Planimetric Accuracy Assessment of Digital Spatial Data for Urban Land Cadastral Registration: Case of Werabe Town, Ethiopia

By: Nadmo Gutago Kemal

A thesis submitted to

The department of Geomatics Engineering

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Master's in Geo-informatics Engineering

Office of Graduate Studies

Adama Science and Technology University

Adama, Ethiopia

Jun, 2020

Planimetric Accuracy Assessment of Digital Spatial Data for Urban Land Cadastral Registration: Case of Werabe Town, Ethiopia

Nadmo Gutago Kemal

Major-Advisor: Roba Gemechu (PhD)

A thesis submitted to

The department of Geomatics Engineering

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Master's in Geo-informatics Engineering

Office of Graduate Studies

Adama Science and Technology University

Adama

Jun, 2020

APPROVAL BOARD of EXAMINERS

We, the undersigned, members of the Board of Examiners of the final open defense by Nadmo Gutago Kemal have read and evaluated his thesis entitled “Planimetric Accuracy Assessment of Digital Spatial Data for Urban Land Cadastral Registration: Case of Werabe Town, Ethiopia” and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfillment of the requirement of the Degree of Masters of Science in Geo-informatics Engineering.

Roba Gemechu (PhD):	_____	_____	
Advisor	Signature	Date	
Getachew B/Meskel (PhD):	_____	_____	
Chairperson	Signature	Date	
Tilahun Erduno (PhD):	_____	_____	
Internal Examiner	Signature	Date	
Daniel Lirebo (PhD):	_____	_____	
External Examiner	Signature	Date	

DECLARATION

I hereby declare that this MSc Thesis is my original work and has not been presented for a degree in any other university, and all sources of material used for this thesis have been duly acknowledged.

Name: Nadmo Gutago Kemal

Signature: _____

This MSc Thesis has been submitted for examination with my approval as thesis advisor/ Supervisor.

Name: Roba Gemechu (PhD)

Signature: _____

Date of submission: _____

ADVISOR'S APPROVAL SHEET

To: Geomatics Engineering department

Subject: Thesis Submission

This is to certify that the thesis entitled "Planimetric Accuracy Assessment of Digital Spatial Data for Urban Land Cadastral Registration: Case of Werabe Town, Ethiopia" submitted in partial fulfillment of the requirements for the degree of Masters of Geo-informatics Engineering in the Graduate program of the department of Geomatics Engineering, and has been carried out by Nadmo Gutago Kemal Id. No PGR/18110/11, under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby he can submit the thesis to the department.

Roba Gemechu (PhD) _____ _____

Name of major Advisor Signature Date

ACKNOWLEDGMENT

First of all, I would like to thank Almighty ALLAH, who made it possible, to begin and finish this work successfully. Next, I would like to express My special gratitude extends to my academic Advisor, Dr. Roba Gemechu for his invaluable advices, comments and assistance from the outset to the submission of this paper.

I would like to express my heart full thanks to my course instructors, Dr.Getachew B/Meskel(PhD), Dr. Daniel Alemayhu (PhD) and Dr.Tilahun Erduno (PhD) and all my class mates at the Adama Science and Technology University School of Civil Engineering and Architecture of postgraduate program of Geoinformatics for their valuable constant encouragement and support during all phases of this work.

I am also thankful to Werabe Town land development and management, sillte zone urban development and construction department especially cadastral department of sillte zone and Werabe Town for cooperation in providing me all kinds of information and material support.

My deepest gratitude extends to my wife *W/o* Rehamt Alemayehu for her encouragements and carrying the entire burden at home while I have been engaged in this research.

The success of this thesis would not have been possible without the financial support from the sillite zone Administrator office, which is gratefully acknowledged to sillite zone Administrator office for all educational and thesis work of financial support.

Finally, I would like to express my sincere gratitude to my best classmates and other friends for continuous technical and scientific guidance, encouragement and advice as well as reviewing of the whole thesis.

TABLE of CONTENT

PAGE

LIST of TABLES i

LIST of FIGURES ii

LIST of APPENDIXES iii

LIST of ACRONYMS iv

Abstract v

CHAPTER ONE: INTRODUCTION 1

1.1 Background of the Study 1

1.2 Statement of the Problem 3

1.3 General objective 4

1.3.1 Specific Objectives 4

1.4 Research Questions 5

1.5 Significance of the Study 5

1.6 Structure of the Thesis 5

1.7 Operational Definition 5

1.8 Limitation of the Study 6

1.9 Ethical Consideration 6

CHAPTER TWO: REVIEW OF LITREATURE 7

2.1 Concepts of Land and Land Registration 7

2.2 Urban Land Management System 7

2.3 Urban land registration 8

2.4 Urban Land Registration in SNNPRS 9

2.5 Cadastral Surveying and Mapping 9

2.6 Cadastral Surveying Techniques 10

2.7 Spatial Data Collection in a Cadaster 10
2.7.1 Digital Satellite image 11
2.7.2 Photogrammetry 12
2.8 The Global Positioning System (GPS) 13
2.8.1 Static GPS 15
2.8.2 Real-Time Kinematic Global Positioning System 15
2.9 Planimetric Features extraction 16
2.10 Accuracy Evaluation of spatial features 17
2.11 Spatial Data planimetric Accuracy 17
2.12 Types of spatial data Accuracy and standards 18
2.13 Importance of Accuracy 20
CHAPTER THREE: MATERIALS AND METHODS 21
3.1 Description of the Study Area 21
3.2 Materials and Data source 22
3.3 Methods Used 23
3.3.1 Sample Selection and Sample Size 23
3.3.2 Preparation of Field Survey Instrument 23
3.3.3 Preparation of Base Map 23
3.3.4 RTK GPS Data Survey 24
3.3.6 Accuracy assessment 27
3.3.7 Flow chart of the methodology 29
CHAPTER FOUR: RESULT AND DISCUSSION 30
4.1 Assessment Results and Discussions 30
4.1.1 Accuracy Assessment Result of Orthophoto with Selected Check Points 31
4.1.2 Assessment of Line Map Coordinates with RTK GPS Data 35

4.1.3 Evaluate the Area Comparison Effect of Digital Line Map Parcels with RTK Data ... 40

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS ... 44

5.1 Conclusions ... 44

5.2 Recommendations ... 45

REFERENCES ... 47

APPENDIX ... 52

LIST of TABLES

Table 3: 1 List of Data and Materials to be Used for the Study.....22

Table 4: 1 Planimetric Accuracy Assessment result orthophoto based on check points.....32

Table 4: 2 Summary of planimetric accuracy Assessment of orthophoto result. 33

Table 4: 3 Data collected form for Orthophoto and RTK Assessed sample of 100 parcels.....35

Table 4: 4 Summary of Orthophoto And RTK Coordinates Planimetric Accuracy Result 37

Table 4: 5 Summary of Digital Line map to RTK measured Coordinates Assessment Result…36

Table 4: 6 Accuracy Assessment summary of orthophoto_RTK side length Evaluation Result……..41

LIST of FIGURES

Figure 3: 1 Location map of study area 21
Figure 3: 4 Measured check points and distribution in the study are 25
Figure 3: 5 RTK Survey parcel corner points 25
Figure 3: 6 Orthophoto and Line map Extracted parcel features for the used Assessment 26
Figure 3: 7 Methodological Work Flow 29
Figure 4: 1 GCPs Used for reference station Established by E.G.I.A 30
Figure 4: 3 The collected check points on the ground. 31
Figure 4: 4 RMSE of check point coordinates in RTK and Orthophoto Extracted coordinates 33
Figure 4: 5 Digital parcel Line map and orthophoto Extracted coordinates. 35
Figure 4: 6 RMSE of digital Orthophoto and digital line map comparison 38
Figure 4: 7 Comparison areas of the parcel 41

LIST of APPENDIXES

Appendix 1 Planimetric Accuracy Assessment of Digital Orthophoto 20 check points to ground truth

Appendix 2 Orthophoto point based parcel corner planimetric accuracy assessment computation

Appendix 3 Digital line map parcel corner planimetric accuracy assessment computation result

Appendix 4 Digital line map to RTK parcel area comparisons assessment computation result

Appendix_5*:* E.G.I.A Established Werabe 2nd order GCP data desorption

LIST of ACRONYMS

ASPRS	American Society for Photogrammetry and Remote Sensing
DGPS	Differential Global Positioning System
E.G.I.A	Ethiopia Geospatial Information Agency
EPRDF	Ethiopian People Democratic Revolutionary Front
FDRE	Federal Democratic Republic of Ethiopia
FIG	International Federation of Surveyors
GCP	Ground Control Point
GIS	Geographical Information System
FGDC	Federal Geographic Data Committee
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSD	Ground Sample Distance
RMSE	Root-Mean-Square Error
RTK	Real Time Kinematic
SNNPRS	Southern Nations, Nationalities and Peoples Regional State
NSSDA	National Standard for Spatial Data Accuracy
WGS84	World Geodetic System of 1984

ABSTRACT

Planimetric accuracy, is a common way of expressing the quality of a spatial data set, it describes the accuracy of positions of spatial features by coordinates of a parcel in (x, y) direction. The main objective of this study is to assess the planimetric positional accuracy of digital orthophoto image and its extracted line map generated parcel features of Werabe Town. There are four basic data used to assessed planimetric(positional) accuracy, those are Geo referenced digital orthophoto, digital line map, GCP and Real-Time-Kinematic GPS (RTK GPS) in situ measured data. Data collected from silite zone urban Development and construction office and from Werabe Town. Collected coordinates of parcel corner and selected check points from well-defined and easily identifiable both on the imagery and on the ground used in RTK GPS.

Extracted and the same points in situ RTK GPS measured parcel corner coordinates and check point evaluated in standard error estimation techniques of root mean square error. The orthophoto RMSE of easting and northing direction is 18.5 cm and 19 cm respectively and the overall RMSE of orthophoto is 26.5cm with o.45m (45cm) at 95% confidence level. The digital line map extracted coordinates and RTK GPS measured comparison results of the root mean square error of easting and northing direction is 50.2cm and 48.4cm respectively and the overall RMSE of orthophoto is 69.7cm with 1.2 m at 95% confidence level.

Therefore, the conclusion of this study indicates that, the orthophoto planimetric accuracy assessment of 20 check points based on national accuracy standard for legal cadaster No 03/2015 is applicable for urban land spatial registration and large-scale mapping production. Because this standard state that overall planimetric accuracy is not exceed 40cm. In the case of digital line map parcel corner coordinates assessment result of the overall root mean square error is more than 40cm, according to national accuracy legal cadaster standard No 03/2015 is not applicable for urban land spatial registration and large-scale mapping production. However, the planimetric accuracy of digital line map does not satisfy national standard and it needs some improvement to use urban land spatial features registration and large-scale mapping in the Werabe Town.

Key Words: Planimetric Accuracy, Urban Land, Spatial Data, RTK GPS.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Land is a very critical resource to the economic, social and cultural development. The rapid population increase in urban areas is causing a need to improve land registration in the urban centers of Ethiopia because most human activities and developmental efforts are based on land (Ethiopia, 2018). A properly organized and regularly maintained land registration/cadastral system provide security and clarity with respect to the legal status of land (Dekker, 2003). Land data is also including spatial data, spatial data are data referred to a location of the Earth's Surface and are often termed as geographical or geo-referenced data, Estimates – 80% of human decisions is related geographically (Worrall,1991). Spatial data registration stretches far beyond the traditional paper-based maps information in to digital form using alternative method of measurements. Now a day Technological development in the field of photogrammetry and remote sensing simplify the process of making different maps like cadastral maps, providing wide coverage spatial data with short period of time. Based on Zinabu, Tulu, Berhan, 2017 as stated in work extraction of parcel feature using photogrammetric surveying become an alternative technique to ground based surveying and this technique become popular and used by different countries for modernizing land management system**,** spatial data has nowadays extended use in cadastral land registration and land management, spatial planning, agriculture, archaeology, geology, and the list can be continued (Zinabu, Tulu, June 2017). Spatial features extracted from satellite image and orthophoto are an alternative major source of data for land registering and mapping a given area, among these planimetric maps are the major ones. Planimetric maps are maps showing only the horizontal position of features on the Earths' surface which reveal geographic objects, natural and cultural physical features and entities, Cadastral maps, urban planning maps and boundary maps are examples of planimetric maps (Tyner, 2010).

The goal of this study is planimetric accuracy assessment on orthophoto and its extracted parcel features (parcel coordinate point and area of the parcel) on cadastral map with RTK_GPSA ground measurements of a parcel relative to urban legal cadastral standard of No 03/2015. There are two types of cadastral map accuracy assessment. The first type is positional accuracy assessment and the second type is thematic accuracy assessment. Positional accuracy is usually determined for both planimetric and vertical coordinates. Planimetric positional accuracy is an estimate of accuracy of the horizontal positions of the spatial objects that can be measured in terms of latitude and longitude or local easting and northing coordinates (Veregin, 1999). Whereas, the vertical positional accuracy

refers to the uncertainty with which the vertical coordinates (ellipsoidal height/geocentric radius) of spatial objects can be measured, so it is not concern from this study because cadastral land spatial registration and mapping used two dimensions and mostly errors cams from source data of orthophoto or in use, that is through process for extracted spatial data. Planimetric accuracy, is a common way of expressing the quality of a spatial data set, it describes the accuracy of positions of spatial features by coordinates of a parcel in (x, y) direction. Positional accuracy deals with the accuracy of the location of map features, and measures how far a spatial feature on a map is from its true or reference location on the ground. The Glossary of the Mapping Sciences (ASPRS and ASCE, 1994) defines positional accuracy as "the degree of compliance with which the coordinates of points determined from a map agree with the coordinates determined by survey or other independent means accepted as accurate." All locations on maps and Geo referenced images are expressed by a set of x- and y-coordinates for horizontal location. Planimetric (horizontal) accuracy is to be assessed using RMSEx, RMSEy and RMSExy. Horizontal accuracy is more complex than vertical accuracy because the error is distributed in two dimensions both the x and y dimensions (Kebede, 2018).

The spatial accuracy evaluation of the digital extracted features and orthophoto as well as its suitability for a given application can be performed in a number of different ways. The first one difference or errors in feature locations between the digital line map and reference layer are observed and quantified. Another way to test the spatial accuracy is by using the global positioning system to determine accurate positions of features that can be easily identified on the digital aerial image and features (Green, 2009). Urban cadastral maps displaying based on the spatial or geometric descriptions of land parcel boundaries define the location, shape and size of a land parcel, within the context of a national geodetic reference system at the same time used for combination with other land data registers and maps, leading towards parcel-based GIS-systems are very important to solving the problems (Tafesse Bosha Hirboro 2018).

The accuracy of an extracted Parcel features of urban land holding certificate of cadastral map are problematic issue from the study area of werabe Town. Thus, problems are the difference of cadastral map on land holding certificate with actual ground, thus arises complain in the cause of area and coordinate/ boundary/ variation between in the map of certificate with actual parcels. Thus, problems are seen in the Town most of land transaction time and boundary disputes resolving from neighborhood in the municipality.

The accuracy of digital line map extracted parcel not respond confidentially most of cadastral land related decision and variation issue, those are indicating the need for accuracy evaluation for improving cadastral spatial registration and large-scale mapping as well as land holding certification on evidence-based decision making under the considerations of urban legal cadaster standard in the Werabe Town.

1.2 Statement of the Problem

Most of the urban land registration in Ethiopia have two parts in land administered system. Those, are spatial and non-spatial land registration for proper organization and regularly maintain cadastral land to provide security and clarity with respect to the legal status of land (Asmamaw Yehun, May 29–June 2, 2017). The quality of data is a function both of the inherent properties of those data and the use to which they are to be put. Hence, knowledge of error levels is necessary if data quality is to be estimated. Among the digital spatial data aerial photograph and its line map are currently in werabe town used for different mapping application. planimetric maps that require high accuracy like cadastral map and urban planning maps are produced from aerial photo. However, accuracy of these digital spatial data sets is not yet assessed thus, decisions based on map information are to have expected results and the accuracy of the maps must be known. Otherwise, implementing such decisions will result error, and these errors may be unacceptable. To effectively extract features from spatially referenced digital image, it is essential to first understand image accuracy and quality. Then, the question is: to what extent can the image contribute to metrically accurate geospatial information collection? Without understanding the image accuracy and quality and the capabilities and limitations of image, users wishing to adopt this technology risk forfeiting the full benefits of the image (Willneff, 2005). In the study area has different problems: Most people are not interested for the given cadastral map by the cause of area and boundary(coordinate) variation between the new cadastral map and the previous one and most neighborhood peoples raise complain about boundary of the parcel. This study focused only spatial part Accuracy assessment for urban land registration and large-scale mapping in urban land holding certification. Spatial data registration is one of the most and essential tasks that is requirement for large scale mapping of cadastral land registration. Spatial accuracy of cadastral maps is very important subject. This subject is primarily used to maintain the boundaries of the property and resolve legal disputes before the courts. Performing spatial data analysis operations on data of unknown accuracy will result in a product with low reliability and restricted use in the decision-making process, while errors deriving from one source

can propagate through the database via derived products (Sulaiman, S., and Gudmundsdottir, H, 2013). Large scale cadastral spatial maps require high accuracy; those, accuracy depends on the quality of spatial data; hence knowledge of error levels is necessary if data quality is to be estimated. Among the digital spatial data aerial photograph and its extracted line map are recant year used in weraba town for cadastral land spatial registration and large-scale mapping Without unknown planimetric accuracy. In the other hand according to Urban Cadastral Survey Directive No.44/2014" the aerial photo or satellite image used for legal cadastral spatial data base map verifies with its quality checking not be more than 5 years old. This directive sited are spatial accuracy measured before used source of spatial data and its extracted line map. From my observation the spatial line map needs accuracy assessment because of most of land holders and land related data users complain about spatial parcel map accuracy on land holding certificate in the werabe town. The major problems are most of land holders not interested for the given cadastral parcel map by the cause of area and coordinate variation of cadastral map with actual land parcel, most of neighborhood boundary disputes do not get quick solution based on land holding certificate maps in the town land administration. Thus, are leads to produce other related problems like land transactions are cumbersome and take a longer time, affects land transactions, it has also lack of confidence on the parcel map certificate in the community.

Finally, recently, no researches were done in Warbe town related to the status of planimetric accuracy of spatial data in land registration. Therefore, thus all are indicating the need to accuracy assessment on extracted digital line map features for large scale cadastral mapping and spatial land registration with under consideration of legal urban cadastral accuracy standard in Worabe Town.

Objective of the Study

1.3 General objective

The main objective of this research is to assess the planimetric accuracy of digital spatial data generated features for urban cadaster registration and large-scale map production in Worabe Town.

