENTATION**

The final coordinates obtained from the field observations were used for the perimeter plotting, detailing, spot heights and contours. The boundary, spot heights and details were plotted with AutoCAD 2007 while the contour was generated using Surfer 8 Software which was later exported through data exchange format (.dxf) into AutoCAD 2007.

##### **4.4.1 PLOTTING PROCEDURES**

The data was prepared as script file and saved as (.txt format) for plotting of points in AutoCAD 2007.

##### **4.4.2 AUTOCAD PLOTTING PROCEDURE**

1. AutoCAD 2007 was launched and 'NEW' was clicked under the **FILE MENU** and named.
2. **Format Menu** was clicked and then **Units** was selected and clicked.
3. In the appeared dialogue box, the unit settings were carried out for *length precision, Angle type and precision, Direction (clockwise) and direction control (North Azimuth)*.

4. Layers for each feature with their conventional colours were also created e.g. Boundary layer in Red, Details in Black, and Contour in Brown e.t.c.
5. From **Tools Menu**, **Run scripts** was selected and clicked.
6. From the appeared dialogue box, the coordinate file already prepared in notepad (e.g. boundary.scr) was selected from the source file and the **OK** was clicked.
7. The plotted lines automatically appears in AutoCAD 2007 environment drawing area
8. Each corresponding layer was made active when running the script files (e.g. boundary layer was made active when running the boundary script file e.t.c.).
9. This process was repeated for plotting of all features.

#### **4.4.3 CONTOUR AND DIGITAL TERRAIL MODEL PROCEDURE**

The contour line was plotted using Surfer 8.0 software which shows imaginary lines joining points/places of equal elevation together.

The following procedures were followed in plotting the contour;

- \* Script file was prepared as **Kam.dat**
- \* Surfer 8.0 was launched from desktop
- \* **'Data'** from Grid menu was clicked to generate Grid file from the edited spot heights data saved in the computer.
- \* From the Grid data dialog box opened, column for Easting (X), Northing (Y) and Height (Z), was specified, gridding method (krigging) and output grid file were specified.
- \* Report generated was saved by clicking **'OK'**.
- \* From Map menu, Contour map and New Contour Map was selected

- \* The Grid file was opened from the open dialog box.
- \* The contour map displayed was double clicked and the contour properties settings dialog box opened.
- \* The following contour properties were selected;
  - contour interval 0.5m
  - contour line thickness 0.6m
  - contour labeling
  - plotting scale e.t.c.
- \* Apply was clicked to effect the new parameters on the newly displayed contour.
- \* **‘Surface’** was selected from map menu and Digital Terrain Model (DTM) showing the three dimensional representation of the terrain was displayed. This is more comprehensive than the contour lines.

#### **4.4.4 EXPORTING CONTOUR FROM SURFER TO AUTOCAD**

- \* **‘Export’** was selected from file menu and the contour map was exported to AutoCAD 2007 with data exchange format (dxf).
- \* From the export dialog box displayed, AutoCAD dxf format was chosen as the save as format and the file name was also supplied and save was clicked.
- \* AutoCAD 2007 was launched and the **‘file menu’** was clicked and sub-menu **‘open’** was selected

- \* Edit menu was also clicked, '**Zoom and Extent**' was selected and the contour was displayed and copied.
- \* Also AutoCAD 2007 was launched and the plotted boundary of site was opened and '**Paste to Original Coordinates**' was selected from view menu. Thereby the imported contour was successfully pasted to its original position.

All the plans presented in this project are attached at the appendix as appendix

## CHAPTER FIVE

### 5.0 SUMMARY, CONCLUSION PROBLEM ENCOUNTERED AND RECOMMENDATION

#### 5.1 SUMMARY

The project area covered 4.768 hectares. The project cut across reconnaissance, monumentation, perimeter traversing, spot heightening and detailing, South (NTS –

350R) Total Station was used for data acquisition. South data transfer software was used for the downloading of all the acquired data. The final adjusted coordinates were used for the production of perimeter and topographical plan using AutoCAD 2007 and Surfer 8.0 respectively. The plan was drawn at a scale of 1:2,500

## 5.2 CONCLUSION

The aim and objectives of this project were achieved to its fullest, since the results obtained were all within the limits of permissible accuracies. Meanwhile, it is quite important to mention that, all the observations and measurements were made in total conformity with survey rules and regulations and departmental instructions. The perimeter / topographical plan of the former institute of environmental studies were successfully carried out.

Conclusively, these plans will be useful as source of information for the planning and management of the academic institution purposely for the designing and future construction of the proposed structures in the site.

## 5.3 PROBLEM ENCOUNTERED

The execution of this project was faced with many problems, some of which are itemize below:

- i) The problem of getting the instrument for the field work.
- ii) The weather condition is another thing due to that it was during raining season.

- iii) The general shortage in power supply also affected the pace of the project at data processing stage. The problem was, however, averted by getting a generator.

#### 5.4 RECOMMENDATION

- i. The student project should be given early to the students to avoid too rushing.
- ii. And the school authority to get the department more surveying equipments.