1.3.1 Specific Objectives

- Examine the planimetric positional accuracy of orthophoto based on ground truth data set.
- Assess the planimetric accuracy of digital line map derived parcel coordinates relative to in situ RTK measured coordinates.
- Evaluate comparison of line map parcel area with in situ RTK GPS measured data.

1.4 Research Questions

1. What is the planimetric accuracy of orthophoto based on ground truth check points?
2. Does the planimetric accuracy of digital line map and orthophoto parcel extracted coordinate meet urban legal cadastral standard?
3. Is there a parcel area variation on digital line map to RTK GPS measured data set?

1.5 Significance of the Study

This study provides relevant information about the quality of currently used digital spatial data sources used for production of planimetric maps in werabe town these sources include digital orthophoto and digital line map thus, result enables the user are the municipality and land administration office help to quality of data used to produce the spatial dataset.

For town land administration decision makers using evidence-based decision making on land related data, provide positional information for the community, resolve boundary dispute simply and also the study serve as an input to the forthcoming researchers, who have interest to pursue in related aspects of the research.

1.6 Structure of the Thesis

The first part includes detailed discussion of the background; statement of the problem; objectives of the research and significance of the study is put with in this subdivision. While, chapter two has incorporated literature review. Chapter three deals with description of study area, discusses with the data source, material and methodology. Finally, chapter four deals with Results and Discussion and chapter five deals with conclusion and recommendation.

1.7 Operational Definition

Land registration: is the process of official recording of rights in land through deed title on property.

Cadastre: is a parcel-based and up-to-date land information system.

Planimetric positional accuracy: is an estimate of accuracy of the horizontal positions of the spatial objects that can be measured in terms of latitude and longitude or local easting and northing coordinates.

Planimetric maps: are maps showing only the horizontal position of features on the Earths' surface which reveal geographic objects, natural and cultural physical features and entities (Tyner, 2010).

Real-time kinematic global positioning system (RTK GPS): is a surveying method performed with a relationship between a reference GPS rover units and sufficient satellite.

Photogrammetry: is the science of obtaining reliable measurements by means of images for the determination of the geometric properties of objects.

Ortho-photo: is the rectified (geometrically corrected) aerial photo taken from camera mounted aircraft.

1.8 Limitation of the Study

Due to unavailability of evenly distributed and easily identifiable sharp edge of a parcel corners on the orthophoto and the same on the ground somehow limitations in the study area. It has somehow affected on distribution of data.

1.9 Ethical Consideration

Before conducting the field survey, the study area targets were contacted and informed for werabe town municipality all concerned government body about objectives of the research. Moreover, a detailed clarification was prepared and delivered in order to address a common understanding upon the application of the data collection process for the fact that the field data collection procedure requires more with a person or groups of persons.

CHAPTER TWO: REVIEW OF LITREATURE

2.1 Concepts of Land and Land Registration

Land can be described in a wider sense for legal point of view which refers to any portion of the earth surface where land rights are exercised and such rights just ownership to the surface and it includes every object attached to it above or below the surface (Tuladher, 2004). Land registration is a process of official recording of rights in land through deeds or as title on properties. It means that there is an official record (land register) of rights on land or of deeds concerning changes in the legal situation of defined units of land. It gives an answer to the questions who and how (Henssen, 2010). Dekker (2003) also defined land registration as recording in a register of the ownership of real rights to land. Currently modern land registration systems are computerized, parcel-based and up-to-date, containing a record of all interests in land (e.g. rights, restrictions and responsibilities). They usually include a geometric description of land parcels linked to other records describing the nature of interests, and ownership or control of those interests and often the value of the parcel and its improvements. There are three major land registration systems. These are the deeds registration system, the title registration system and the private conveyance system.

*Problems of Land Registration System in Developing Countries***:** Governments of developing countries have been unable to improve the efficiency of land registration systems because of various problems. The problems, which, governments are facing in developing countries, related to land registration can be divided into four categories: institutional, technical, economical and motivational problems (Ezeakuetal, 2008).

2.2 Urban Land Management System

Urban Land Development and Management Policy in 2011and issuance of urban landholding registration proclamation 818/2014 respectively. Under the urban land development and management policy it is clearly stated that in order to achieve a goal of helping country join middle income countries the issuance of the urban land development and management policy and ensuring the existence of effective, efficient, transparent, and reliable urban land development and management service delivery system over urban areas is a must (MUDHo, 2015).

According to UN, (1996), land management guidelines, the modern cadaster is not primarily concerned with generalized data but rather with detailed information at the individual land parcel level. As such it should service the needs both of the individual and of the community at large. Benefits arise through its application to: asset management; conveyance; cadastral updating; demographic analysis; development control; environmental impact assessment; housing transactions and land market analysis; land and property ownership; land and property taxation; land reform; monitoring statistical data, etc. The compilation of land records and the judicial processes that must be gone through in order to bring land information onto the registers should provide formal identification and, in some systems, legal proof of ownership. Cadastral systems are depicted as having textual and spatial information; a geometric description of the land parcels, linked to the textual records or registers describing the nature of interests and ownership of the land parcel (ibid, 2004). From the types of cadasters, legal cadastre constitutes the primary evidence for landholding certification purpose. Therefore, it means an updated landholding information system containing a record of the rights, restrictions and responsibilities on a defined legal boundary for each landholding demarcated as parcel on map (Enemark, 2003).

2.3 Urban land registration

Land registration identifies each individual land parcel and provides either evidence or confirmation that the person named in the register has specified property rights to that parcel **(**McEwen and Nolan, 2007). Land registration have two components: spatial and non-spatial or attributed. The center of this study about spatial urban land data accuracy Assessment for land registration and large-scale mapping in urban area. Spatial land registrations including geometrical descriptions of land parcel and boundaries define the location, shape and size of a land parcel, within the context of a national geodetic reference system.

Thus, Digital land records are essential to updating, reliable land data providing for any decision's makers, effective land related service provision, generally digital spatial land registration providing mutual benefits from the community, expertise and organizations. Currently modern land registration systems are computerized, parcel-based and up-to-date, containing a record of all interests in land and geometric description of land parcels linked to other records describing the nature of interests, and ownership to providing effective service to the customers as well as to the organizations only achieved on digital spatial data registration in land Administration this is known as cadaster system (Wolfgang Effenberg, May 2001)**.**

The development of technology, digital photogrammetry started to be used widely for registration and mapping application, especially digital orthophoto is a very popular product due to its diversity of use, particularly in its use as base information for Geographic Information Systems. In connection to Zinabu, Tulu, Berhan, 2017 as stated in (Sirba, 2009) work extraction of parcel feature using photogrammetric surveying become an alternative technique to ground based surveying and this technique become popular and used by different countries for modernizing land management system (Zinabu, Tulu, June 2017).

2.4 Urban Land Registration in SNNPRS

Improved land records are essential to provide accurate data for maximizing the collection rates for land-based revenues, and they are important to reduce the burden of transaction costs on citizens and to allow land transfers to operate smoothly. Land records are also important as a basis to impose higher rents and taxes on existing properties in core city areas and thus encourage their conversion to higher and better use. According to the GTZ (2006) report on Land administration issues, land records in SNNPRS towns are in a poor state, with as much as 50% of properties unrecorded and untitled, thus representing a serious shortfall in land rents and house tax revenues. Given that there are over 100 towns in SNNPRS, a short- and medium-term solution lies with improving existing systems along the following lines: Land record improvement begins with simple mapping of all urban blocks to create a reference inventory of what lands fall within the urban territory. There is a need in all towns in SNNPRS for improved systems of land records. The options available range from the creation and maintenance of full-blown cadaster systems to simple spreadsheet-based land ledgers and records backed by archive filing of land documentation (GTZ 2006).

2.5 Cadastral Surveying and Mapping

The cadaster is a register of parcel or survey of land for the purpose of taxation, description location of land, the rights to the land and information and showing details of ownership and the land value. Cadaster has three classifications: legal cadaster is a legally recognized register of land tenure, fiscal cadaster which was developed property valuation and multipurpose cadaster that contains both fiscal and the legal cadaster with the addition of other parcel-related information (Augustus and Moses, 2016). (Williamson, 2000) says that “the requirements of physical survey of land boundaries preceding registration may not be necessary since registration can be based on old documents”. Legal cadaster is measurement of legal ownership and registration of legal transactions. Legal cadaster deals with rights to use land, it is a complement to both property cadaster and tax cadaster and it is

a register identify the legal owner and clear boundaries of each land parcel. To prepare a legal cadaster requires both fitting parcel boundaries through surveying and mapping and fitting legal rights which may involve negotiations among involved parties and a judicial determination of ownership. For cad astral maps the scale range is 1:500 to 1:10 000. Large scale maps have more precise parcel dimensions and features. Such types of maps are often prepared by cad astral surveys based on ground surveys and aerial photography. Land value ownership can be accessed by new parcel code shown on the cad astral map thus creating a cadaster. The general description of these land parcels is normally shown on large scale maps. According to (Gopikrihnan, 2013) an important aspect of "cad astral maps are to preserve the accuracy and precision of the areas of land parcels". (Wolfgang Effenberg, May 2001).

2.6 Cadastral Surveying Techniques

Three sets of complimentary techniques of cad astral surveying are common: field/ground surveying, photogrammetry and remote sensing; all of which are concerned with the registering and presentation of spatially referenced data. Cadastral surveying has three possible methods: (a) ground survey (b) aerial survey and (c) satellite images. The ground survey method comes under direct technique while the aerial survey and satellite image methods are indirect technique (Dale and Mclaughlin, 1988). (Rao et al., 2014) says "field surveys are conducted by groups on ground using conventional surveying techniques and instruments". The ground survey method is the most accurate because most of the calculations are carried out in the field. Ground cadastral surveying technique in remote area and mountainous area is difficult due to bad weather condition or security reasons (Roy et al,, 2014).

2.7 Spatial Data Collection in a Cadaster

Development of technology in the field of remote sensing and photogrammetry collection digital spatial data become an alternative method to ground based surveying for acquisition of spatial data and has great significant for cartographers in providing data used for mapping. Currently spatial data extracted from satellite image and aerial photo are major source of data for mapping a given area (Vieira, 2002). In the literature, the term spatial is often used synonymous with the term geographical or even geospatial (Shi, 2002). here on the term spatial, as in spatial data, is emphasized. Spatial data itself is explained as a simplified depiction, or model, containing information about locations, shapes and relationships of geographical phenomenon, both naturally occurring and humanmade, as associated with the surface or near-surface of the earth. Data of spatial

character constitutes of three fundamental components, or dimensions, distinguished by Longley et al. (2005) as 'place', 'attributes' and 'time'. Place, also called space (Chrisman, 1991), indicates the linkage of the data to a location on the geographical space, preferably in a systematic way defined by a geodetic reference system. In fact, without a location connected to a spatial data set, the data would be named 'non-spatial' or 'a spatial' attributes, or theme (Sinton, 1977) is a property of a feature, entity or phenomenon found within the geographical space that links to a spatial data set commonly in tabular form. Finally, spatial data is in essence fixed to a particular moment in time, thereby the temporal component. Categories of spatial data, commonly utilized today, are represented by either the raster or vector GIS data storage types (Decker, 2001).

Raster format is grid based, i.e. it consists of individually divided cells or pixels arranged in a matrix of columns and rows, where each cell contains a unique value. For instance, on a raster DEM each cell contains a unique elevation value corresponding to a specific location on the geographical space. Spatial data stored in raster format includes for instance DEMs, digitally scanned paper maps (digital raster graphics) as well as raster imagery like aerial photographs (photography-based imagery and orthophotographs) and satellite imagery.

Vector data format stores geographical features in the form of points, lines and polygons (areas). Geographical information stored in vector format includes everything from land use and land cover classes, to elevation models (by for example a triangulated irregular network, TIN). orthophoto, satellite image and Google earth image as investigated within the scope of this study, is an example of a raster data and digital line map are example of vector data which categorized under spatial data. Collection of spatial data is accomplished through for example, photogrammetry or remote sensing technique which are the main concern of this study (Decker, 2001).

2.7.1 Digital Satellite image

Remote sensing is defined, as the measurement of object properties on the earth's surface using data acquired from aircraft and satellites. It is therefore an attempt to measure something at a distance, rather than in situ. Since we are not in direct contact with the object of interest, we must rely on propagated signals of some sort, for example optical, acoustical, or microwave. Satellite data of a finer spatial resolution have opened up new fields of applications that were not possible with data of a poor spatial or spectral resolution before. In addition to multispectral data, it is possible to obtain satellite data in hundreds of spectral bands. These remotely sensed data with improved viewing capabilities and improved resolution have not only opened up new areas of successful applications, but also created specific fields in digital image analysis (Jay Gao, 2009).

About a decade ago space borne remote sensing experienced another trend, namely, the advent of very high spatial resolution satellite imagery. Their spatial resolution is so fine that it is comparable to that of airborne photographs. A few successful satellite programs have recorded images with a spatial resolution on the order of meters and submeters. So far more than twelve of them have become available for digital analysis. The majority of these sensors record only a panchromatic band that is intended mostly for cartographic mapping, even though environmental monitoring is possible with the data. All systems record optical data near the visible light and NIR portion of the spectrum (Jay Gao, 2009)

Satellite images constitute one of the vital elements in providing many of the much-needed spatial inputs to digital cadastral maps. The fact that Remote Sensing (RS) imagery is in digital form so that it could be zoomed at any required scale making it is fundamental tool, quicker, and cheaper as compared to aerial photographs (Ondulo and Kalande, 2006). RS images on the wide area can be achieved more repeatedly and economically compared to aerial photos (Jeong et al., 2003). The use of RS images also plays an important role for extracting and updating land related information. One advantage of using RS images is that they provide a historical record of the areas that can be revisited in the future to see what changes have taken place. In this way old images can provide valuable evidence where conflicts occur in parcel boundaries (Ali, 2012). In this way, RS imagery can be used as an alternative to traditional land surveying approach for spatial data acquisition where most measurements can be done in the office (Tuladhar, 2005). The locational accuracy of maps is utmost important for certain applications like cadastral survey, infrastructure/ utility maps, urban land use, land planning, and land consolidation works. Cay et al. (2004) showed that using 1 m resolution imagery and GPS controls, it is possible to achieve an accuracy of ±2 m. In this way, the recent advances in space-based data capturing techniques (imaging) have revolutionized the field of cadastral surveying and mapping. All these improvements in satellite imaging have led to availability of better-quality data/pictures for mapping applications (Ajai, 2002).

2.7.2 Photogrammetry

The two fundamental elements (measurements) used to derive spatial positions are: direction and distance. These elements can be obtained either by direct observation, or indirectly, by measuring a quantity which is a function of these elements. Measurements made with a theodolite, a level or tapes are direct observations of the fundamental elements. The measurement of distances with an electronic distance measuring (EDM) device is indirect observation, since the distances are derived

by recording the time of propagation of the electromagnetic wave between two points. Positioning by the global positioning system (GPS) is done by means of distances to satellites which are based on accurate observations of the time of travel of the electromagnetic signal. Images can also be used for spatial positioning, and measurements made in images are also considered indirect observations with respect to the two fundamental elements. (Ajai, 2002).

Images are utilized in two distinct manners: by performing either metric or interpretative analysis. In the metric analysis, quantitative measurements are made in the image and then geometric information, such as spatial position, distance, area, shape, size, volume, distribution of objects are derived. This operation is called photogrammetry. The definition of photogrammetry is therefore: the science of obtaining reliable measurements by means of images for the determination of the geometric properties of objects. Photogrammetry has become an exceptionally valuable tool in land surveying. To mention just a few uses in the field, aerial photos can be used as rough base maps for relocating existing property boundaries. If the point of beginning or any corners can be located with respect to ground features that can be identified on the photo, the entire parcel can be plotted on the photo from the property description. All corners can then be located on the photo in relation to identifiable ground features which, when located in the field, greatly assist in finding the actual property corners. Aerial photos can also be used in planning ground surveys ((Epheram, 2018).

Following the development of technology, digital photogrammetry started to be used widely for mapping application. Especially digital orthophoto is a very popular product due to its diversity of use, particularly in its use as base information for Geographic Information Systems. Further, recent developments in the very important area of intelligent image analysis techniques for the automation of feature extraction, object recognition and object classification make use of digital orthophotos (pierre,1990). In connection to this Zinabu, Tulu, Berhan, 2017 as stated in (Sirba, 2009) work extraction of parcel feature using photogrammetric surveying become an alternative technique to ground based surveying and this technique become popular and used by different countries for modernizing land management system. (Zinabu, Tulu, June 2017).

2.8 The Global Positioning System (GPS)

GPS is a satellite-based radio signal system which was established by the United States department of defense. GPS system provides position velocity and time anywhere in the world. Two types of GPS positioning :(a) absolute positioning and (b) relative positioning (alkan et al., 2015). The global positioning system has been used great success for the production and propagation of survey control.

During the development of surveying by GPS the focus was on measured horizontal position and to measure height (Isioye and Musa, 2007). GPS has the following advantages: (1) GPS used to describe the geographical co-ordinates joined with satellite image, used to increase the positional accuracy of satellite images when three or more distinctive points can be located both on a satellite image, and on the ground GPS receivers can be used to collect accurate spatial coordinates at these positions. (2) GPS can be used in the ground reality of satellite images. When a particular satellite image has a region of unusual back scatter and the co-ordinates of that region can be loaded into a GPS receiver. (3) GPS has developed into a cost-effective tool for updating GIS or computer aided design (CAD) systems and GPS is an excellent tool for data collection in many environments. The cadaster and land registry agency maintain two separate databases to control the information on ownership rights and parcels: a) cartographic database mapping information system and b) administrative database automatic cadastral registers administrative database contains legal and administrative information of any parcel of land (Wakker et al, 2003) .

GPS applications can be categorized into two: such as static applications and kinematic applications. A) Static applications are concerned with positioning of stationary points. Static applications of GPS can be used in geodetic surveying, areal photogrammetric surveying, land surveying, orthometric height determination, topographic mapping monitoring, structural change and engineering surveys. B) Kinematic applications are concerned with the positioning of moving objects. (Mageed, 2014) says “kinematic applications of GPS can be used in attitude determination of a moving body where the attitude is defined as the orientation of a specific coordinate system in a land vehicle a ship or an aircraft with respect to a global or local coordinate system”. GPS receivers can be categorized into two types: single frequency receivers and dual frequency receivers. A) Single frequency receivers which access the l1 frequency only. The single frequency receivers output the raw c/a code pseudo ranges the l1 carrier phase measurements and the navigation message and gives accuracy about 1cm+2ppm. B) Dual frequency receivers which access both l1 and l2 frequencies. The dual frequency receivers are the most complicated and most expensive receiver type. This type of receiver is the capacity of measuring all the GPS observables which are: l1, l2, carrier’s c/a code and p-code and gives accuracy 5mm+1ppm. Single frequency receivers are affected more by ionosphere errors than dual frequency receivers but they are less expensive making them adaptable for certain surveying applications. Dual frequency multiple channel receivers can compensate well for ionosphere errors and these receivers are ideal for geodetic applications (Mageed, 2014).

2.8.1 Static GPS

Static GPS is a relative position determination method and the use of several GPS receivers with longer measurements of duration from 20 minutes up to several days. Static GPS is suitable for long distances above 20 kilometers but should not be used for baselines exceeding 50km. This method is often used to establish first and second order points which require high accuracy (Kartverk, 2005). The vectors are saved internally in each receiver and the vectors between the receivers and the known reference point is determined by post processing the data (Wellenhof et al, 2008).

According of (Alkan, 2015) "Static GPS surveying is a relative positioning technique that depends on the carrier-phase measurements and carrier-phase measurements is the most accurate positioning technique".

2.8.2 Real-Time Kinematic Global Positioning System

Real-time kinematic global positioning system is a surveying method performed with a relationship between a reference GPS rover units and sufficient satellite. The base station must be mounted on a known reference point while the rover is moveable. The base station acts as the known position with predetermined x- y- and z-coordinates from which the unknown positions are derived. Data from the base station to the rover is transmitted through radio contact which enables RTK GPS coordinates to appear in real-time in the rover (Wsdnr, 2004). When RTK surveying all receivers must observe minimum four common satellites (Moser, et al, 2016). RTK technology is enhanced with active repeater stations which are specially designed to re-transmit the base station signals in the areas of poor reception (Wayumba, 2013). There are an increasing number of applications for high precision carrier phase-based positioning for machine and vehicle guidance and control lee 2009 RTK surveying has three methods: The survey involves a large number of unknown points located in the vicinity of a known point; the coordinates of the unknown points are required in real time; and the line of sight the propagation path is relatively unobstructed (Elrabbany, 1997).

RTK in the field printouts of the orthophoto image overlaid with selected sample were used to make it easier to find and identify each sample features. During the RTK GPS measurement, the base station sends correction for GPS error sources in real time via radio link to the rover over 1-4 km on average. According to the proximity of the selected sample feature to the base station two base stations are used for this RTK survey. With the help of printed out location map of sample point RTK survey were conducted on each selected sample of point. based on Ephrem Mulugeta concluded information's to assessing the accuracy of extracted features (point, line and polygon)

and orthophoto satellite image of spatial source data assessments more accurate GCP points established by E.G.I.A than online establishing without core station nearly available for accuracy measurements (Ephrem Mulugeta 2018). Based on this Ephrem approved information for this study use the GCP for established by E.G.I.A. To compare planimetric accuracy of orthophoto for the selected 20 sample points RTK GPS survey were collected twice by setting the reference base station coordinates obtained from E.G.I.A and current computed coordinate. Therefore, the number of collecting coordinate along the selecting samples (Ephrem Mulugeta 2018).

2.9 Planimetric Features extraction

Feature extraction is a systematic collection of all details appearing on ground which are also visible on the imagery by digitization into vector form (Paul R. et al., 2014) i.e. conversion of data from raster to vector. In the science of photogrammetry there are two techniques of feature extraction (digitization) from digital image these are: stereo digitization and heads-up digitization. In stereo digitization technique features are digitized using stereo plotter instrument embedded with computer and in this technique one can see and extract 3-dimensional position of a feature while in heads-up digitization features displayed on a computer screen are digitized directly with a mouse. The human operator views the digital image simultaneously with the digitized features on the computer screen (Paul R. et al., 2014). In this study using heads-up digitization technique testing only for orthophoto (parcel feature). Legal cadaster standard 03/2014 state that when using orthophoto as a data source for preparing cadastral map providing options to extract parcel feature based on heads up feature compilation technique can be used.

Therefore, coordinates of select sample parcel corner (vertex) were extracting from digital orthophoto (parcel feature) on Arc GIS 10.3 and using heads-up digitization technique planimetric coordinates of similar parcels corner are extract from orthophoto image. This is done manually by creating a point vector layer using Arc GIS 10.3. In an effort to eliminate error, the sample point vectors were identified 5 different times independently from orthophoto during manual digitization. The averages of the 5 coordinates for each point vector were use**.** The point vectors layer which are creating along the parcel corners are digitizing following points along the geometry of the feature. Following similar techniques of heads up digitizing technique on the selected sharp edge, junction of road planimetric coordinates are extracting from orthophoto by creating a point vector layer on Arc GIS 10.3. To clearly identify the selecting sample features during the extraction of planimetric coordinate features are zoomed to at a visible extent (Ephrem Mulugeta 2018).

2.10 Accuracy Evaluation of spatial features

The accuracy of the cadastral maps is analyzed through the accuracy of the transformation models, location accuracy and finally the area accuracy of each parcel. The accuracy of digital cadastral maps is assessed through one-to-one matching of the vectorized cadastral maps with the original analog map to ensure the shape and number of the respective parcel and the total number of parcels & other features in the village, particularly zero labels and duplicate labels and assessment of parcels area in vector layer with respect to the area of parcels mentioned in revenue records.

Accuracy assessment was done by comparison of geo coordinates of randomly selected points generated by computer with that of observed through GPS, comparison of length measurement (of tie lines) generated by computer with that of actual field measurement and comparison of area of randomly selected parcels generated from image data set with that of actual field measurements. (Kumar, et al, 2014). Accuracy of the cadastral map, the spatial accuracy and integrity of cadastral maps can vary a great deal as shown by the reviews of the Danish and Australian cadastral systems. Cadastral maps can be graphic out-of-date approximations of the cadastral framework which are used primarily for charting of cadastral surveys or for valuation and land tax purposes, as originally used in Australia. On the other hand, some cadastral maps are created by field surveys and in their digital form are as accurate as the supporting cadastral surveys, as seen in the cadastral maps of the Australian Capital Territory. If the map is compiled from sporadic cadastral surveys, the map will usually have a lower integrity and a greater variability of accuracy in the spatial location of parcel boundaries. (Williamson and Enemark, 1996). The accuracy of photogrammetric measurements is usually premised on the use of ground control points. These are points that can be accurately located on the photograph and for which we have information on their ground coordinates and/or elevations (often through GPS observations). The accuracy of area measurement is a function of not only the measuring device used, but also the degree of image scale variation clue to relief in the terrain and tilt in the photography. (Lillesand, et al, 2004).

2.11 Spatial Data planimetric Accuracy

The accuracy of spatial data can be defined through measures of the difference between the location of the recorded feature and the true location (Goodchild and Hunter,1997**).** In planimetric mapping process different kinds of features found on the earth according to their standard representation on a map can be extracted in terms of point, line and polygon from satellite image, orthophoto and other spatial source data (Tyner, 2010).

Points are the simplest features to test. Points have only a location (coordinates), so the method would be to obtain the coordinates of the test point, then compare that to the planimetric coordinates of the same point as defined by a higher accuracy source (GPS). Thus, in this study planimetric accuracy of points selecting along parcel corners and edge of road or junction are assessing relative to coordinates obtained from RTK GPS survey. Errors in lines or polygon arise from the errors in the points that define those lines and polygon (REDDY, 2008). Therefore, in this study the planimetric coordinates extracting from the orthophoto and digital line map (parcel and road adage line) planimetric accuracy will comparing point wise independently with independent reference RTK GPS points in terms of x, y and horizontal root mean squared error (RMSEx, RMSEy and RMSEr, respectively) equations taken from FGDC (1998)). According to Zenabu G. *et al,* (2017) conclusion the planimetric accuracy of orthophoto appropriate for large scale cadastral map production relative to E.G.I.A GCP more accurate than online establishing GCP. Based on Zenabu G. *et a*l, (2017) and Ephrem Mulugeta (2018) study observation and conclusions for may study using E.G.A recently established GCP points from study area. Regardless of the method, the final feature extricated output of spatially land parcel positional accuracy checking by min esquire error method used by RTK GPS measuring data overlaying with orthophoto extracted features. After the completion of the digitizing layers, the digital map will produce a sample in its final form with scale of 1:500 in national standard in land holding certification.

2.12 Types of spatial data Accuracy and standards

In geographic or spatial data accuracy can be divided in to positional and thematic accuracy of spatial data. Positional accuracy determines how closely the position of spatial objects shown on a rectified image (map) or in a spatial database agree with the true position on the ground.

Positional accuracy describes the location of cadastral map features and measures the distances of spatial feature on a map (Bolstad, 2005). Thematic accuracy describes with the attributes of cadastral map and measures. Thematic accuracy refers to the non-positional characteristic of a spatial data entity, the so-called attributes (which are derived from radiometric information) (Jassen et al, 1994). Positional accuracy also divided in to two these are horizontal (planimetric) and vertical accuracy. Horizontal(planimetric) accuracy is the horizontal (radial) component of the positional accuracy of a data set with respect to a horizontal datum, at a specified confidence level (ASPRS, 2013).

All locations on maps and georeferenced images are expressed by a set of values: x-and y-coordinates for horizontal location. Many data set also include elevations, which are represented by the letter z. however this study only carried out on planimetric accuracy assessment**.** Following the

advancement in technology different kinds of map can be prepared from different source for instance it can be prepared from ground survey, aerial photo, and satellite image (Tyner, 2010). Thus, the accuracy of the final map prepared depends on the accuracy of the specific data source used to produce that map. If our decisions based on map information are to have expected results, then the accuracy of the maps must be known. Otherwise, implementing such decisions will result in surprises, and these surprises may be unacceptable. Widely known, in terms of the assessment of positional accuracy, is the concept of 'well-defined points. In the United States, the approach is commonly suggested by standards, such as by the NMAS (United States Bureau of the Budget, 1947), the ASPRS Accuracy Standards for Large-Scale Maps (ASPRS Specifications and Standards Committee, 1990) and more recently, by the FGDC published NSSDA on positional accuracy (FGDC, 1998). Corresponding well-defined points are identified both on X and on Q. The independent reference source (Q) is acquired using for example a geodetic surveying technique such as by a total station or by a GNSS technique like the GPS, or by a photogrammetric method towards for example high resolution imagery (FGDC, 1998; Wasström et al., 2008). In term of linear features, the identification of well-defined points includes furthermost right-angled intersections of especially man-made objects such as roads, canals, house corners etcetera. The accuracy standards, such as the ones above mentioned, recommend either the calculation of the Euclidean distance, i.e. the minimum distance between two spatial features (Peuquet, 1992), or the differences in x and y of corresponding pair of points. Determined differences enable for knowledge about the positional deviations between selected points on X in relation to corresponding points on Q. Producing an overall quality assessment of the positional accuracy requires the selection of multiply test points, i.e. by well-defined points, commonly by a sample, randomly or manually specified. FGDC (1998) recommend a minimum requirement of 20 test points. The sample will represent the positional accuracy as a magnitude of the whole. Deviations derived by the accuracy assessment should preferably be statistically handled so that to obtain an overall report of the positional accuracy of X relative to Q. Thus, different researchers assess the accuracy of digital spatial data in order to evaluate the accuracy of the data set for the demanded application. In this connection to P. Agrafiotis , A. Georgopoulos (2015) assess the comparative horizontal accuracy of orthorectified high resolution satellite imagery from Pleiades-1B satellites image(0.50m GSD), GeoEye-1 satellite image(0.50m GSD) and orthomosic aerial image that has 0.50m GSD the study use point wise accuracy assessment and the RMSExy for 26 check points were computed thus based on this computation Pleiades-1B satellites

image has 0.646m, GeoEye-1 satellite image 0.86m and ortho mosaic aerial image has 0.649. Thus, the researchers suggest that the satellite image can be used as an alternative for large scale map production. Similarly S.Rao,etal (2014) assess the usefulness high-resolution satellite imagery for re-survey of cadastral maps in India in this study CARTOSAT-2 panchromatic satellite image that have 1m GSD and GEO-EYE-1 multispectral satellite image that have 0.5m GSD were used for assessment. The positional accuracy assessment was undertaken parcel wise 159 parcel feature were extracted from the two satellites were compared using their attributes viz area, perimeter and position. Around 80% of the parcels can be derived with precision, meeting the standards for survey/re-survey and the researchers suggest use of HRSI will result in increased throughput, area prioritization for ground survey, faster maintenance and updating of cadastral maps in more economical manner. In Ethiopia, Angot Yedegera Tor (2013) was assessed the accuracy of worldview-1 satellite image for rural land registry system in this research coordinates extracted from satellite image compared with RTK GPS coordinate and its accuracy statistically compared in terms percentile. Thus, based on this only 46.4% of all the coordinates have discrepancies below 1m and the remaining are above 1m discrepancy relative to RTK GPS survey coordinates and the researcher conclude that worldview-1 satellite image Angot Yedegera, do not meet the requirement of 1m accuracy for rural land management system (Angot Yedegera Tor 2013).

2.13 Importance of Accuracy

There are several advantages of accuracy assessment. First users must consider the quality of data used to produce the spatial dataset (Wright, 1997). Second users must consider the utility of parcel spatial data. The GIS should not only make analysis easier but it should also increase confidence in the outcomes of analyses (Struck, 1998). There are many reasons for performing an accuracy assessment. Therefore, a valid accuracy is not only useful but may be required (Green, 2009).

CHAPTER THREE: MATERIALS AND METHODS

3.1 Description of the Study Area

Werabe Town is found in Southern Nations, Nationalities and Peoples Regional State (SNNRS), Ethiopia. The town is one of from 12 reform Towns in the region of Southern Nations, Nationalities and Peoples Regional State of Ethiopia (SNNRS UDCD 2019 report). Weraba is the capital town of silite zone administration. Total Area of the Town is 15,671 hectors. Geographical location of the Town lie coordinates between 7° 48′04″ and 7° 55′15″ / N latitude and from 38° 08′42″ to 13′42″ E / 8.017; 38.333 longitude coordinates. Currently, the town marked rapid expansion and development in almost all parts of the Town. There was significant change in urban land use pattern mainly in commercial and residential areas where as reduction in agricultural land use because of urban expansion in the fringe areas of the Town (worabe Town municipality finance and economy office 2019 report).

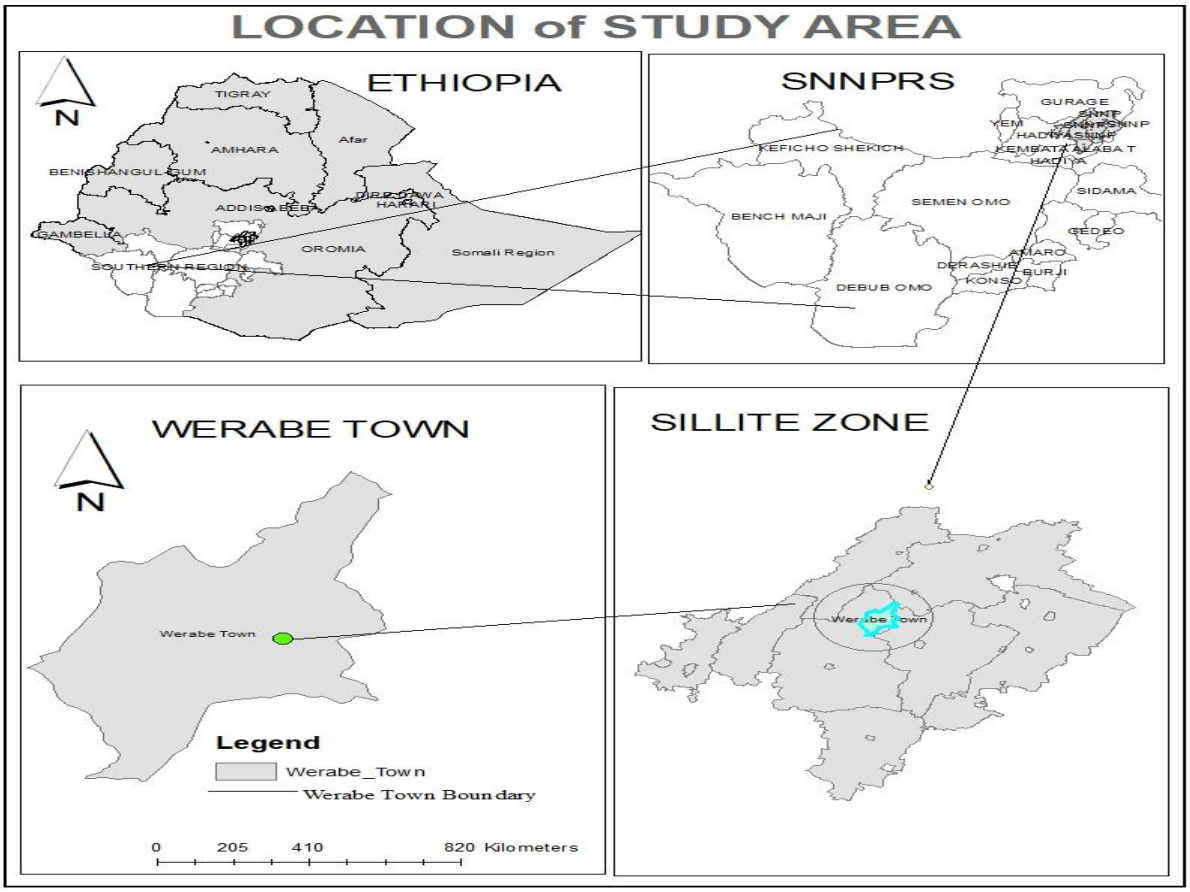


Figure 3: 1 Location map of study area

3.2 Materials and Data source

Data collecting from both primary and secondary data to achieving the setting goals. There are four basic data sources used to collected for assessed planimetric accuracy: such as data from Geo referenced digital orthophoto of whole Werabe Town, digital line map and Newly E.G.I.A stablished GCP data as well as RTK measured point data. In this paper used already Geo referenced digital orthophoto and its digital line map acquired from weraba Town in 2012 at 1:2,000 scales and 15 cm Ground Sample Distance. Rectified Orthophoto image reducing spatial errors derived from source of data. Lawali and Waziri (2014) showed that orthorectification process reduces geometric errors inherent within photography and imagery. Newly stablished First order GCP data acquired from EG Silite zone urban development and construction department. Proclamations, standards, journals, related land data, published and unpublished works and other documents from south region urban development and construction bureau and from internet websites thus all are the data used as Secondary data. Primary data collected from in situ survey methods on the field n from RTK GPS collection and in land registration (cadastral) department information from expertise about spatial data accuracy issues gathered directly to understand and used for the assessment.