#### RAW DATA

| PT  | E        | N        | H       |  | PT     | E        | N        | H       |
|-----|----------|----------|---------|--|--------|----------|----------|---------|
| M27 | 679768.7 | 946566.1 | 355.231 |  | 247BLD | 679563.2 | 946433.7 | 354.413 |
| CV  | 679758.3 | 946567   | 355.38  |  | 248SH  | 679564.8 | 946439.4 | 354.751 |
| 1CV | 679758.2 | 946567.7 | 355.385 |  | 249SH  | 679561.8 | 946441   | 354.737 |

|      |          |          |         |  |        |          |          |         |
|------|----------|----------|---------|--|--------|----------|----------|---------|
| 2CV  | 679757.5 | 946576.2 | 355.708 |  | 250SH  | 679560.6 | 946446.5 | 354.941 |
| 3CV  | 679757.5 | 946576.7 | 355.699 |  | 251SH  | 679563.8 | 946445.5 | 354.953 |
| 4CV  | 679738.3 | 946565.9 | 355.575 |  | 252SH  | 679566.8 | 946448.1 | 354.891 |
| 5CV  | 679737.8 | 946565.7 | 355.58  |  | 253BLD | 679567.4 | 946450.1 | 354.8   |
| 6CV  | 679744.2 | 946563.5 | 355.438 |  | 254SH  | 679564.4 | 946451.9 | 354.808 |
| 7CV  | 679732.9 | 946577.2 | 355.97  |  | 255BLD | 679561.1 | 946451.7 | 354.852 |
| 8CV  | 679732.9 | 946577.7 | 355.993 |  | 256SH  | 679554.4 | 946457.1 | 355.082 |
| 9SH  | 679731.3 | 946566.6 | 355.457 |  | 257SH  | 679557   | 946463.2 | 355.252 |
| 10SH | 679735.3 | 946561.9 | 355.322 |  | 258SH  | 679563.2 | 946469.2 | 355.584 |
| 11SH | 679734.1 | 946554.9 | 355.268 |  | 259SH  | 679570.9 | 946475.6 | 355.635 |
| 12SH | 679735   | 946550.1 | 355.154 |  | 260SH  | 679579.4 | 946479.5 | 355.513 |
| 13SH | 679729.2 | 946549.5 | 355.141 |  | 261SH  | 679585.7 | 946482.5 | 355.311 |
| 14SH | 679726.2 | 946557.5 | 355.246 |  | 262SH  | 679585   | 946474.8 | 355.259 |
| 15SH | 679726   | 946565.7 | 355.537 |  | 263SH  | 679581.3 | 946467.8 | 355.057 |
| 16SH | 679725.8 | 946569.2 | 355.778 |  | 264SH  | 679583.3 | 946461.5 | 354.781 |
| 17SH | 679721.2 | 946569.3 | 355.854 |  | 265SH  | 679575.1 | 946459.8 | 354.9   |
| 18SH | 679720.8 | 946565.2 | 355.79  |  | 266SH  | 679577.8 | 946452   | 354.63  |
| 19SH | 679720.1 | 946561   | 355.772 |  | 267SH  | 679585.7 | 946448.9 | 354.304 |
| 20SH | 679718.7 | 946555.5 | 355.498 |  | 268SH  | 679589.5 | 946455.5 | 354.304 |
| 21SH | 679716.5 | 946552.6 | 355.489 |  | 269SH  | 679589   | 946463.8 | 354.691 |
| 22SH | 679717.4 | 946548.4 | 355.223 |  | 270SH  | 679591.4 | 946475   | 355.109 |
| 23SH | 679721.1 | 946546.8 | 355.076 |  | 271SH  | 679596.1 | 946482.5 | 355.144 |
| 24SH | 679727   | 946546.3 | 354.981 |  | 272SH  | 679604.1 | 946483.4 | 355.098 |
| 25SH | 679729.2 | 946543.3 | 354.897 |  | 273SH  | 679611   | 946488.5 | 355.065 |
| 26SH | 679731.9 | 946540.9 | 354.872 |  | 274TR  | 679613.1 | 946494.8 | 355.362 |
| 27SH | 679732.9 | 946537.6 | 354.712 |  | 275BLD | 679621.7 | 946489.3 | 354.727 |
| 28SH | 679728.9 | 946536.2 | 354.721 |  | 276BLD | 679626.8 | 946508.1 | 355.612 |
| 29SH | 679726.4 | 946534.4 | 354.752 |  | 277SH  | 679633.5 | 946519.1 | 355.851 |

|      |          |          |         |  |        |          |          |         |
|------|----------|----------|---------|--|--------|----------|----------|---------|
| 30SH | 679723.8 | 946538.5 | 354.814 |  | 278BLD | 679640.2 | 946520   | 355.785 |
| 31SH | 679721   | 946542.6 | 354.977 |  | 279SH  | 679639.8 | 946513.4 | 355.627 |
| 32SH | 679717.6 | 946539.8 | 354.892 |  | 280EP  | 679637.4 | 946507.6 | 355.433 |
| 33SH | 679718   | 946536.4 | 354.884 |  | 281BLD | 679636.5 | 946505.6 | 355.246 |
| 34SH | 679714   | 946538.3 | 354.977 |  | 282SH  | 679643.8 | 946502.3 | 355.063 |
| 35SH | 679713.3 | 946542.8 | 355.154 |  | 283BLD | 679650.7 | 946501.9 | 354.954 |
| 36SH | 679712.2 | 946547.9 | 355.442 |  | 284SH  | 679642.9 | 946494.6 | 354.689 |
| 37SH | 679710.9 | 946552.7 | 355.429 |  | 285SH  | 679635.3 | 946492   | 354.726 |
| 38SH | 679708.2 | 946557.5 | 355.701 |  | 286SH  | 679641   | 946488.1 | 354.571 |
| 39SH | 679707.7 | 946563.4 | 355.883 |  | 287SH  | 679644.8 | 946486.4 | 354.7   |
| 40SH | 679711.1 | 946566.7 | 356.004 |  | 288BLD | 679645.9 | 946483.4 | 354.33  |
| 41SH | 679708.1 | 946569.9 | 356.206 |  | 289SH  | 679645.7 | 946479.5 | 353.979 |
| 42SH | 679703.6 | 946568.2 | 356.182 |  | 290SH  | 679638.9 | 946480.2 | 354.355 |
| 43SH | 679700.2 | 946563   | 356.12  |  | 291SH  | 679633.7 | 946483   | 354.408 |
| 44EP | 679698.2 | 946563.3 | 356.114 |  | 292BLD | 679631.6 | 946486.8 | 354.527 |
| 45SH | 679702.3 | 946553.9 | 355.727 |  | 293SH  | 679629.4 | 946481.2 | 354.451 |
| 46SH | 679704.5 | 946548.4 | 355.536 |  | 294SH  | 679633.3 | 946475.9 | 354.313 |
| 47TR | 679706.9 | 946541.3 | 355.205 |  | 295EP  | 679627.7 | 946474.3 | 354.551 |
| 48TR | 679702.6 | 946540.8 | 355.225 |  | 296BLD | 679628.2 | 946472.5 | 354.312 |
| 49TR | 679699.1 | 946541.1 | 355.248 |  | 297BLD | 679618.2 | 946475.1 | 354.697 |
| 50SH | 679700   | 946547.5 | 355.499 |  | 298SH  | 679611.2 | 946479.6 | 354.871 |
| 51SH | 679700.2 | 946552.8 | 355.744 |  | 299SH  | 679605.2 | 946477.6 | 355.077 |
| 52SH | 679697.7 | 946558.7 | 355.964 |  | 300SH  | 679602   | 946467.8 | 354.57  |
| 53SH | 679694.5 | 946563.2 | 356.2   |  | 301SH  | 679597.8 | 946456.7 | 354.278 |
| 54SH | 679693.8 | 946570.4 | 356.51  |  | 302SH  | 679594.7 | 946448   | 354.104 |
| 55SH | 679687.9 | 946568.2 | 356.447 |  | 303BLD | 679595.7 | 946443.4 | 353.704 |
| 56SH | 679685.7 | 946562   | 356.281 |  | 304SH  | 679599.7 | 946443.2 | 353.734 |
| 57SH | 679685.7 | 946557.7 | 355.987 |  | 305SH  | 679606.4 | 946449.5 | 353.675 |