Table 3: 1 List of Data and Materials to be Used for the Study

A. Source of Data			
No	**Name**	**Source**	**Purpose**
1	Orthophoto Imagery (2012)	Silite zone urban Development and construction Department	To spatial feature extractions and spatial data measurement
2	Digital line map	Weraabe Town	Parcel corner point feature extraction
3	GCP Points	Silite zone urban Development and construction Department	Used for reference station point in RTK GPS coordinate measurement
B. Software's Used			
No	**Name**	**Version**	**Purpose**
1	ArcGIS	10.3	Orthophoto Imagery feature extraction and processing spatial data
2	Microsoft Office Excel	2016	For data processed and RMSE assessment analysis
C. Instrument used			
1.	SOKKIA DGPS	South Region urban development and construction Bureau	In situ RTK GPS measurement on the field

3.3 Methods Used

3.3.1 Sample Selection and Sample Size

Due to dynamic nature of Urban area features are changed over time due to such factor's spatial information such as orthophoto and digital line maps must update. Samples are selected based on FGDC, 1998, which are evenly distributed over the geographic extent of the image and well defined, easily identifiable features are selected. similar samples were selected from orthophoto and digital line map carefully. In fact, the guidelines of FGDC states that to evaluate the accuracy of spatial data, at least a minimum of 20 independent check points shall be tested (FGDC, 1998).

The same principle based on American Society for Photogrammetry and Remote Sensing (ASPRS, 2013) recently developed new geo-location accuracy standards for digital geospatial data are recommend 20 clearly defined check points for a project area of ≤500 km2. The point wise models used. This approach updated and internationally accepted, also this study use thus approach for assessing 20 well defined check points (parcel sharp edge) and used clearly visible 100 parcel corners are selected. The study area covers up to 200km^2.The selected samples feature visible both on the imagery at the same time on the ground. The data analysis by compare point wise independently with independent reference in RTK GPS measuring points in terms of x, y coordinates in planimetric root mean squared error (RMSEx, RMSEy and RMSEr, respectively) analysis are used.

3.3.2 Preparation of Field Survey Instrument

Before the field work could start all survey, instruments were checked. The instrument supported from south region urban development and construction bureau with two survey Expertise. The instruments are one SOKKIA GRX receivers and 2 rovers for RTK GPS measurement and checked all the accessories and instrument before field surveying.

3.3.3 Preparation of Base Map

The prepared base map used for field collected data and followed procedure related with extracted features to guide the direction of measurement and analysis after accomplished the task. The basic approaches/methods used to employ in the preparation of the base map is orthophoto image and from known selected features attribute data collected from the municipality. Digitizing the selected features of parcel corner and sharp edge coordinate in large scale of 1:500 on the study area to Produce digitized map to guiding and supporting with attribute data of each block and parcels on the ground from selected samples.

3.3.4 RTK GPS Data Survey

Recommence survey used before measuring on the field to understand the study area in detailed about the distribution of sample parcels identification, the direction of the parcel corner used to measure. Real-Time-Kinematic GPS measurement technique is used to collect the coordinates of parcel corners and selected points to test the accuracy associated with the orientation of the orthophoto extracted line map and aerial photograph. With the help of printed out base map of sample area, RTK survey were conducted on the field to make it easier to find and identify each sample features to measured. This accuracy assessment study used in situ measurement techniques applied on the field. For precision of the data the measurement instrument used RTK GPS for data collection from selected samples. From field measurement to getting better evaluation 20 check-points for orthophoto assessment and 100 parcels corners for digital line map assessment measured selected sample parcel on the ground. Measured RTK spatial data focused on selected features which are visible both on the ground and orthophoto which can be easily identifiable sharp edge are selected on field measurement. The six days were used for RTK GPS surveying parcel corner points in the study area from selected features. The chosen epoch interval was set to five seconds. For RTK GPS surveying, radio contact had to be established between the base and the rover before the surveying could begin. All parcel corners were also surveyed with GDOP epoch values below 5, which ensure that the geometry of the satellites is sufficient. During the RTK GPS measurement, the base station sends correction for GPS error sources in real time via Bluetooth (radio) link to the rover over 4 km on average. According to the proximity of the selected sample feature to the base station, take hundred total sample sizes by systematic random sampling technique used as ideally evenly distributed points collected to assess twenty check points for the study area. The sample of 20 check points must also be well distributed across the study area and also collected by using Leica GS 14 GPS. Due to unavailability of local CORS station which used as a reference during RTK GPS measurement first order GCPs which was established by Ethiopian Geospatial Information Agency was used the reference base station, the GCP point name of WRB**1** and WRB4 at 95% confidence level of horizontal errors is 0.012m are used for RTK GPS measurement. The GCP of WRB1 used station orientation for receiver and GCP of WRB4 are uses for checking the point by measuring known point in RTK and in second round GCP WRB4 used station of receiver and GCP WRB1 known points used for checking accuracy measuring in rover by RTK GPS, then after checking to collect selected sample point for assessment.

Those selected GCP points are monumented and protected by fancy and also around points are not any construction done after established the points because of recently established points. Finally, from the municipality experts assured GCP points to use the reference station on field measurement. For orthophoto assessment 20 ground check points are identified in the study area under consideration of evenly distributed and visible both on the ground and image for extracting the coordinate points to evaluating the orthophoto quality on the ground truth data set. Selected points consider on parcel corner, road edges and others visible on the image used for the assessment. After accomplishing the field survey measured coordinate value of each feature exported from the GPS data collect to external heard disc ensures that a back-up copy of all raw data is maintained in case the data becomes corrupted or delated. The distribution of check points and RTK GPS measured parcel corner points are shown below figure 3.2.

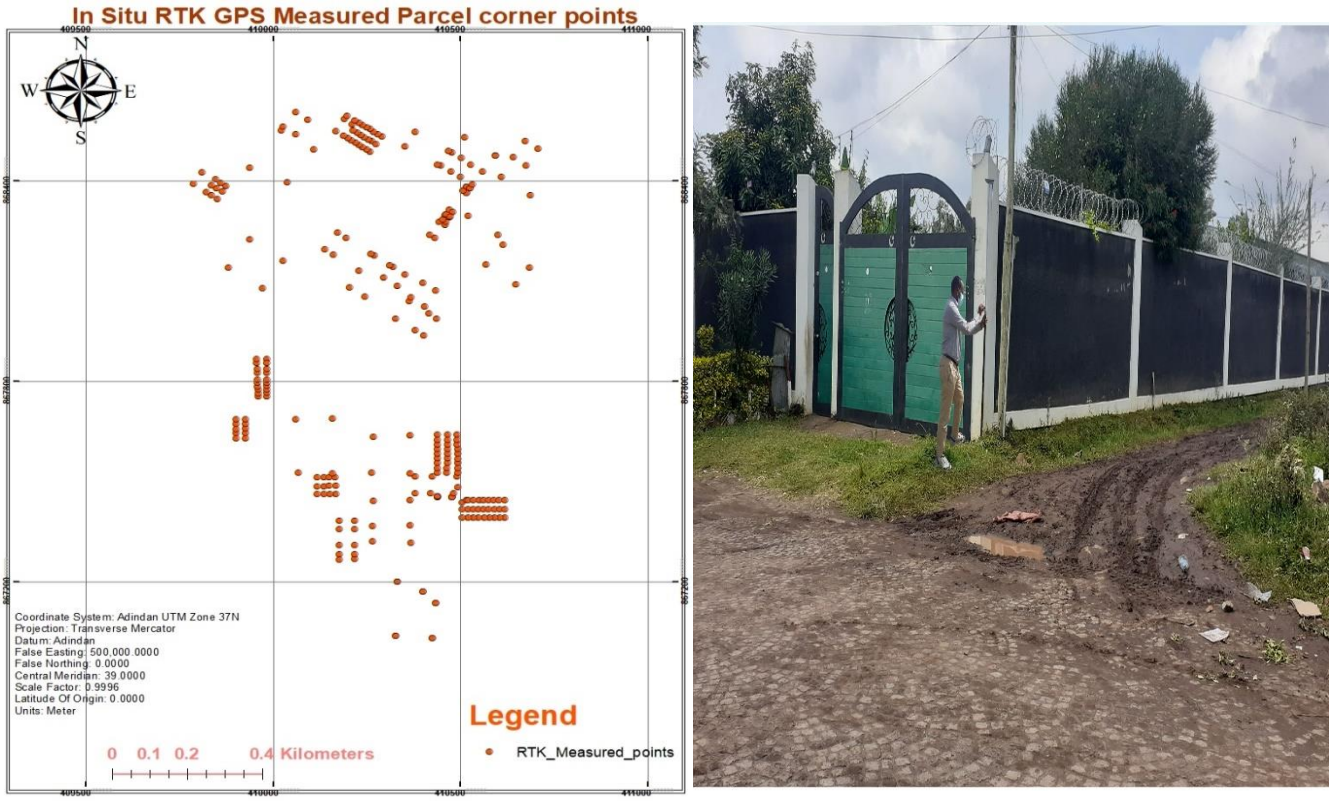


Figure 3: 2 Measured parcel coordinate samples and Extracted point features

3.3.5 Planimetric Feature Extraction

Feature extraction is a systematic collection of all details appearing on ground which are also visible on the imagery by digitization into vector form (Paul R. *et al.,* 2014) i.e. conversion of data from raster to vector. The human operator views the digital image simultaneously with the digitized features on the computer screen (Paul R. *et al.*, 2014). Coordinates of selected sample parcel features corners extracted from digital orthophoto and digital line map on Arc GIS 10.3 computer onscreen heads-up digitization technique used features extracted (Legal urban cadaster standard 03/2015).

This is done manually by creating a point vector layer using Arc GIS 10.3. an effort to eliminate error, the sample point vectors identified 5 different times independently from orthophoto during manual digitization. There for averages of the 5 coordinates for each point vector used for feature extraction**, t**he capture scale is kept constant at scale of 1:500 for 1:2000 scale output. From digital Orthophoto and Line map Extracted 100 parcel features shown figure 3.6.

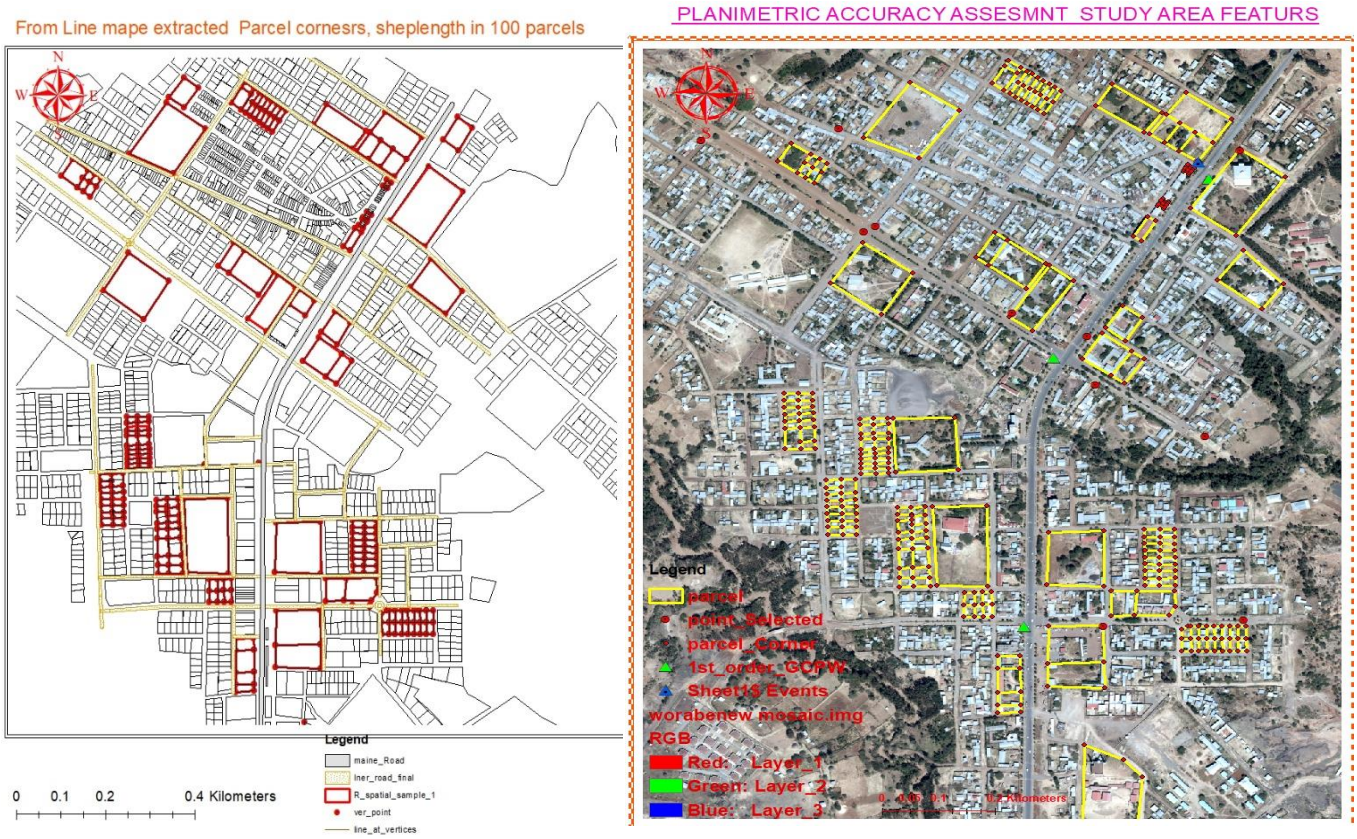


Figure 3: 3 Orthophoto and Line map Extracted parcel features for the used Assessment

3.3.6 Accuracy assessment

The accuracy of spatial data can be defined through measures of the difference between the location of the recorded feature and the true location (Goodchild and Hunter,1997). The planimetric accuracy assessments include 20 check point for orthophoto evaluation and 100 sample parcel corners coordinates surveying on RTK GPS with digital line map and orthophoto extracted coordinate assessment for cadastral parcel map (large scale map) accuracy assessment used after data collection and extraction. To calculate the planimetric accuracy of the twenty measured cheek points and the extracted points from orthophoto, the extraction value of coordinate by using ArcGIS software by zooming in from the image until clearly see the exact location of the chosen point and using identify icon measure coordinates. Therefore, in this study the planimetric accuracy of orthophoto assessed on the selected points from parcel corners and specified feature of a parcel corners (point and polygon feature). Points are the simplest features to be tested in the Accuracy assessments of spatial data, because of Points have only a location (coordinates), so the method used to obtain the coordinates of the test point, then compare that to the planimetric coordinates of the same points as check points measured from RTK GPS data set based on national urban legal cadaster standard No_03/2015.

The assessment of accuracy would compare point wise independently with independent reference in RTK GPS measuring points in terms of x, y from planimetric root mean squared error (RMSEx, RMSEy and RMSEr, respectively) equations. The Root mean square error is the standard error measure used in ground-controlled points. Points testing approach using for the data analysis, data analysis using the principle of guidelines of FGDC (1998). For digital spatial data analysis using root mean squared error equations taken from FGDC (1998) and Vieira et al (2002) geometric features assessing approaches uses. Examples of geometric features are roads edges, parcels and other boundaries. They should be easily locating and representing as a set of sequential coordinates. Therefore, in this study the planimetric coordinates extracted from the orthophoto and digital line map (parcel edges and roads edges) planimetric accuracy compared point wise independently with independent reference RTK GPS points in terms of x, y in planimetric root mean squared error (RMSEx, RMSEy and RMSEr, respectively) equations taken from FGDC (1998)) as flows.

$$\mathbf{RMSEx} = \sqrt{\frac{\in (\boldsymbol{X\,datai - Xchecki})\mathbf{2}}{\mathbf{n}}}$$

$$\textbf{RMSEy} = \sqrt{\frac{\in (\boldsymbol{ydatai - ychecki})\mathbf{2}}{\mathbf{n}}}$$

$$\textbf{RMSEr} = \sqrt{\boldsymbol{MSEx2 + RMSEy2}}$$

Where: - X data, i, Y data, i are the coordinates of the i^{th} point in the evaluated dataset

X check, i, Y check, i are the coordinates of the i^{th} point in the independent reference dataset of higher accuracy,

n is the number of check points and

i is an integer that ranges from 1 to n.

Case1: Computing Accuracy According to the NSSDA when RMSEx = RMSEy

- If RMSEx = RMSE **y** the planimetric accuracy can be computed by the following formula:

RMSEr = sqrt (2*RMSEx ^{2}) = sqrt (2*RMSEy ^{2}) = 1.4142*RMSEx = 1.4142*RMSEy

It is assumed that systematic errors have been eliminated as best as possible. If error is normally distributed and independent in each the x- and y-component and error, the factor 2.4477 is used to compute planimetric/horizontal/ accuracy at the 95% confidence level as FGDC 1998 stated on (Greenwalt and Schultz, 1968). When the preceding conditions apply, Accuracy, the accuracy value according to NSSDA, shall be computed by the formula:

Accuracy $_r$ = 2.4477 * RMSEx = 2.4477 * RMSEy

= 2.4477 * $RMSE_r$ /1.4142

Accuracy = 1.7308 * RMSEr

Case2: (results similar to Case1**):**

- If RMSE x # RMSE y, (the ratio between the largest RMSE and the smallest one is between 0.6 and 1.0), then the accuracy can be computed by the following formula:

$$\text{Accuracy x y} = \frac{\textbf{2.4477*(RMSE x * RMSE y)}}{2}$$

$$= \textbf{1.22385* (RMSE x + RMSE y)}$$

Note that the constants **1.7308 and 1.22385** are the standard value from the x-axis of the standard normal distribution for an interval with a probability of horizontal (radial) accuracy at the 95% confidence interval.

3.3.7 Flow chart of the methodology

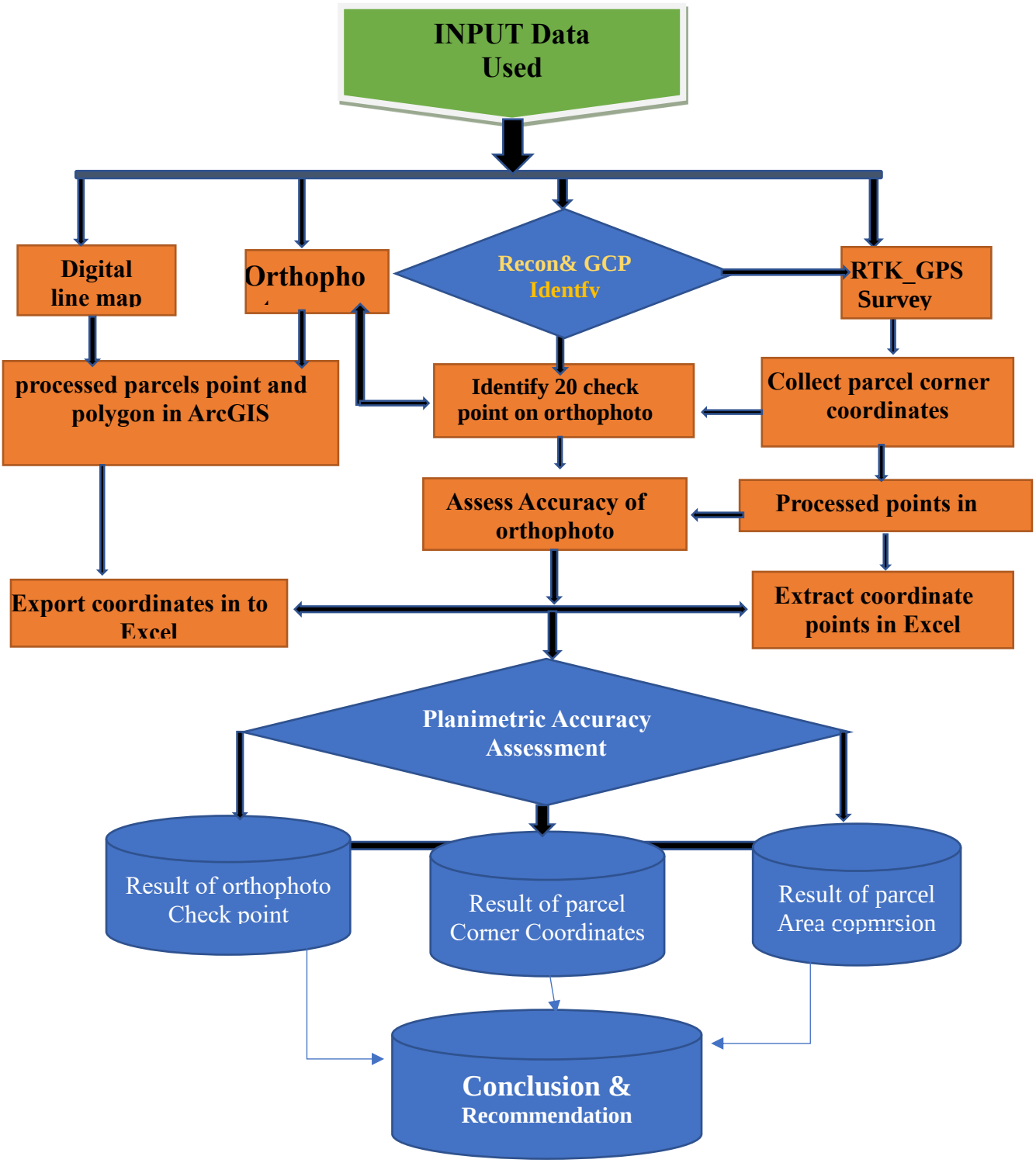


Figure 3: 4 Methodological Work Flow

CHAPTER FOUR: RESULT AND DISCUSSION

4.1 Assessment Results and Discussions

This study assesses the planimetric accuracy of orthophoto and its extracted digital line map currently used for large scale cadastral mapping and spatial land registration in the werabe Town relative to in situ RTK GPS measured data sate based on of legal cadastral standard No 03/2005. Planimetric accuracy only focused on horizontal accuracy assessment, the assessment was used point-based assessment technique to checking the horizontal accuracy of orthophoto and its extracted line map independently compared with RTK GPS on situ survey data to evaluate statistically.

The accuracy tested reference as a base or reference station used coordinate obtained from E.G.I.A GCPs 2019 established first order points (show in Appendix_5). Therefor 20 sample point used from orthophoto and RTK GPS measured data set for evaluation of orthophoto accuracy. The second pillar issue is digital parcel line map assessment of current years using in urban land spatial registration and mapping in the Town and finally parcel area evaluation to visualize the effect (result) of digital line map relative to in situ RTK GPS measured parcel and orthophoto extracted sample parcels to understand the assessment result of accuracy area of the parcel.

Figure 4: 1 GCPs Used for reference station Established by E.G.I.A

4.1.1 Accuracy Assessment Result of Orthophoto with Selected Check Points

The planimetric accuracy of orthophoto was assessed coordinates from well-defined 20 check points derived from sample features in orthophoto against in situ measured RTK GPS data independently. A minimum of twenty well defined test points should be used to evaluate the horizontal accuracy of digital orthophoto. The check points evenly distributed relatively across the study area. planimetric accuracy of orthophoto assessed relative to coordinate value obtained from RTK GPS survey result on similar sample features of 20 sample point from orthophoto with coordinate obtained from RTK survey with identified bases station coordinate on the same base stations. Based on this the planimetric accuracy of orthophoto for the selected 20 points relative to coordinate computed from coordinate obtained from E.G.I.A GCP used as base station on RTK survey result. In this study the applied methods for sampling and accuracy assessment based on ASPRS and NSSDA standards used to calculate RMSE deviation of ΔE and ΔN separately. Therefore, the RMSE for each sample feature computed independently. Similarly, RMSEr and 95% confidence levels were computed and finally the results are presented according to national urban legal cadaster slandered No_03/2015 *shown* as below figure 4.3.

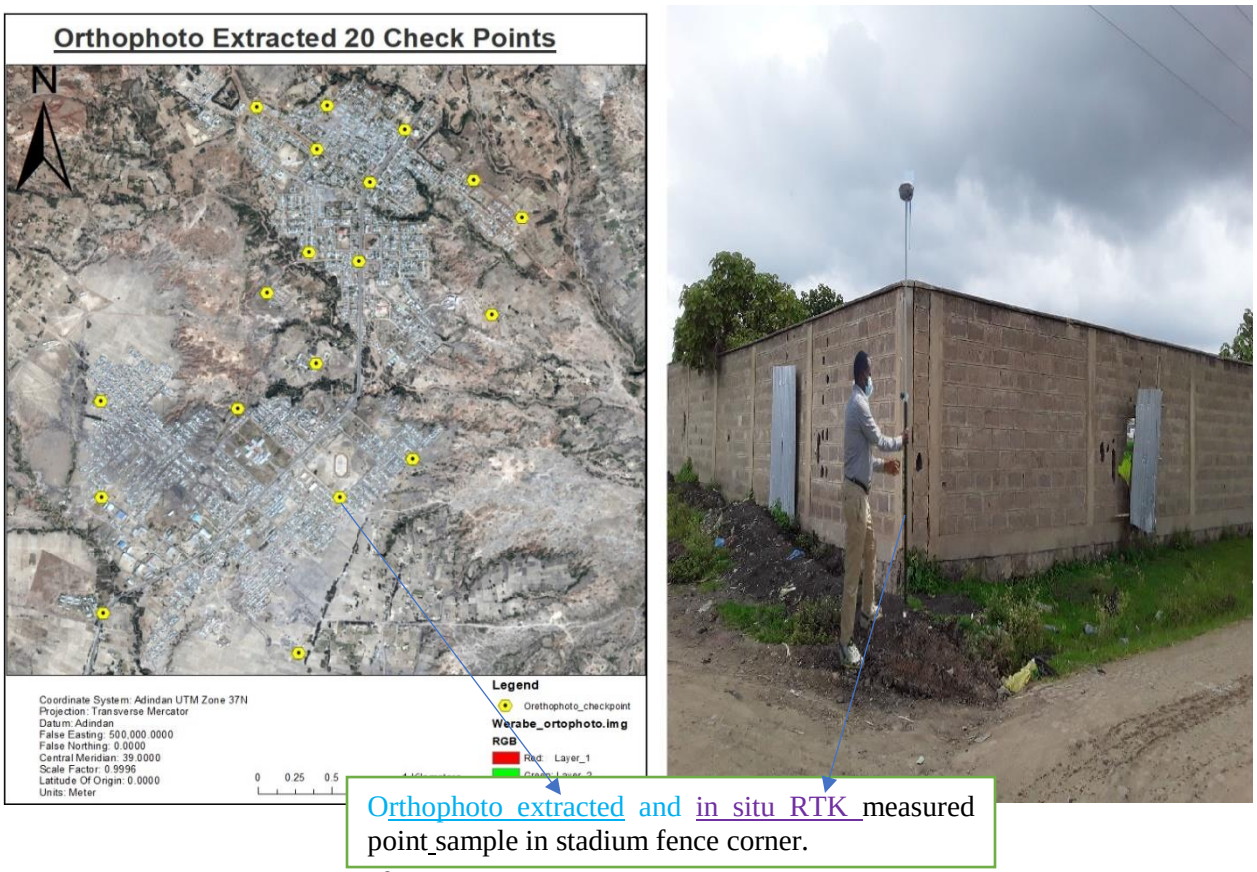


Figure 4: 2 Distribution of check points and RTK Measured on the ground.

The RTK GPS measured coordinates for the twenty checkpoints were determined using Leica Geo office and load in to ArcGIS 10.3 for processing and export to Excel sheets for RMSE analysis. In order to analyze the planimetric positional accuracy of orthophoto, the coordinate measurement of some independent check points measured. In this research there are twenty check points, whose coordinates are measured by using RTK GPS technique with at least ½ hour observation.

Then, the resulting coordinate from GPS measurement is compared against coordinate measurement from the orthophoto. The shifts in coordinates of the extracted points from the orthophoto as compared to that of the check points are presented in Table 4.1.

Table 4: 1 Planimetric Accuracy Assessment result orthophoto based on check points

Pr. ID	Orthophoto Extracted Coordinate Points		Rtk Gps Measured Coordinate Points		Deviations Of Orthophoto To_Rtk		Discrepancy Square	
	Easting (x)	Northing (y)	Easting (x)	Northing (y)	Δ x Easting	Δ y Northing	$(\Delta x)^2$	$(\Delta y)^2$
p1	410,533.610	868385.678	410,533.250	868385.556	0.360	0.122	0.130	0.015
p2	411,004.269	868021.882	411,004.299	868021.622	-0.030	0.260	0.001	0.068
p3	411,328.484	867756.667	411,328.374	867756.967	0.110	-0.300	0.012	0.090
p4	409,526.127	868544.468	409,526.147	868544.344	-0.020	0.124	0.000	0.015
p5	410,224.134	867441.751	410,224.172	867441.510	-0.038	0.241	0.001	0.058
p6	411,128.017	867060.206	411,128.137	867060.408	-0.120	-0.202	0.014	0.041
p7	409,972.372	865861.872	409,972.330	865861.750	0.042	0.122	0.002	0.015
p8	408,485.757	864925.17	408,485.863	864925.493	-0.106	-0.324	0.011	0.105
p9	409,813.452	864642.042	409,813.474	864642.165	-0.022	-0.123	0.000	0.015
p10	409,996.352	869012.146	409,996.200	869012.024	0.152	0.122	0.023	0.015
p11	410,297.980	868005.980	410,297.770	868005.788	0.210	0.192	0.044	0.037
p12	410,008.603	868553.923	410,008.668	868553.967	-0.065	-0.044	0.004	0.002
p13	409,936.789	868,242.849	409,936.540	868,243.024	0.249	-0.175	0.062	0.031
p14	409,881.889	867,508.693	409,881.966	867,508.558	-0.077	0.135	0.006	0.018
p15	409,599.447	867,216.845	409,599.308	867,216.967	0.139	-0.122	0.019	0.015
p16	409,931.613	866,713.993	409,931.816	866,714.129	-0.203	-0.136	0.041	0.018
p17	409,400.255	866,391.250	409,400.141	866,391.501	0.114	-0.251	0.013	0.063
p18	408,467.155	866,442.829	408,467.329	866,443.082	-0.174	-0.253	0.030	0.064
p19	410,589.669	866,028.623	410,589.312	866,028.430	0.357	0.193	0.127	0.037
p20	408,475.672	865,756.633	408,475.360	865,756.765	0.312	-0.132	0.097	0.017
					Total		0.640	0.739

The above table shows the orthophoto Image Extracted coordinates and in situ RTK GPS measured coordinate for Planimetric positional Accuracy assessment of Orthophoto in the Werabe Town.

The evaluation results summarized based on basic standards for applicability of orthophoto to urban land spatial registration and large-scale mapping. The assessment results show in below Table 4.2.

Table 4: 2 Summary of planimetric accuracy Assessment of orthophoto result.

No	Assessment Result	Value	Remark
1	sum square of Δx	0.640	All units are in meter
2	sum square of Δy	0.739	
3	Max Δx	0.360	
4	Min Δx	-0.203	
5	Max Δ y	0.260	
6	Min Δy	-0.324	
7	MSE Δx	0.032	
8	MSE Δy	0.037	
9	RMSE x	0.179	
10	RMSEy	0.192	
11	RMSE xy	0.263	Overall Accuracy
12	At 95% CLE Based on NSSDA	**0.455**	Error factor is 1.7308

The results show that the maximum deviations are 0.360 and 0.260 for easting and northing respectively. These minimum deviations are -0.203 easting and -0.324 northing. The accuracy of digital orthophoto image as compared to the RTK GPS data processing result is 18 cm and 19 cm in x and y-direction, respectively in RMSE sense from above table, it more illustrated comparison from below Figure4.4.

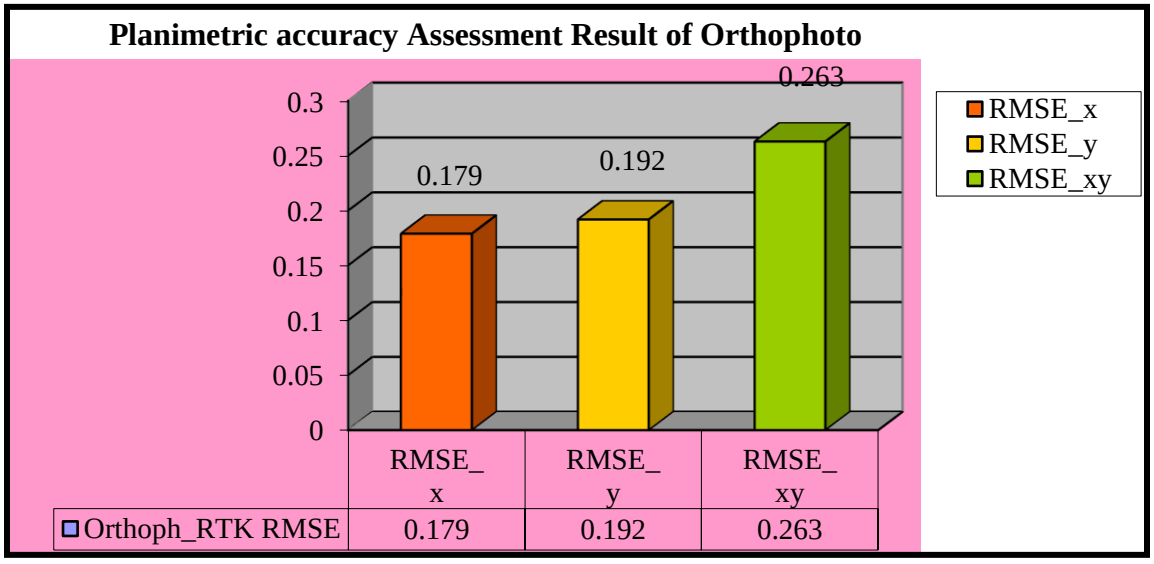


Figure 4: 3 RMSE of check point coordinates in RTK and Orthophoto Extracted coordinates.

The above figure 3.11 shown the result of root mean square error of easting and northing component is 18 cm and 19 cm respectively. Thus, Overall values correspond to planimetric positional Root

mean square error of x and y are 26 cm. The reference station points used EGIA established points for accuracy assessment. From literature review accuracy assessment to use EGIA established first order GCP point in the case of unavailability of nearby CORS station. According to Ephrem mulugeta (2017) stated that, the planimetric accuracy of orthophoto relative to E.G.I.A first order GCP is appropriate for demanded application relative to new established GCP points because of large discrepancy between computed and previous coordinate planimetric accuracy of orthophoto only for 20 similar selected samples are assessed relative to RTK GPS survey coordinate result with reference to coordinate obtained from computed and previous E.G.I.A. coordinate on the same GCP. The reason for positional accuracy test to compare the accuracy first and second order GCP have better accuracy obtained on processed reference to first order GCP and to use as a base station during RTK survey. Based on Ephrem mulugeta (2017) accuracy assessment evidence used first order GCP points established by E.G.I.A. as reference station point. The result shows, the RMSE of the difference between the orthophoto coordinates and in-situ GPS coordinates of the 20 check points in x and y-directions are 18 cm and 19 cm and also Overall values correspond to planimetric positional Root mean square error of x and y are 26 cm respectively.

This above result against research question number one planimetric accuracy of digital orthophoto based on selected ground check points findings are:

The planimetric positional accuracy of Orthophoto indicated that based on National urban legal cadaster standard lies an acceptable for cadastral spatial land registration and large-scale mapping production. Because National urban legal cadaster standard No 03/2015 state that the overall planimetric RMSE of orthophoto should not exceeds to 40cm at scale of 1:2000. Therefore, overall accuracy of orthophoto assessment result is 26 cm. The planimetric accuracy of orthophoto according to the national standard and FGDC (1998) the accuracy is laid on acceptable range for liable for urban land spatial registration and large-scale map production in the Werabe Town.

4.1.2 Assessment of Line Map Coordinates with RTK GPS Data

In this section tries to analyze the coordinates of some selected parcels which are extracted from orthophoto and digital line map for comparison to in situ RTK GPS measured data set with RTK GPS survey coordinate which used E.G.I.A. established first order GCP as a reference of GCP_WRB1(x= 410276.516, y=867987.914) and GCP_ WRB0(x= 410552.689, y=868352.484), reference point used base station for the receiver and measure RTK data from the rover to observe the required parcel corner points. Therefore for 100 sample parcels corner coordinates from line map and orthophoto compared with coordinate obtained in situ RTK survey data. The digital line map source data is orthophoto, it captured at the beginning of 2012 currently the town used to spatial land parcel registration and large-scale mapping production in the Town.

Digital Line map with RTK GPS measured Coordinates assessment result are evaluated from field measured data and extracted data to evaluated in RMSEs are used for the planimetric accuracy of digital line map sample shown below in figure 4.5.

Figure 4: 4 Digital parcel Line map Extracted coordinates and RTK GPS parcel corner measured sample.

Digital Line map and RTK GPS measured Coordinates assessment result summarized shown in the following table 4.5.

Table 4: 3 Summary of Digital Line map to RTK measured Coordinates Assessment Result

No	**Assessment Result**	**Line map _RTK**	**Remark**
1	sum squrs of Δx	101.130	Measured in meter
2	sum squrs of Δy	94.276	(m)
3	MSE Δx	0.252	
4	MSE Δy	0.235	
5	RMSEx in m	0.502	
6	RMSEy in m	0.484	
7	RMSExy in m	0.697	
8	At 95% CLE Based on NSSDA	1.207	
9	Max Δx	2.004	
10	Min Δx	-2.000	
12	Max Δy	2.200	
13	Min Δy	-1.300	

The above Table 4.5 Assessment summary shows from Line map of 100 parcel corner coordinates comparison with RTK GPS measured data (show in Appendix_3). The Assessment results of the maximum change of Easting and northing are 2.004 m and 2.2m as well as minimum change of Easting and northing are -2.0m and -1.3m respectively. The mean squares errors of change of easting and northing are 25.2cm and 23.5cm respectively.