|      |          |          |         |  |         |          |          |         |
|------|----------|----------|---------|--|---------|----------|----------|---------|
| 58SH | 679687.4 | 946552.8 | 355.886 |  | 306SH   | 679612.9 | 946452.5 | 353.553 |
| 59SH | 679689.6 | 946547.6 | 355.721 |  | 307BLD  | 679613.5 | 946456.3 | 353.862 |
| 60SH | 679692.1 | 946541.8 | 355.525 |  | g308BLD | 679619.6 | 946439.8 | 352.65  |
| 61SH | 679687.3 | 946541.8 | 355.53  |  | g309SH  | 679617.2 | 946446.8 | 353.497 |
| 62SH | 679685.1 | 946548.3 | 355.926 |  | g310SH  | 679610.5 | 946444.8 | 353.32  |
| 63SH | 679683.4 | 946553.8 | 355.96  |  | g311BLD | 679609.6 | 946442.1 | 353.459 |
| 64SH | 679681.3 | 946561.7 | 356.184 |  | g312SH  | 679605.9 | 946436.5 | 353.69  |
| 65SH | 679680.2 | 946571   | 356.77  |  | g313SH  | 679601.2 | 946433   | 353.554 |
| 66SH | 679674.5 | 946570.5 | 356.782 |  | g314SH  | 679595.7 | 946428.9 | 353.495 |
| 67SH | 679673.9 | 946563.2 | 356.591 |  | g315BLD | 679591.8 | 946426.5 | 353.5   |
| 68SH | 679674.9 | 946554.6 | 356.218 |  | g316EP  | 679598   | 946422.5 | 353.204 |
| 69SH | 679676.6 | 946546.3 | 355.755 |  | g317SH  | 679590.1 | 946421.1 | 353.102 |
| 70TR | 679681.2 | 946542.1 | 355.649 |  | g318BLD | 679604.9 | 946423.3 | 352.95  |
| 71TR | 679673.8 | 946542.5 | 355.789 |  | g319BLD | 679615.8 | 946420.7 | 352.757 |
| 72TR | 679665.4 | 946543.4 | 355.889 |  | g320SH  | 679614.2 | 946417.3 | 352.596 |
| 73SH | 679669.4 | 946542.7 | 355.803 |  | g321SH  | 679620.4 | 946415.7 | 352.595 |
| 74SH | 679677.6 | 946542.3 | 355.62  |  | g322SH  | 679622.2 | 946414.8 | 352.605 |
| 75SH | 679669.4 | 946545.5 | 355.927 |  | g323BLD | 679622.9 | 946410.2 | 352.294 |
| 76SH | 679668.5 | 946553.8 | 356.104 |  | g324SH  | 679625.4 | 946403.4 | 351.797 |
| 77SH | 679668.9 | 946564.3 | 356.611 |  | g325BLD | 679619.7 | 946397.5 | 351.831 |
| 78SH | 679668.9 | 946569   | 356.74  |  | g326BLD | 679631.9 | 946392.1 | 351.05  |
| 79SH | 679668.4 | 946571.6 | 356.384 |  | g327SH  | 679635.8 | 946389.4 | 350.748 |
| 80SH | 679658.5 | 946571.5 | 357.129 |  | g328BLD | 679629.1 | 946382.7 | 350.598 |
| 81SH | 679656.9 | 946564.6 | 356.704 |  | g329SH  | 679621.3 | 946378.2 | 350.407 |
| 82SH | 679659.7 | 946559.8 | 356.571 |  | g330SH  | 679606.6 | 946383.7 | 351.339 |
| 83SH | 679661.4 | 946553.8 | 356.428 |  | g331SH  | 679596.7 | 946380.8 | 351.666 |
| 84SH | 679658.3 | 946544.9 | 356.1   |  | g332BLD | 679596.7 | 946388.5 | 351.902 |
| 85SH | 679651.8 | 946547.7 | 356.306 |  | g333BLD | 679599.3 | 946402.2 | 352.205 |

|       |          |          |         |  |         |          |          |         |
|-------|----------|----------|---------|--|---------|----------|----------|---------|
| 86SH  | 679653.1 | 946556.6 | 356.574 |  | g334BLD | 679600   | 946404.1 | 352.247 |
| 87SH  | 679652.9 | 946567.1 | 356.877 |  | g335BLD | 679602.8 | 946415.1 | 352.52  |
| 88SH  | 679651.7 | 946572.1 | 357.378 |  | g336TR  | 679591.5 | 946412.2 | 352.672 |
| 89SH  | 679643.6 | 946572.2 | 357.413 |  | 337TR   | 679576.9 | 946419.6 | 353.472 |
| 90SH  | 679644.4 | 946566.5 | 357.246 |  | 338SH   | 679580.8 | 946408.4 | 352.808 |
| 91SH  | 679645.7 | 946559.4 | 357.04  |  | 339SH   | 679565.8 | 946411.4 | 353.369 |
| 92SH  | 679647.1 | 946551.7 | 356.739 |  | 340SH   | 679558.7 | 946412.2 | 353.495 |
| 93BLD | 679647.6 | 946549.5 | 356.635 |  | 341SH   | 679566.7 | 946408   | 353.271 |
| 94BLD | 679636.9 | 946552.3 | 357.159 |  | 342SH   | 679567   | 946388.8 | 352.506 |
| 95SH  | 679641.8 | 946557.2 | 357.072 |  | 343BLD  | 679571.7 | 946384.7 | 352.154 |
| 96SH  | 679642.5 | 946566.2 | 357.28  |  | 344TR   | 679567.6 | 946377.1 | 352.218 |
| 97SH  | 679639.7 | 946572.6 | 357.549 |  | 345SH   | 679574.9 | 946373.7 | 351.786 |
| 98    | 679638.1 | 946566.2 | 357.424 |  | 346BLD  | 679582.1 | 946383.3 | 351.964 |
| 99SH  | 679633.8 | 946560.7 | 357.238 |  | 347SH   | 679589.9 | 946379.1 | 351.617 |
| 100SH | 679631.7 | 946554.4 | 357.111 |  | 348BLD  | 679593.8 | 946378.6 | 351.609 |
| 101SH | 679623.3 | 946553.8 | 357.256 |  | 349BLD  | 679592.7 | 946373.4 | 351.36  |
| 102SH | 679624.7 | 946559.9 | 357.438 |  | 350SH   | 679591.2 | 946368.2 | 351.155 |
| 103SH | 679624   | 946568   | 357.655 |  | 351BLD  | 679585.1 | 946372.1 | 351.57  |
| 104SH | 679624.1 | 946573.4 | 357.874 |  | 352BLD  | 679580   | 946372.4 | 351.647 |
| 105SH | 679614.3 | 946573.9 | 358.127 |  | 353BLD  | 679579.8 | 946361.4 | 351.38  |
| 106SH | 679613.7 | 946565.3 | 357.839 |  | 354BLD  | 679584.7 | 946361.2 | 350.9   |
| 107SH | 679612.1 | 946556.3 | 357.508 |  | 355SH   | 679586.2 | 946359.2 | 350.709 |
| 108SH | 679604.2 | 946553.5 | 357.549 |  | 356BLD  | 679583.2 | 946358.5 | 350.985 |
| 109SH | 679602   | 946561.4 | 357.851 |  | 357BLD  | 679579.2 | 946359.8 | 351.415 |
| 110SH | 679601.3 | 946569.8 | 358.163 |  | 358BLD  | 679587.4 | 946357.5 | 350.786 |
| 111SH | 679608.9 | 946574.4 | 358.288 |  | 359BLD  | 679582.3 | 946353.4 | 350.772 |
| 112SH | 679609.1 | 946574.8 | 358.241 |  | 360BLD  | 679585.3 | 946351.4 | 350.581 |
| 113CV | 679617.6 | 946581.9 | 358.345 |  | 361SH   | 679576.9 | 946338.9 | 350.162 |

|       |          |          |         |  |        |          |          |         |
|-------|----------|----------|---------|--|--------|----------|----------|---------|
| 114CV | 679617.7 | 946582.4 | 358.349 |  | 362BLD | 679582.5 | 946334.2 | 349.974 |
| 115SH | 679599.7 | 946572.7 | 358.277 |  | 363BLD | 679581   | 946328.7 | 349.615 |
| 116SH | 679596.4 | 946572.9 | 357.998 |  | 364SH  | 679586.8 | 946320.7 | 349.368 |
| 117SH | 679595.5 | 946567.4 | 358.085 |  | 365SH  | 679597.4 | 946313.8 | 349.046 |
| 118SH | 679593.4 | 946557.3 | 357.738 |  | 366SH  | 679607.1 | 946318.7 | 348.963 |
| 119TR | 679590.3 | 946549.5 | 357.64  |  | 367BLD | 679613.7 | 946320.1 | 348.941 |
| 120SH | 679582.1 | 946549.4 | 357.531 |  | 368TR  | 679613.9 | 946309.8 | 348.65  |
| 121SH | 679581.6 | 946557.2 | 357.962 |  | 369SH  | 679616.2 | 946298.2 | 348.005 |
| 122SH | 679582.2 | 946567.9 | 358.263 |  | 370SH  | 679627.7 | 946297.1 | 347.625 |
| 123EP | 679579.7 | 946568.6 | 358.591 |  | 371SH  | 679645.1 | 946296.7 | 347.453 |
| 124SH | 679580.2 | 946575   | 358.495 |  | 372SH  | 679658.3 | 946302.9 | 347.295 |
| 125SH | 679571.3 | 946573.8 | 358.741 |  | 373SH  | 679666.7 | 946298.5 | 347.142 |
| 126SH | 679572.7 | 946566.2 | 358.364 |  | 374SH  | 679680.6 | 946284.1 | 346.411 |
| 127SH | 679574.8 | 946560   | 358.059 |  | 375SH  | 679688.2 | 946270.8 | 345.395 |
| 128SH | 679573.5 | 946553.2 | 358.022 |  | 376CV  | 679689.3 | 946261.5 | 345.332 |
| 129SH | 679566.7 | 946550.8 | 357.993 |  | 377CV  | 679690.3 | 946261.4 | 345.328 |
| 130SH | 679566.9 | 946557.8 | 358.18  |  | 378CV  | 679697.8 | 946261.4 | 345.408 |
| 131SH | 679568.5 | 946567.9 | 358.512 |  | 379CV  | 679698.5 | 946261.3 | 345.478 |
| 132SH | 679566.3 | 946575.8 | 358.74  |  | 380SH  | 679692.3 | 946305.8 | 347.227 |
| 133RD | 679566.1 | 946577.5 | 358.327 |  | 381SH  | 679695.6 | 946312.3 | 347.226 |
| 134RD | 679565.7 | 946582.3 | 358.571 |  | 382CV  | 679697.4 | 946313.1 | 347.122 |
| 135SH | 679559.5 | 946575   | 358.704 |  | 383CV  | 679698   | 946313   | 347.138 |
| 136SH | 679556.4 | 946568.5 | 358.758 |  | 384CV  | 679698.3 | 946319.2 | 347.244 |
| 137SH | 679555   | 946563.4 | 358.596 |  | 385CV  | 679698.9 | 946319.2 | 347.274 |
| 138SH | 679553   | 946556   | 358.304 |  | 386SH  | 679685   | 946318   | 347.51  |
| 139TR | 679552.5 | 946552.5 | 358.303 |  | 387SH  | 679672.4 | 946315.8 | 347.617 |
| 140SH | 679545.4 | 946553.1 | 358.459 |  | 388BLD | 679658.2 | 946309.2 | 347.637 |
| 141SH | 679546.7 | 946561.8 | 358.652 |  | 389BLD | 679659.5 | 946314.7 | 347.746 |