The root mean square error of easting component is 50.2cm and northing 48.4cm. Thus, values correspond to overall planimetric root mean square error (RMSExy) is 69.7cm, and at 95 % confidence levels is 1.20 m.

The Orthophoto and RTK GPS planimetric accuracy assessment result are comparisons from similar parcels 402 corner coordinate value extracted from orthophoto and in situ RTK GPS measured parcel corner coordinate comparisons evaluated in the root mean square error of easting and northing component. Therefore, the RMSE for each sample feature computed independently at 95% confidence levels according to urban legal cadaster standard 03/2015 of Ethiopia and FGDC (1998) the accuracy standards are suggested to calculate RMSE based on the deviation of ΔX and ΔY separately. The result of this computation summarized below on the table 4.4.

Table 4: 4 Summary of Orthophoto with RTK Coordinates Planimetric Accuracy Result

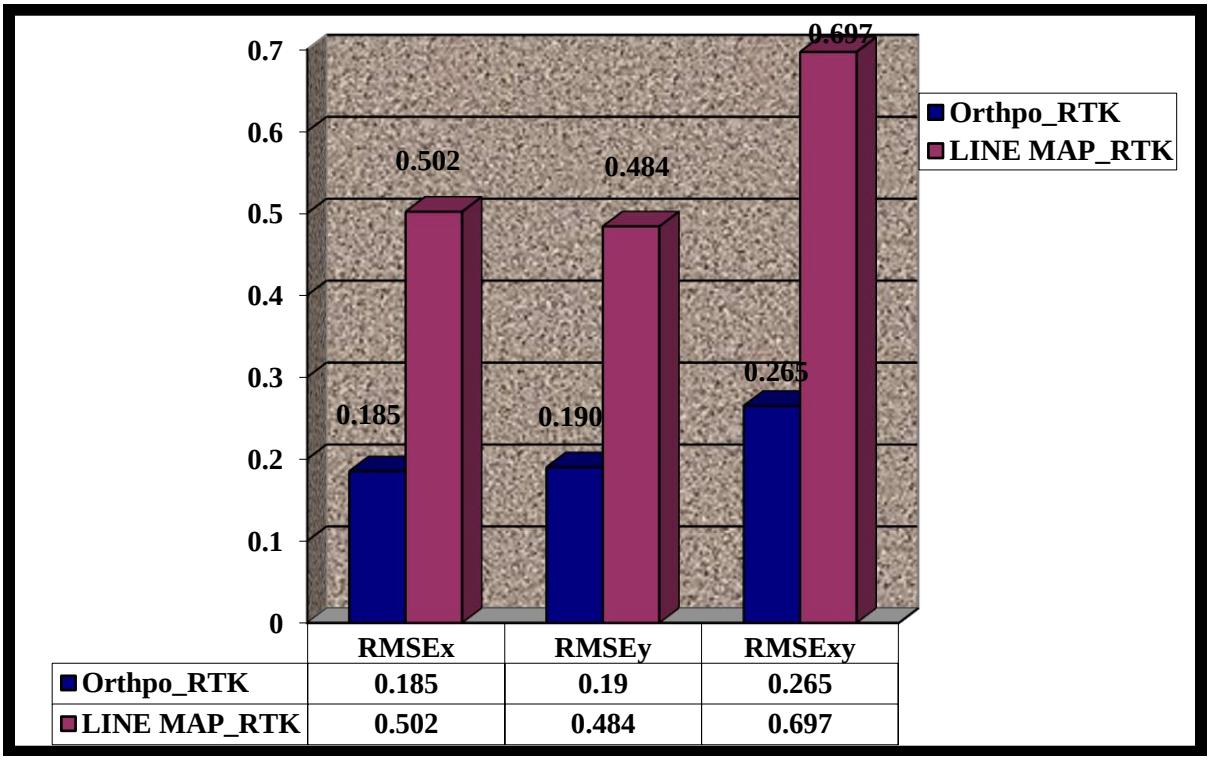
Accuracy Assessment summary of Orthophoto_RTK parcel coordinate Evaluation Result			
No	**Assessment Results**	**Orthophoto_RTK**	**Remark**
1	Max Δ x	0.985	All units are in meter
2	Min Δ x	-0.997	
3	Max Δ y	0.996	
4	Min Δ y	-0.600	
5	sum squares of Δ x	13.742	
6	sum squares of Δ y	14.439	
7	MSE Δ x	0.034	
8	MSE Δ y	0.036	
9	RMSEx	0.185	
10	RMSEy	0.190	
11	RMSE x y	0.265	Over all Accuracy
12	At 95% CLE	0.458	

The above Table 4.4 Assessment summary shows from digital orthophoto of 100 parcel corner coordinates comparison with RTK GPS measured data set (show in Appendix_1). The assessment result of maximum change of easting and northing are 98.5cm and 99.6cm. Minimum deviation of easting and northing are -99.7cm and -60 cm respectively. The mean squares errors of change of easting and northing are 3.4cm and 3.6cm respectively.

The root mean square error of easting component is 18.5cm and northing 19.0 cm. These values correspond to overall planimetric root mean square error (RMSE x y) is 26.5 cm, at the 95% confidence level was computed is 46 cm.

Generally, the above section 4.1.2 (objective two) result shows that digital line Map parcel and orthophoto parcel coordinate comparison to RTK GPS parcel Coordinate assessment results are: The main intention of similar parcel feature was to compare the planimetric accuracy of digital line map of a parcel with that of manually digitized planimetric coordinate with RTK GPS in situ measured data assessments to evaluating acceptable accuracy for spatial land registration and large-scale mapping production responding the stated problems in the study area.

The differences between actual observed GPS coordinates of points and the extracted coordinates from digital orthophoto and digital line map coordinates as listed below in figure 4.5 shows in the following figure 4.6.



	RMSEx	RMSEy	RMSExy
Orthpo_RTK	0.185	0.19	0.265
LINE MAP_RTK	0.502	0.484	0.697

Figure 4: 5 RMSE of digital Orthophoto and digital line map comparison

The above planimetric accuracy assessment result based on research question number two (Does the planimetric accuracy of Digital line map extracted parcel coordinate meet urban legal cadastral standard?) the assessment findings are:

Orthophoto parcel coordinate to RTK GPS measured parcels the Statistical values shows that the parcels corner coordinate of the root mean square error of easting component is 18.5cm and northing 19.0 cm. These values correspond to overall planimetric root mean square error (RMSExy) is 26.5 cm. This evaluation result based on national urban legal cadaster standard No 03/2015 stated that overall accuracy of RMSExy not more than 40cm at the scale of 1:2,000, which is the recommended scale for urban areas spatial land registration and large-scale mapping. This corresponds to the assessed values of orthophoto lays the production of large-scale cadastral spatial registration and mapping. Therefore, the digital image is acceptable for cadaster spatial registration and large-scale mapping in Werabe Town.

Digital line map coordinate to RTK planimetric assessment result indicated that the digital line map coordinate of the parcel was not good accuracy than in situ ground RTK GPS measured parcel coordinates. Because evaluation result of digital line map coordinates of the root mean square error of easting component is 50.2cm and northing 48.4cm. These values correspond to overall planimetric root mean square error (RMSExy) is 69.7cm.

Therefore, based on this evaluation result digital line map of a parcel used in the Town was not acceptable range of planimetric accuracy of parcel coordinates for urban land cadastral spatial registration and large-scale mapping in urban land holding certification. The reason of this, overall value of digital line map parcel coordinate result of RMSE xy is more than 40cm. From this analysis result according to national urban legal cadaster standard No 03/2015 not acceptable and not appropriate for urban land spatial registration and large-scale mapping at the scale of 1:2,000.

This above followed analysis method and standard acceptable at national level and also the methods implemented practically in different researchers. But according to international level of ASPRS standards used for large scale production from 2.5m RMSE can be used for the production 1:10,000 scale of map. These standard errors used national and international levels indicated from literature reviews in the ASPRS standards explicitly used the statistical term, Root Mean Square Error (RMSE) for reporting error. Similarly, Ethiopia by adopting this standard set standard for large scale legal urban cadaster standard No 03/2015 and this standard use RMSE to evaluate error on the spatial data set. The standard state that the total RMSE error of coordinates derived from different digital spatial data features (orthophoto, line map and satellite image) should not exceed 40cm in X or Y direction at 1:2000 scale of map. The planimetric accuracy of spatial data set also evaluated according to ASPRS international standard for large scale maps described error in terms of RMSE in relation to the scale of map. For instance, this standard categorized the digital spatial data which have 0.50m and 2.5m RMSE can be used for the production 1:2000 and 1:10,000 scale of map respectively. The methods and standards are used practically in different authors from literature review compared the analysis based on those standard and methods. Used exemplars authors are Ephrem Mulugeta(2017) in Dire Dawa City, Zinabu et al., (2017) in Bahir Dar Town, Addition to above supported retreaters, from Zinabu et al., (2017) journal connection, Siriba (2009) stated that the identification of parcel boundaries using photogrammetric method has become an alternative approach to ground-based surveying and has been adopted in different countries for modernizing land information registration and administration system.

Photogrammetric technique provides seamless coverage of cadastral information, but the accuracy of data has to be calibrated using in-situ ground measurements to realize the production of large-scale maps (ranging from 1:500 to 1:10,000) based on orthophoto and digital line map that can be reliably used for practical cadastral applications. This are acceptability and rejections based on analysis result compared with sated standards based on purpose used. The analysis statistical value compered to national standard not lied on allowable errors and also the assessment results indicated digital line map manually head up digitalization techniques vary the errors from experts to experts, it indicting that without know planimetric accuracy any decision makings related to land produces the errors, the errors may not allowable, planimetric accuracy assessment is a must for any urban land related decision making and for any production of spatial land registration and large scale mapping production.

4.1.3 Evaluate the Area Comparison Effect of Digital Line Map Parcels with RTK Data

Among the of objectives of this section of study was to investigate the effect of area in the accuracy of digital line map current years used for spatial land holding certification map and registration in the study area. The parcel areas obtained by orthophoto extracted line map parcels deviated from the equivalent RTK ground survey. As a reference the RTK GPS survey parcels area were chosen as shown below *Figure 4: 6.*

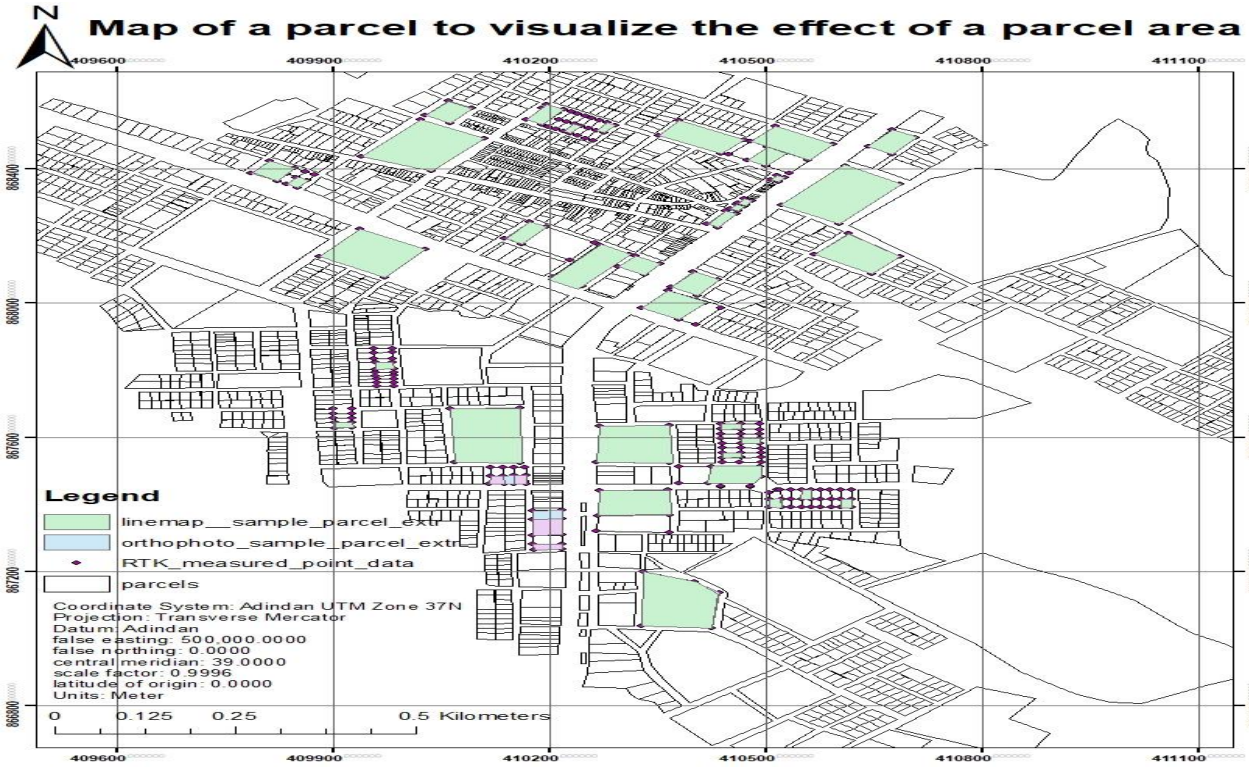


Figure 4: 7 Map of the parcels to visualize the area comparison effect assessment.

In the above line map extracted parcel area of the matching parcels from each layer were extracted and used for analysis. The parcel area compressions from a total of hundred parcels were derived from orthophoto, line map and the same parcels observed by GPS. The results of extracted parcels generated from in situ RTK GPS surveys, orthophoto and digital line map comparations with RTK GPS measured dataset of spatial parcel features are shown statistical value and visually on a map in below figure 4.7 and Table 4.6. The assessment results of extracted parcels area statically generated from digital orthophoto and its line map from RTK GPS ground measured dataset are summarized in below Table 4.6.

Table 4: 5 Accuracy Assessment summary of orthophoto with RTK area Evaluation Result

No	**Standards**	**Orthophoto with RTK**	**Line with RTK**	**Remarks**
1	Max Δ area	10.000	29.300	
2	Min Δ area	-12.000	-16.240	
3	Mean	16.552	36.783	
4	RMSE	4.068	6.065	

Based on the area compressions shown in (Appendix_4) the evaluation result summary in above table 4.6 indicates that the differences of the size of the parcels range from -12.0 to 10.0m2 in orthophoto and -16.240 to 29.300 m^2 in digital line map. The root mean square error is 4.068 and 6.065 m^2 in orthophoto extracted parcels and digital line map respectively. The compared results of parcel areas generated from ground surveys, orthophoto and digital line map are shown in figure 4.8.

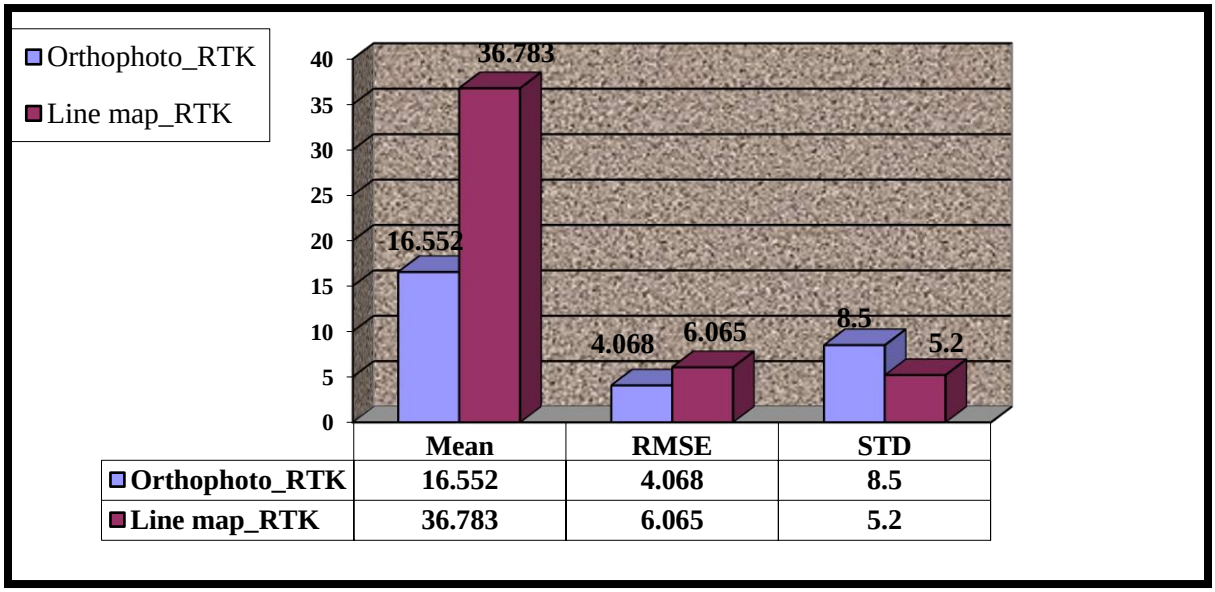


Figure 4: 8 Comparison areas of the parcel.

From above sample parcels were derived from orthophoto, digital line map and the same parcels observed by RTK GPS data set parcel area comparison effect to show the result of digital line map parcel area and orthophoto extracted parcel area with RTK in situ measured data set are shows error. The errors measured in comparison of the parcels independently with high accuracy ground measurement instrument. This comparison assessments supported on Zinabu et al., (2017) in literature review state that photogrammetric technique provides seamless coverage of cadastral information, but the accuracy of data has to be calibrated using in-situ ground measurements to realize the production of large-scale maps (ranging from 1:500 to 1:10,000) based on orthophoto and digital line map that can be reliably used for practical cadastral applications (Zinabu et al., (2017). Thus, above line map comparison result of RTK GPS ground measured parcel area have different variation on land holding certificate map, it also the maps are large scale map (1:500). This variation is it may source of conflict and difficult to resolve those boundary conflicts as well as land holding certificates are may not secure land holding security.

Generally, the line maps that the town used for urban land cadastral spatial land holding registration and large-scale mapping production source data have a parcel area variation indicates the same errors on line map. From above (Appendix_4) result of Parcel area compression indicates area variation or errors are shown, those errors are crosschecked by some sample evidence on a map and supported by numerical values below in Figure 4.8.