|        |          |          |         |  |        |          |          |         |
|--------|----------|----------|---------|--|--------|----------|----------|---------|
| 142SH  | 679547.1 | 946570.4 | 358.817 |  | 390SH  | 679662.1 | 946322.1 | 347.929 |
| 143SH  | 679546.6 | 946576.8 | 358.9   |  | 391BLD | 679664.6 | 946328.2 | 347.996 |
| 144SH  | 679537.5 | 946577.1 | 358.812 |  | 392BLD | 679665.6 | 946337.4 | 348.704 |
| 145RD  | 679535.2 | 946578.8 | 358.651 |  | 393SH  | 679646.2 | 946324.2 | 348.235 |
| 146RD  | 679534.5 | 946583.1 | 358.823 |  | 394BLD | 679631.5 | 946335   | 348.708 |
| 147SH  | 679539.9 | 946570.3 | 358.934 |  | 395BLD | 679632.6 | 946345.9 | 349.393 |
| 148SH  | 679544.4 | 946558.1 | 358.671 |  | 396BLD | 679626.8 | 946323.1 | 348.605 |
| 149SH  | 679542.9 | 946549.1 | 358.421 |  | 397BLD | 679625.6 | 946317.6 | 348.556 |
| 150SH  | 679539.7 | 946542   | 358.296 |  | 398EP  | 679624.5 | 946325.5 | 348.953 |
| 151SH  | 679537.1 | 946534.2 | 358.041 |  | 399BLD | 679615.4 | 946325.9 | 349.043 |
| 152SH  | 679533.5 | 946527.2 | 357.905 |  | 400SH  | 679625.7 | 946339.6 | 348.81  |
| 153SH  | 679532.6 | 946516.9 | 357.628 |  | 401BLD | 679619.2 | 946342.3 | 349.354 |
| 154SH  | 679532.2 | 946509.9 | 357.354 |  | 402BLD | 679620.5 | 946349.1 | 349.802 |
| 155SH  | 679532.5 | 946506.5 | 357.25  |  | 403SH  | 679620.4 | 946355.6 | 350.257 |
| 156SH  | 679538.4 | 946504.8 | 357.316 |  | 404SH  | 679611.7 | 946360.6 | 350.523 |
| 157SH  | 679540.9 | 946511.6 | 357.488 |  | 405SH  | 679607.6 | 946365.4 | 350.685 |
| 158SH  | 679543.3 | 946519.9 | 357.603 |  | 406BLD | 679625.6 | 946365.5 | 350.363 |
| 159SH  | 679546.2 | 946529.7 | 357.712 |  | 407BLD | 679627   | 946370.7 | 350.097 |
| 160SH  | 679545.8 | 946534.5 | 357.933 |  | 408SH  | 679633.7 | 946366.2 | 350.067 |
| 161SH  | 679548.3 | 946541.9 | 358.09  |  | 409EP  | 679632.1 | 946354.8 | 349.928 |
| 162SH  | 679550.7 | 946548.7 | 358.235 |  | 410TR  | 679639.5 | 946352.7 | 350.048 |
| 163SH  | 679561.1 | 946547.8 | 357.996 |  | 411SH  | 679655.1 | 946353.2 | 349.219 |
| 164SH  | 679560.3 | 946537.6 | 357.688 |  | 412SH  | 679657.8 | 946344.1 | 349.121 |
| 165SH  | 679559   | 946529.5 | 357.501 |  | 413SH  | 679678.2 | 946346.6 | 348.571 |
| 166CV  | 679550.8 | 946527.8 | 357.744 |  | 414SH  | 679685.7 | 946339.6 | 347.804 |
| 167BLD | 679550.8 | 946527.8 | 357.751 |  | 415SH  | 679693.7 | 946350   | 348.212 |
| 168EP  | 679549.2 | 946532   | 358.235 |  | 416SH  | 679689.3 | 946359.3 | 348.39  |
| 169SH  | 679546.6 | 946517.5 | 357.867 |  | 417SH  | 679697.3 | 946363.6 | 349.033 |