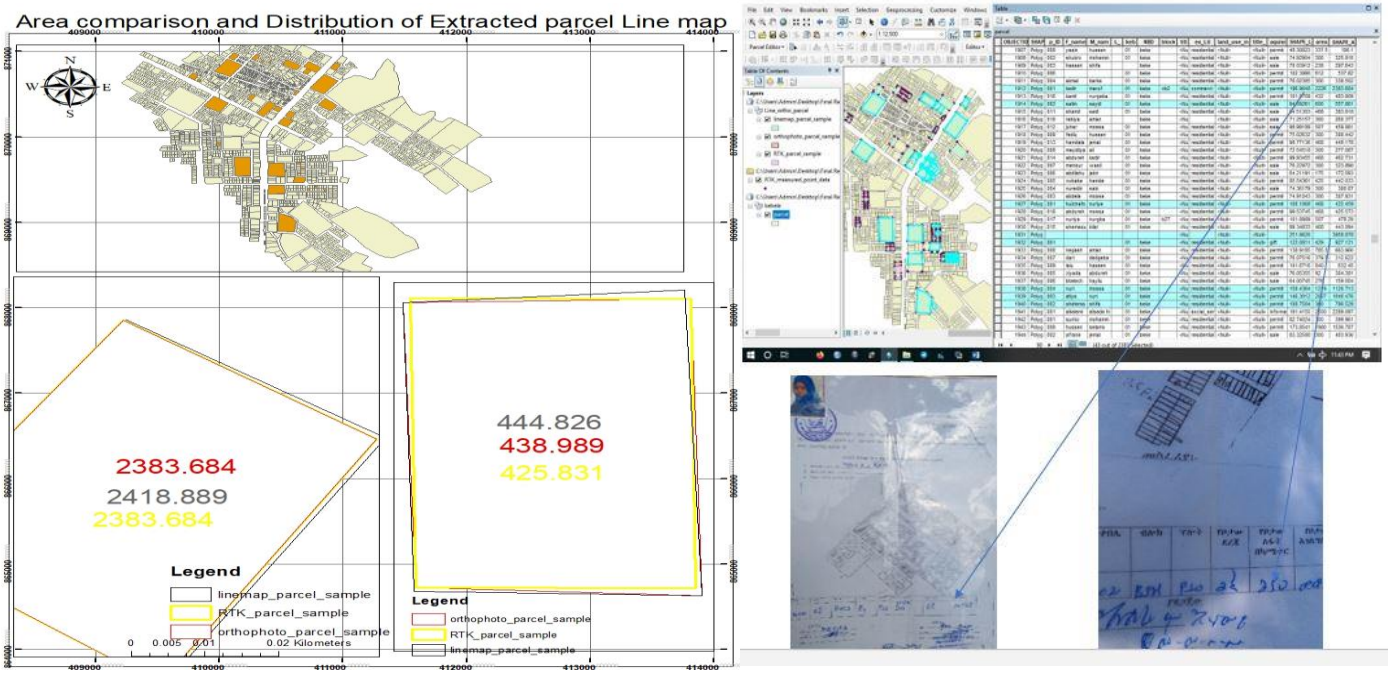


Figure 4: 9 The parcel area effect sample crosschecked land holding certifications maps.

Finally, from above sample data showed the comparison of line map extracted parcel area with RTK in situ measured data shows from evaluated 100 parcels 72 % of the parcel's hold by under individual land holders from 250 m^2 to 350m^2 parcel sizes and the others almost hold by public use. The comparison result of the parcel variation indicates, 48% of the parcel area variation above acceptability level, 28% of parcels the same parcel size to RTK measured parcel area and 24 % of the parcels area variations are approximately closed to RTK measured data set, so 52% of the parcel area are acceptable range from 100 parcels area comparison because of each individual parcel area variations less than 10% of the parcel size.

The above results based on research question number three, "evaluation of parcel Area variation assessment of digital line map to RTK GPS measured parcel area comparison" the *finding* indicates: The line map extracted parcels with in situ RTK GPS point developed parcel variations are 48% of the parcel size more than 10% of each individual parcel size, this result based on urban land cadaster implementation Guideline 18/2004, sub section number of 15.2. the tolerance limit of urban land parcels is not acceptable. Therefore, the parcel Area evaluation indicates a larger error from manually extracted digital line map. Based on this the line map not appropriate for urban land holding certification in the study area of Weraba Town.

CHAPTER FIVE: CONCLUSIONS AND

5.1 Conclusions

The planimetric accuracy is a much important element of the overall quality of a spatial data set. In contrast, spatial data is subject to a variety of quality issues, due to limitations in for instance data acquisition and maintenance. Assessing the quality of the data, in terms of its planimetric accuracy, can help to assure its suitability within a certain application area.

The main objective of the study was to conduct accuracy assessment of the digital orthophoto and its digital line map for spatial land registration and large-scale mapping production such as cadastral spatial registration and land holding certification. Cadastral data is important for decision making and it is basic for many computers based spatial applications. Therefore, it should have the required accuracy. Purpose of this thesis work was to assess and compare accuracy of digital orthophoto and its digital line map relative to RTK GPS measured data set. The comparison was made between RTK GPS versus Digital orthophoto and RTK GPS versus Digital line map in the study area. The planimetric accuracy is a much important element of the overall quality of a spatial data set. The planimetric accuracy assessed using point-based accuracy assessment method and the planimetric accuracy was evaluated mainly in terms of RMSE and 95 % confidence level and RMSE in x, y direction from the two datasets (RTK GPS survey checkpoints and orthophoto extracted or derived coordinates of digital spatial data.

Therefore, the planimetric accuracy of orthophoto assessed from extracted check points in a sample feature relative to coordinates obtained from RTK GPS survey in terms of RMSE. Based on this the planimetric accuracy of orthophoto RMSE easting component is 18.5cm and northing 19.0 cm and also the values correspond to overall planimetric root mean square error (RMSE x y) is 26.5 cm. it is lies on acceptable value based on the standard. According to national standard for urban legal cadastral No 03/2015 state that the final output of cadaster accuracy does not exceed 40cm in horizontal RMSE at scale of 1:2000 scale of maps.

The planimetric accuracy result of digital parcel line map coordinate was assessed. Thus, planimetric accuracy of digital parcel line map coordinate was conducted on similar sample parcel feature coordinate with that of RTK GPS measured coordinate data set. Based the assessment result the planimetric accuracy of digital parcel line map coordinates have RMSE of x and y the values correspond to overall planimetric root mean square error (xy) is 69.7cm and 1.2m at 95% confidence level. Therefore, based on this result the digital parcel line map extracted from orthophoto does not

satisfy national standard for urban parcel spatial registration and large-scale map especially for cadastral parcel map in urban land holding certification purpose. The parcel Area comparation results have larger errors from extracted digital line map derived coordinate developed parcel size from comparison of landholding certificate map and statistical value of comparison. These differences come from different causes. Such as shadows, vegetation, topographic factors and the skill of expertise from extracted line map on heads-up computer screen digitization. From the result supported, the digital orthophoto is considered as appropriate for cadastral urban land spatial registration and large-scale mapping applications, infrastructural mapping, road network mapping etc. But the digital parcel line map extracted from orthophoto does not satisfy national standard for urban parcel spatial registration and large-scale map especially for cadastral parcel map in urban land holding certification purpose. Because of overall RMSE of digital parcel line map more than 40cm.

5.2 Recommendations

Spatial data are the base for many engineering, land administration and planning application especially which needs high accuracy and used for decision making process should have uniform and fulfill the national and international accuracy standard. The accuracy of spatial data which are used for similar application should have similar accuracy or their accuracies must be on the acceptable error based on the standard. In Werabe Town the orthophoto and its digital line map are used for cadaster application however based on the results of assessed planimetric accuracy of orthophoto and its digital line map based on findings recommend as follows:

- The digital orthophoto currently used in the Werabe Town is appropriate for cadastral spatial parcel registration and large-scale mapping applications, utility mapping, road network mapping.
- Extracted digital line map indicated that, it needs to some spatial improvement for urban land cadastral spatial registration and large-scale mapping of 1: 500 to 1: 2000 scale map production of urban land holding certification. The digital line map used in the study area not appropriate for urban land spatial parcel registration and large-scale mapping (1:2000 scale). so, it must be assessing the accuracy before using the line map important for decision making.

- Since there is a variation in land area between ground surveyed and digitized lines map on the given land holding certificate for the owners, the organization have to prepare the certificate and land area through ground survey using RTK GPS. Unless the land holding certificate, it may source of conflict from the actual parcel area variation from land holding certificate map.

However, the planimetric accuracy of digital line map parcel with that of manually digitized planimetric coordinate of parcel features requires skilled experts to digitized as well as it requires ground verification or adjudication before spatial parcel data registration and large-scale mapping in urban land holding certification in the Werabe Town.

Based on the national or international accuracy standards furthermore a responsible government body give due attention on spatial data accuracy before any urban land holding spatial related decision making in the study area of Werabe Town

REFERENCES

Abdulrahman Showaiter (2018). Assessment of a land administration system: a case study of the survey and land registration bureau in Bahrain, Enschede, Netherlands.

Ali, Z., Nasir, A. (2010), Land Administration System in Pakistan - Current Situation and Stakeholders' Perception, in XXIV FIG Congress 2010 "Facing the Challenges - Building the Capacity": Sydney, Australia.

Amanuel T (2008) Preparation of Coordinate Based Cadastral Map in Rural Ethiopia, 12th AGILE international conference on geographic information science.

Asmamaw Yehun, Amezene Reda, Animaw Mekonen and Solomon Chekole(May 29–June 2, 2017) '*Evaluation of Current Urban Cadaster Practice in Ethiopia',* Helsinki, Finland.

Azeneg Eneyew Kebede (2018) Horizontal Accuracy Assessment of Digital Aerial Photograph in Urban Cadaster: The Case of Wereda 10, Gulelie Sub-City, Addis Ababa

ASPRS, (December, 2013) Accuracy Standards for Digital Geospatial.

ASPRS. (2013). ASPRS accuracy standards for digital geospatial data."Photogrammetric Engineering & Remote Sensing79 (12):1073–1085.

Congalton, R. G. (2009). Assessing the Accuracy of Remotely Sensed Data: Principles and Practices (second eddition ed.). New York: CRC Press, Taylor & Francis Group.

Congalton and Green, (2001) Assessing the accuracy of remotely sensed data, Principles and Practices.

Coppock, J., and Rhind, D. (1991). The history of GIS. Geographical Information Systems: Principles and Applications, 1(1), 21-43.

Corlazzoli, M., Fernandez, L.O., 2004. Spot 5 cadastral validation project in Izabal, Guatemala. International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences 35 (Part 1), 291–296.

Corominas, J. G. (2000). Using Global Positioning System techniques in landslide monitoring. Engineering Geology.

Dale, F., and McLaughlin, J (1988) Land Information Management: An Introduction with Special Reference to Cadastral Problems in Third World Countries, J.W. Arrow Smith Ltd., Bristol, Great Britain.

Dale, P. and McLaughlim,J.D. (1999) Land Administration Systems. Oxford University Press.

Daniel, T. (2006), Reflection on the situation of Urban Cadastre in Ethiopia: Addis Ababa City Administration.

Dekker, A (2003), *The Invisible Line: Land Reform, Land Tenure Security, and Land Registration,* International land management series, Ashgate Publishing Limited, Surrey, England.

D. M. (Eds.) (2012). Springer Handbook of Geographic Information. Berlin, Heidelberg: Springer.

Data Atak, (2008) Feature completion from high resolution imagery, Turkey, Commission IV, WG IV/9 Ali, Z., Tuladhar, A. M., Zevenbergen

Ezeaku, P, Yiadom, k, Ayonga, J, Mpofu, T, Elias, M, & Juliet, A (2008), *Land & Real Estate Management Course Handbook* Urban Management Masters Programme Ethiopian Civil Service College, Addis Ababa, July 2008.2011.

GTZ (2006) Annual Report Unpublished paper report on Land administration issues, Hawassa.

Gahegan, M., and Ehlers, M. (2000). A framework for the modelling of uncertainty between remote sensing and geographic information systems. ISPRS Journal of Photogrammetry and Remote Sensing, 55(3), 176-188.

GTZ -IS, (2009) Urban Land Administration and Land Markets SNNPRS Final Report, 25 June 2006.

Gahegan, M., and Ehlers, M. (2000). A framework for the modelling of uncertainty between remote sensing and geographic information systems. ISPRS Journal of Photogrammetry and Remote Sensing, 55(3), 176-188.

Gertrude Pieper (May 201) Development of an Open Source Land Records System for Urban Centres in Ethiopia.

Habib (2009) Linear feature in photogrammetry, department of Geomatics Engineering university of Calgary, Canada.

Henssen, J (2010) Land Registration and Cadastre Systems: principles and related issues, Maastricht; Netherlands.

International Federation of Surveyors, n.d, "*FIG Statement on the Cadastre*", available Onlinehttp://www.fig.net/commission7/reports/cadastre/statement_on_cadastre.html.

Jacobsen, K., Buyuksalih, G., Baz, I., 2008. Mapping from space for developing countries. In: Remote Sensing – New Challenges of High Resolution, Bochum,Germany Jassen et al, L. L. (1994). Accuracy assessment of satellite derived land-cover data.

Jay Gao, 2009. Digital Analysis of Remotely Sensed Imagery

J. D. G. O. Wayumba F. W. O. Aduol (January 2015) Accuracy Assessment of Preliminary Index Diagrams (PIDS) From High Resolution Orthoimages In Kenya.

J. A. (2010), Developing a Framework for Improving the Quality of a Deteriorated Land Administration System Based on an Exploratory Case Study in Pakistan. Nordic Journal of Surveying and Real Estate Research, 7(1): p. pp. 30-57.

Konecny, G. (2003). Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems. London: Taylor and Francis. Kresse, W., and Danko,

Leick.A. (1995). GPS satellite surveying. New York. Li, R., Zhou, G., Yang, S., Tuell, G., Schmidt, N. J., Fowler, C., . (2000, July). A study of the potential attainable geometricaccuracy of IKONOS satellite imagery.

Longley, P., Goodchild, M., Maguire, D., and Rhind, D. (2005). Geographic Information Systems and Science. 2ndedition. Chichester: John Wiley and Sons.

Larsson, G. (2000). *Land Registration and Cadastral Systems: Tools for Land Information and Management*, KTH, Stockholm, Sweden.

Mamoru, K., Toshihiro, K., Nobuyuki, W., Kaoru, M. J., 2002. Interpretation Characteristics of IKONOS Imagery and its Coordinate Accuracy Validation, Journal of the Geographical Survey Institute, vol. 94, pp. pp. 38-47.

Ministry of Urban Development and Housing, Ethiopia Paper presentation at the (march 20-24, 2017) world bank conference on land and poverty" the world bank - Washington dc.

Ondulo, J.D., Kalande, W., 2006. High spatial resolution satellite imagery For PID improvement in Kenya shaping the change. In: XXIII FIG Congress, 8–13 October,Munich, Germany.

Paul R. *et al*., W. l. (2014). Elements of Photogrammetry with Applications in GIS (Fourth Edition ed.). New York.

Proceedings of the FIG Land Records Conference/Geomatics Atlantic "1994 Conference, Fredericton, Canada, October.

Raza, F., Almas, M., Ahmed, K. (2005), Land Records Information Management System, in 25th Annual ESRI International User Conference: San Diego, California.

Sulaiman, S., and Gudmundsdottir, H. (2013). Quality assurance in geodata (Student thesis, Master degree). Royal Institute of Technology, Stockholm, Sweden.

Solomon Abebe, (2006). Land registration system in Ethiopia: Comparative Analysis of Amhara, Oromiya, SNNP and Tigray regional states. In Solomon Bekure et.al, Standardization of rural land registration and cadastral Conference, ELTP. Addis Ababa.

Tafesse bosha hirboro (August 2018) Urban land registration system and its contribution to sustainable land management: thecase of walaita sodo town, snnpr, ethiopa.

Tsui, J. B.-Y. (2000). Fundamentals of Global Positioning System Receivers: A Software Approach. NEW YORK: A WILEY INTERSCIENCE PUBLICATION.

Tyner, J. A. (2010). Principles of map design. London: The Guilford Press.

Tuladher; A.M (2004) Parcel-Based Geo-Information system; Concepts and Guidelines,International Institutional for Geo-Information and Earth Observation (ITC).Ensched,The Netherlands.

UN-Habitat (2012) State of the world's cities, Prosperity of Cities. Nairobi: United Nations Human Settlements Programme.

Veregin, H. (1999). Data quality parameters. In: P. A. Longley, M. F. Goodchild, D. J. Maguire, and D. W. Rhind (Eds.).

Worabe municipality (2018) Annual Report Unpublished paper.

World Bank presented paper (2018) Federal Urban Land & Landed Property Registration and Information Agency of Ethiopia.

World Bank (2013) Implementation Practice: Real Property Registration Systems in Developing Countries: Confluence of technological, institutional and Organizational requirements in the Addis Ababa, Annual World Bank.

Williamson, I (1994) Cadastral systems in the Asia-Pacific Region – Experiences and lessons.

Zinabu Getahun Sisaya, Tulu Beshab, Berhan Gessesseb (June 2017) feature orientation and positional accuracy assessment of digital orthophoto and line map for large scale mapping: the case study on Bahir Dar town, Ethiopia.