|        |          |          |         |  |        |          |          |         |
|--------|----------|----------|---------|--|--------|----------|----------|---------|
| 170BLD | 679546.5 | 946511.2 | 357.256 |  | 418SH  | 679702.2 | 946372.7 | 348.67  |
| 171SH  | 679546.1 | 946507.2 | 357.186 |  | 419SH  | 679688.6 | 946371.5 | 348.483 |
| 172BLD | 679545.3 | 946503.3 | 357.135 |  | 420SH  | 679677.2 | 946367.2 | 349.121 |
| 173SH  | 679551.7 | 946505.4 | 356.976 |  | 421SH  | 679671.4 | 946359.9 | 348.729 |
| 174SH  | 679559.9 | 946503.8 | 356.64  |  | 422BLD | 679670.3 | 946354.5 | 349.084 |
| 175BLD | 679561.8 | 946500.4 | 356.478 |  | 423BLD | 679675.9 | 946377.1 | 349.092 |
| 176SH  | 679566.9 | 946498.4 | 356.428 |  | 424BLD | 679677.1 | 946382.8 | 349.104 |
| 177SH  | 679571.2 | 946501.3 | 356.343 |  | 425SH  | 679662.3 | 946371.3 | 349.086 |
| 178BLD | 679573.8 | 946504.7 | 357.183 |  | 426SH  | 679647.7 | 946369.2 | 349.931 |
| 179SH  | 679578.6 | 946504.1 | 356.447 |  | 427SH  | 679642   | 946376.7 | 349.812 |
| 180BLD | 679582.3 | 946503.1 | 355.884 |  | 428BLD | 679638.6 | 946368.1 | 350.15  |
| 181SH  | 679580   | 946509.6 | 356.121 |  | 429BLD | 679637.1 | 946362.6 | 350.102 |
| 182SH  | 679583.8 | 946519   | 357.024 |  | 430BLD | 679642.7 | 946384.4 | 350.7   |
| 183BLD | 679577.6 | 946520.7 | 356.899 |  | 431EP  | 679640.4 | 946386.1 | 351.014 |
| 184SH  | 679572.4 | 946524.5 | 357.272 |  | 432BLD | 679644.2 | 946392   | 351.105 |
| 185SH  | 679564.7 | 946525.9 | 357.481 |  | 433SH  | 679645.6 | 946401.9 | 351.266 |
| 186SH  | 679561   | 946531.9 | 357.539 |  | 434SH  | 679656.4 | 946403.3 | 350.336 |
| 187SH  | 679563.2 | 946539.3 | 357.697 |  | 435SH  | 679666.1 | 946393.7 | 350.098 |
| 188SH  | 679570.5 | 946542.3 | 357.698 |  | 436BLD | 679671.9 | 946402.6 | 350.621 |
| 189SH  | 679574.1 | 946537.3 | 357.474 |  | 437BLD | 679683.3 | 946399.8 | 349.785 |
| 190SH  | 679572.8 | 946530.8 | 357.268 |  | 438SH  | 679684.8 | 946392.8 | 349.542 |
| 191SH  | 679580   | 946527   | 357.036 |  | 439SH  | 679694.3 | 946383.3 | 349.352 |
| 192SH  | 679586.1 | 946523.8 | 356.906 |  | 440SH  | 679700.9 | 946391.8 | 349.379 |
| 193BLD | 679586.6 | 946518.6 | 356.888 |  | 441SH  | 679698   | 946401.6 | 350.207 |
| 194SH  | 679591.2 | 946521.4 | 356.86  |  | 442SH  | 679691.2 | 946407.8 | 350.659 |
| 195EP  | 679593.5 | 946519.8 | 356.908 |  | 443SH  | 679693.1 | 946424.1 | 351.444 |
| 196SH  | 679592.7 | 946530.2 | 356.945 |  | 444SH  | 679709.3 | 946425.3 | 350.398 |
| 197SH  | 679595.2 | 946536.9 | 357.132 |  | 445SH  | 679700.2 | 946437.2 | 351.277 |

|        |          |          |         |  |        |          |          |         |
|--------|----------|----------|---------|--|--------|----------|----------|---------|
| 198SH  | 679601.3 | 946533.4 | 356.671 |  | 446BLD | 679692.5 | 946437.1 | 351.513 |
| 199SH  | 679607.7 | 946537.2 | 356.882 |  | 447BLD | 679681.3 | 946440   | 352.138 |
| 200SH  | 679615.4 | 946534.5 | 356.675 |  | 448SH  | 679670.6 | 946428.4 | 352.005 |
| 201SH  | 679619.8 | 946538   | 356.77  |  | 449SH  | 679663.4 | 946427.9 | 351.66  |
| 202SH  | 679628   | 946537.4 | 356.481 |  | 450TR  | 679660.6 | 946414.2 | 351.409 |
| 203SH  | 679630.9 | 946533.1 | 356.72  |  | 451SH  | 679666.4 | 946437.9 | 352.43  |
| 204SH  | 679626   | 946526.8 | 356.201 |  | 452BLD | 679682.2 | 946443.1 | 352.568 |
| 205BLD | 679629.2 | 946522.7 | 355.981 |  | 453BLD | 679686.7 | 946442.1 | 351.911 |
| 206SH  | 679623.4 | 946520.5 | 356.201 |  | 454SH  | 679674.9 | 946452   | 352.97  |
| 207SH  | 679617.7 | 946521.2 | 356.108 |  | 455BLD | 679684.5 | 946451.3 | 352.486 |
| 208SH  | 679611.6 | 946523.3 | 356.384 |  | 456BLD | 679689   | 946449.9 | 351.837 |
| 209SH  | 679604.3 | 946525.8 | 356.865 |  | 457BLD | 679696.3 | 946451.5 | 351.911 |
| 210SH  | 679602.2 | 946520   | 356.68  |  | 458BLD | 679685.2 | 946454.6 | 352.676 |
| 211SH  | 679606.1 | 946515.1 | 356.475 |  | 459SH  | 679675.9 | 946461.6 | 353.019 |
| 212SH  | 679613.1 | 946517   | 356.194 |  | 460SH  | 679658.2 | 946458.7 | 353.337 |
| 213BLD | 679612.3 | 946512   | 356.107 |  | 461EP  | 679658.2 | 946453   | 353.214 |
| 214SH  | 679619.1 | 946510.3 | 355.873 |  | 462BLD | 679648.4 | 946447.2 | 352.812 |
| 215SH  | 679612.7 | 946503.6 | 355.803 |  | 463BLD | 679637.6 | 946450.2 | 353.151 |
| 216BLD | 679608.1 | 946496.4 | 355.398 |  | 464BLD | 679642.4 | 946469   | 353.937 |
| 217SH  | 679603.9 | 946490.1 | 355.448 |  | 465BLD | 679652   | 946466.3 | 353.419 |
| 218SH  | 679596.5 | 946493.7 | 355.604 |  | 466SH  | 679651.4 | 946474.9 | 354.079 |
| 219SH  | 679590.5 | 946498.9 | 356.009 |  | 467SH  | 679666.3 | 946476.5 | 353.816 |
| 220SH  | 679584.8 | 946496.3 | 355.747 |  | 468BLD | 679656.8 | 946480.5 | 353.787 |
| 221SH  | 679578.3 | 946492.7 | 355.877 |  | 469BLD | 679645.9 | 946483.1 | 354.285 |
| 222SH  | 679571.3 | 946490   | 356.129 |  | 470SH  | 679644.4 | 946490.2 | 354.801 |
| 223SH  | 679563.2 | 946490.9 | 356.253 |  | 471BLD | 679661   | 946499.4 | 354.491 |
| 224SH  | 679560.6 | 946484.9 | 356.036 |  | 472EP  | 679670.2 | 946496.7 | 354.513 |
| 225SH  | 679560.8 | 946478   | 355.726 |  | 473SH  | 679680.6 | 946496.1 | 354.202 |

|        |          |          |         |  |         |          |          |         |
|--------|----------|----------|---------|--|---------|----------|----------|---------|
| 226SH  | 679556.9 | 946472.5 | 355.577 |  | 474SH   | 679672.4 | 946509.5 | 354.748 |
| 227BLD | 679553.8 | 946473.4 | 355.804 |  | 475SH   | 679672.4 | 946509.5 | 354.739 |
| 228BLD | 679538.5 | 946476.2 | 356.302 |  | 476SH   | 679664.9 | 946523.6 | 355.222 |
| 229BLD | 679533.9 | 946474   | 356.554 |  | 477SH   | 679676   | 946530.6 | 355.519 |
| 230SH  | 679527.8 | 946468.5 | 356.181 |  | 478SH   | 679686.2 | 946531.4 | 355.08  |
| 231SH  | 679529.4 | 946463.3 | 356.074 |  | 479SH   | 679700.7 | 946534.1 | 355.174 |
| 232SH  | 679525.5 | 946458.7 | 355.888 |  | 480SH   | 679704.5 | 946528.6 | 355.07  |
| 233BLD | 679532.5 | 946457.9 | 355.865 |  | 481SH   | 679698.7 | 946515.4 | 354.326 |
| 234BLD | 679534.4 | 946463.9 | 355.907 |  | 482SH   | 679698.4 | 946503.3 | 354.155 |
| 235BLD | 679539.2 | 946462.3 | 355.783 |  | 483SH   | 679723.7 | 946504.1 | 353.476 |
| 236BLD | 679541.6 | 946470.6 | 356.121 |  | 484CV   | 679724.6 | 946494.3 | 353.215 |
| 237SH  | 679544.7 | 946467.5 | 355.849 |  | 485CV   | 679725.2 | 946494   | 353.219 |
| 238SH  | 679528.8 | 946452.7 | 355.837 |  | 486CV   | 679724.5 | 946489.2 | 353.073 |
| 239SH  | 679527.7 | 946446.4 | 355.505 |  | 487CV   | 679724.2 | 946489.2 | 353.046 |
| 240BLD | 679528.7 | 946441.9 | 355.166 |  | 488EP   | 679717.4 | 946488.5 | 353.257 |
| 241SH  | 679534.2 | 946439.4 | 354.862 |  | 489BLD  | 679705.9 | 946488.2 | 353.574 |
| 242SH  | 679550   | 946434.1 | 354.871 |  | 490BLD  | 679694.3 | 946490.8 | 353.581 |
| 243SH  | 679554.8 | 946428.8 | 354.268 |  | 491TR   | 679711.1 | 946483.1 | 353.198 |
| 244EP  | 679559.1 | 946432.2 | 354.382 |  | 492SH   | 679715.2 | 946466.1 | 352.765 |
| 245BLD | 679556.7 | 946434.9 | 354.583 |  | 493SH   | 679704.7 | 946454.2 | 352.534 |
| 246SH  | 679560.6 | 946436   | 354.447 |  | 494SH   | 679717.2 | 946455.6 | 351.999 |
|        |          |          |         |  | 495HND5 | 679731.3 | 946443.9 | 351.403 |
|        |          |          |         |  | 496O4   | 679732.8 | 946468.4 | 352.414 |