APPENDIX

Appendix_1: Planimetric Accuracy Assessment result of orthophoto based on selected check points

NB: planmeric accuracy assessment coordinates Adinda Ethiopia zone 37

Pr. ID	ORTHOPHOTO EXTRACTED		IN SITU RTK GPS MEASURED		DEVATIONS OF		Discrepancy	
	Coordinate Points		Coordinate Points		Orthophoto _RTK		Square	
	Easting (x)	Northing (y)	Easting (x)	Northing (y)	Δ x Easting	Δ y Northing	$(\Delta x)^2$	$(\Delta y)^2$
p1	410,533.610	868385.678	410,533.250	868385.556	0.360	0.122	0.130	0.015
p2	411,004.269	868021.882	411,004.299	868021.622	-0.030	0.260	0.001	0.068
p3	411,328.484	867756.667	411,328.374	867756.967	0.110	-0.300	0.012	0.090
p4	409,526.127	868544.468	409,526.147	868544.344	-0.020	0.124	0.000	0.015
p5	410,224.134	867441.751	410,224.172	867441.510	-0.038	0.241	0.001	0.058
p6	411,128.017	867060.206	411,128.137	867060.408	-0.120	-0.202	0.014	0.041
p7	409,972.372	865861.872	409,972.330	865861.750	0.042	0.122	0.002	0.015
p8	408,485.757	864925.17	408,485.863	864925.493	-0.106	-0.324	0.011	0.105
p9	409,813.452	864642.042	409,813.474	864642.165	-0.022	-0.123	0.000	0.015
p10	409,996.352	869012.146	409,996.200	869012.024	0.152	0.122	0.023	0.015
p11	410,297.980	868005.980	410,297.770	868005.788	0.210	0.192	0.044	0.037
p12	410,008.603	868553.923	410,008.668	868553.967	-0.065	-0.044	0.004	0.002
p13	409,936.789	868,242.849	409,936.540	868,243.024	0.249	-0.175	0.062	0.031
p14	409,881.889	867,508.693	409,881.966	867,508.558	-0.077	0.135	0.006	0.018
p15	409,599.447	867,216.845	409,599.308	867,216.967	0.139	-0.122	0.019	0.015
p16	409,931.613	866,713.993	409,931.816	866,714.129	-0.203	-0.136	0.041	0.018
p17	409,400.255	866,391.250	409,400.141	866,391.501	0.114	-0.251	0.013	0.063
p18	408,467.155	866,442.829	408,467.329	866,443.082	-0.174	-0.253	0.030	0.064
p19	410,589.669	866,028.623	410,589.312	866,028.430	0.357	0.193	0.127	0.037
p20	408,475.672	865,756.633	408,475.360	865,756.765	0.312	-0.132	0.097	0.017
					Total		0.640	0.739

Appendix_2: Planimetric Accuracy Assessment of Orthophoto and Line map Extracted coordinate with RTK _GPS Measured coordinate

NB: planimetric accuracy assessment coordinates Adinda Ethiopia zone 37

parcel owner and parcel corner identification				Orthophoto Parcel Ex.coor		RTK_GPS measured coor		Devotion of Orthopho_RTK		Discrepancies of Orthopho_RTK	
Parcel_Owner	Parcel No	P_ID/OBID	P_corner	X_coordinat	y_coordinat	X_coordinat	y_coordinat	ΔX	ΔY	(ΔX)2	(ΔY)2
	Pr_1	FID_482	Pr_cor_1	410531.514	868388.323	410531.620	868388.223	-0.106	0.100	0.011	0.010
			Pr_cor_2	410499.622	868409.451	410499.642	868408.951	-0.020	0.500	0.000	0.250
			Pr_cor_3	410527.922	868447.648	410527.922	868447.648	0.000	0.000	0.000	0.000
			Pr_cor_4	410558.627	868427.101	410558.828	868426.141	-0.201	0.960	0.040	0.922
fedlu kedir	Pr_2	FID_481	Pr_cor_1	410499.532	868407.951	410499.642	868407.971	-0.110	-0.020	0.012	0.000
			Pr_cor_2	410474.310	868425.864	410473.396	868425.964	0.914	-0.100	0.836	0.010
			Pr_cor_3	410501.143	868467.234	410501.143	868466.284	0.000	0.950	0.000	0.903
			Pr_cor_4	410558.725	868427.132	410558.828	868426.141	-0.103	0.991	0.011	0.982
fuwad fedlu	Pr_3	FID_492	Pr_cor_1	410474.332	868426.064	410473.396	868425.964	0.936	0.100	0.876	0.010
			Pr_cor_2	410446.310	868443.460	410446.713	868443.260	-0.403	0.200	0.162	0.040
			Pr_cor_3	410476.990	868483.193	410476.980	868483.098	0.010	0.095	0.000	0.009
			Pr_cor_4	410558.927	868426.402	410558.828	868426.141	0.100	0.261	0.010	0.068
Beferacot	Pr_4	FID_517	Pr_cor_1	410558.672	868426.231	410558.828	868426.141	-0.156	0.090	0.024	0.008
			Pr_cor_2	410476.910	868483.983	410476.980	868483.098	-0.070	0.885	0.005	0.783
			Pr_cor_3	410512.434	868529.444	410512.630	868529.744	-0.196	-0.300	0.039	0.090
			Pr_cor_4	410592.602	868474.333	410592.732	868473.393	-0.130	0.940	0.017	0.884
seyid umer	Pr_5	5	Pr_cor_1	410437.310	868447.900	410437.360	868446.975	-0.050	0.925	0.002	0.856
			Pr_cor_2	410351.105	868501.311	410351.105	868500.315	0.000	0.996	0.000	0.992
			Pr_cor_3	410379.350	868545.276	410379.257	868544.976	0.093	0.300	0.009	0.090
			Pr_cor_4	410469.681	868486.776	410468.696	868486.556	0.985	0.220	0.970	0.048
radiya seid	Pr_6	OBID_6	Pr_cor_1	410258.971	868485.550	410258.953	868485.454	0.018	0.096	0.000	0.009
			Pr_cor_2	410248.186	868492.791	410248.166	868492.699	0.020	0.092	0.000	0.008
			Pr_cor_3	410264.545	868516.105	410263.589	868515.995	0.956	0.110	0.914	0.012
			Pr_cor_4	410275.105	868508.726	410274.507	868508.926	0.598	-0.200	0.358	0.040
gudhager nuri	Pr_7	OBID_7	Pr_cor_1	410248.186	868492.590	410248.166	868492.699	0.020	-0.109	0.000	0.012
			Pr_cor_2	410238.001	868499.516	410237.897	868499.596	0.104	-0.080	0.011	0.006
			Pr_cor_3	410253.341	868523.706	410253.131	868522.766	0.210	0.940	0.044	0.884
			Pr_cor_4	410264.541	868516.395	410263.589	868515.995	0.952	0.400	0.906	0.160
temima bamud	Pr_8	OBID_16	Pr_cor_1	410238.810	868499.696	410237.897	868499.596	0.913	0.100	0.834	0.010
			Pr_cor_2	410229.580	868505.847	410228.598	868505.842	0.982	0.005	0.964	0.000
			Pr_cor_3	410244.129	868529.257	410244.423	868529.245	-0.294	0.012	0.086	0.000
			Pr_cor_4	410254.130	868522.709	410253.201	868522.766	0.929	-0.057	0.863	0.003
keyiro ale	Pr_9	OBID_9	Pr_cor_1	410228.692	868505.864	410228.598	868505.842	0.094	0.022	0.009	0.000

			Pr_cor_2	410218.840	868512.662	410218.741	868512.462	0.099	0.200	0.010	0.040
			Pr_cor_3	410233.573	868535.448	410233.493	868535.480	0.080	-0.032	0.006	0.001
			Pr_cor_4	410243.223	868529.251	410243.123	868529.245	0.100	0.006	0.010	0.000
	Pr_10	OBID_10	Pr_cor_1	410218.821	868512.471	410218.741	868512.462	0.080	0.009	0.006	0.000
			Pr_cor_2	410208.560	868519.321	410208.560	868519.300	0.000	0.021	0.000	0.000
			Pr_cor_3	410223.159	868542.239	410223.057	868542.237	0.102	0.002	0.010	0.000
			Pr_cor_4	410233.590	868535.480	410233.493	868535.480	0.097	0.000	0.009	0.000
behre musebo	Pr_11	OBID_11	Pr_cor_1	410208.660	868519.311	410208.560	868519.300	0.100	0.011	0.010	0.000
			Pr_cor_2	410197.989	868526.410	410197.969	868526.413	0.020	-0.003	0.000	0.000
			Pr_cor_3	410213.360	868548.597	410213.264	868548.577	0.096	0.020	0.009	0.000
			Pr_cor_4	410223.157	868542.337	410223.057	868542.237	0.100	0.100	0.010	0.010
bahre musebo	Pr_12	FID_563	Pr_cor_1	410208.660	868519.302	410208.560	868519.300	0.100	0.002	0.010	0.000
			Pr_cor_2	410187.091	868533.049	410187.693	868533.047	-0.602	0.002	0.362	0.000
			Pr_cor_3	410218.616	868578.730	410218.114	868578.731	0.502	-0.001	0.252	0.000
			Pr_cor_4	410229.150	868571.450	410229.054	868571.460	0.096	-0.010	0.009	0.000
habib jemal	Pr_13	FID_558	Pr_cor_1	410189.050	868533.042	410188.093	868533.047	0.957	-0.005	0.916	0.000
			Pr_cor_2	410166.402	868547.692	410166.302	868547.682	0.100	0.010	0.010	0.000
			Pr_cor_3	410189.373	868582.780	410189.273	868582.776	0.100	0.004	0.010	0.000
			Pr_cor_4	410210.830	868567.665	410210.837	868567.657	-0.007	0.008	0.000	0.000
mulu segude	Pr_14	FID_572	Pr_cor_1	410210.830	868567.658	410210.837	868567.657	-0.007	0.001	0.000	0.000
			Pr_cor_2	410189.370	868582.780	410189.273	868582.776	0.097	0.004	0.009	0.000
			Pr_cor_3	410196.271	868593.323	410196.172	868593.316	0.099	0.007	0.010	0.000
			Pr_cor_4	410218.210	868578.732	410218.114	868578.731	0.096	0.001	0.009	0.000
	Pr_15	FID_563	Pr_cor_1	410223.152	868542.237	410223.057	868542.237	0.095	0.000	0.009	0.000
			Pr_cor_2	410213.164	868548.587	410213.264	868548.577	-0.100	0.010	0.010	0.000
			Pr_cor_3	410229.150	868571.460	410229.054	868571.460	0.096	0.000	0.009	0.000
			Pr_cor_4	410237.730	868565.631	410237.838	868565.621	-0.108	0.010	0.012	0.000
Awel jemal	Pr_16	FID_564	Pr_cor_1	410233.590	868535.480	410233.493	868535.480	0.097	0.000	0.009	0.000
			Pr_cor_2	410223.131	868571.472	410223.057	868571.460	0.074	0.012	0.005	0.000
			Pr_cor_3	410237.932	868565.623	410237.838	868565.621	0.094	0.002	0.009	0.000
			Pr_cor_4	410248.431	868558.602	410248.338	868558.642	0.093	-0.040	0.009	0.002
Albeyan hitsan masadegiya	Pr_17	FID_558	Pr_cor_1	410243.143	868529.246	410243.123	868529.245	0.020	0.001	0.000	0.000
			Pr_cor_2	410233.473	868535.484	410233.493	868535.480	-0.020	0.004	0.000	0.000
			Pr_cor_3	410257.650	868552.521	410257.562	868552.510	0.088	0.011	0.008	0.000
			Pr_cor_4	410248.340	868558.655	410248.338	868558.642	0.002	0.013	0.000	0.000
Dilsebo Reshid	Pr_18	FID_555	Pr_cor_1	410253.151	868522.768	410253.131	868522.766	0.020	0.002	0.000	0.000
			Pr_cor_2	410243.153	868529.255	410243.123	868529.245	0.030	0.010	0.001	0.000
			Pr_cor_3	410248.364	868558.632	410248.338	868558.642	0.026	-0.010	0.001	0.000
			Pr_cor_4	410268.183	868545.524	410268.089	868545.514	0.094	0.010	0.009	0.000
Abdela Barkeda	Pr_19	FID_552	Pr_cor_1	410263.594	868515.997	410263.589	868515.995	0.005	0.002	0.000	0.000
			Pr_cor_2	410253.141	868522.768	410253.131	868522.766	0.010	0.002	0.000	0.000
			Pr_cor_3	410268.191	868545.516	410268.089	868545.514	0.102	0.002	0.010	0.000

			Pr_cor_4	410278.550	868538.577	410278.534	868538.570	0.016	0.007	0.000	0.000
Akme Bahre	Pr_20	FID_541	Pr_cor_1	410274.601	868508.928	410274.507	868508.926	0.094	0.002	0.009	0.000
			Pr_cor_2	410263.590	868515.975	410263.589	868515.995	0.001	-0.020	0.000	0.000
			Pr_cor_3	410278.544	868538.470	410278.534	868538.570	0.010	-0.100	0.000	0.010
			Pr_cor_4	410289.384	868531.373	410289.376	868531.364	0.008	0.009	0.000	0.000
adminstration	Pr_21	FID_529	Pr_cor_1	410060.673	868537.884	410060.686	868537.879	-0.013	0.005	0.000	0.000
			Pr_cor_2	410026.824	868560.771	410026.819	868560.739	0.005	0.032	0.000	0.001
			Pr_cor_3	410059.952	868603.295	410059.839	868603.285	0.113	0.010	0.013	0.000
			Pr_cor_4	410092.438	868581.483	410092.436	868581.483	0.002	0.000	0.000	0.000
market center	Pr_22		Pr_cor_1	410036.259	868395.223	410036.253	868395.213	0.006	0.010	0.000	0.000
			Pr_cor_2	409936.831	868436.750	409937.828	868436.753	-0.997	-0.003	0.994	0.000
			Pr_cor_3	410020.380	868548.162	410020.378	868548.142	0.002	0.020	0.000	0.000
			Pr_cor_4	410108.491	868491.622	410108.484	868491.522	0.007	0.100	0.000	0.010
	Pr_23	OBID_146	Pr_cor_1	409850.599	868344.065	409850.497	868344.065	0.102	0.000	0.010	0.000
			Pr_cor_2	409834.438	868355.282	409834.428	868355.272	0.010	0.010	0.000	0.000
			Pr_cor_3	409848.460	868375.797	409848.350	868375.787	0.110	0.010	0.012	0.000
			Pr_cor_4	409863.551	868366.276	409863.541	868366.275	0.010	0.001	0.000	0.000
	Pr_24	OBID_147	Pr_cor_1	409834.439	868355.276	409834.428	868355.272	0.011	0.004	0.000	0.000
			Pr_cor_2	409820.843	868364.715	409820.839	868364.750	0.004	-0.035	0.000	0.001
			Pr_cor_3	409833.761	868384.928	409833.757	868384.925	0.004	0.003	0.000	0.000
			Pr_cor_4	409864.500	868366.285	409863.741	868366.275	0.759	0.010	0.576	0.000
	Pr_25	OBID_145	Pr_cor_1	409820.842	868364.750	409820.839	868364.750	0.003	0.000	0.000	0.000
			Pr_cor_2	409786.001	868389.444	409786.005	868389.044	-0.004	0.400	0.000	0.160
			Pr_cor_3	409810.238	868425.600	409810.238	868424.670	0.000	0.930	0.000	0.865
			Pr_cor_4	409844.944	868403.380	409844.935	868402.385	0.009	0.995	0.000	0.990
	Pr_26	OBID_151	Pr_cor_1	409844.951	868402.389	409844.935	868402.385	0.016	0.004	0.000	0.000
			Pr_cor_2	409859.891	868392.884	409859.885	868392.784	0.006	0.100	0.000	0.010
			Pr_cor_3	409848.450	868375.789	409848.350	868375.787	0.100	0.002	0.010	0.000
			Pr_cor_4	409833.767	868384.929	409833.757	868384.925	0.010	0.004	0.000	0.000
	Pr_27	OBID_150	Pr_cor_1	409859.892	868392.794	409859.885	868392.784	0.007	0.010	0.000	0.000
			Pr_cor_2	409873.844	868383.811	409873.844	868383.819	0.000	-0.008	0.000	0.000
			Pr_cor_3	409863.561	868366.276	409863.541	868366.275	0.020	0.001	0.000	0.000
			Pr_cor_4	409848.380	868375.791	409848.350	868375.787	0.030	0.004	0.001	0.000
Finance and economy mamrya	Pr_28	OBID_106	Pr_cor_1	410194.436	868227.998	410194.436	868227.968	0.000	0.030	0.000	0.001
			Pr_cor_2	410261.571	868180.498	410261.531	868180.496	0.040	0.002	0.002	0.000
			Pr_cor_3	410227.410	868130.096	410227.399	868130.093	0.011	0.003	0.000	0.000
			Pr_cor_4	410160.539	868177.451	410160.529	868177.454	0.010	-0.003	0.000	0.000
Zone party office	Pr_29	OBID_26	Pr_cor_1	410171.884	868243.996	410171.784	868243.996	0.100	0.000	0.010	0.000
			Pr_cor_2	410194.436	868227.967	410194.436	868227.968	0.000	-0.001	0.000	0.000
			Pr_cor_3	410160.530	868177.444	410160.529	868177.454	0.001	-0.010	0.000	0.000
			Pr_cor_4	410137.714	868193.609	410138.605	868193.619	-0.891	-0.010	0.794	0.000
	Pr_30		Pr_cor_1	410311.970	868145.972	410311.960	868145.879	0.010	0.093	0.000	0.009

Hed Adminstr.silite zone			Pr_cor_2	410238.230	868043.162	410238.258	868043.022	-0.028	0.140	0.001	0.020
			Pr_cor_3	410197.533	868072.137	410197.528	868072.127	0.005	0.010	0.000	0.000
			Pr_cor_4	410269.297	868176.308	410269.496	868176.306	-0.199	0.002	0.040	0.000
Fate shehhassen	Pr_31		Pr_cor_1	410352.011	868117.946	410352.011	868117.844	0.000	0.102	0.000	0.010
			Pr_cor_2	410331.780	868085.130	410331.770	868085.035	0.010	0.095	0.000	0.009
			Pr_cor_3	410295.522	868109.255	410295.522	868109.245	0.000	0.010	0.000	0.000
			Pr_cor_4	410319.070	868141.128	410319.270	868141.127	-0.200	0.001	0.040	0.000
hayishuk baltina	Pr_32		Pr_cor_1	410398.957	868094.440	410398.957	868094.340	0.000	0.100	0.000	0.010
			Pr_cor_2	410368.259	868049.538	410368.258	868049.54	0.001	0.002	0.000	0.000
			Pr_cor_3	410403.935	868022.577	410403.935	868022.78	0.000	-0.200	0.000	0.040
			Pr_cor_4	410433.390	868070.7	410433.490	868070.9	-0.100	-0.201	0.010	0.040
juher parek	Pr_33		Pr_cor_1	410377.933	867952.445	410377.931	867952.495	0.002	-0.050	0.000	0.003
			Pr_cor_2	410414.715	868002.338	410414.714	868002.328	0.001	0.010	0.000	0.000
			Pr_cor_3	410436.694	867987.026	410436.691	867987.024	0.003	0.002	0.000	0.000
			Pr_cor_4	410401.387	867936.488	410401.389	867936.482	-0.002	0.006	0.000	0.000
Ezedin	Pr_34		Pr_cor_1	410327.565	867986.889	410327.645	867986.887	-0.080	0.002	0.006	0.000
			Pr_cor_2	410363.026	868038.322	410363.015	868038.329	0.011	-0.007	0.000	0.000
			Pr_cor_3	410414.724	868002.329	410414.764	868002.328	-0.040	0.001	0.002	0.000
			Pr_cor_4	410377.950	867952.475	410377.931	867952.495	0.019	-0.020	0.000	0.000
surur nuri(3)	Pr_35	OBID_138	Pr_cor_1	410417.960	868236.308	410417.978	868236.303	-0.018	0.005	0.000	0.000
			Pr_cor_2	410443.436	868275.977	410443.425	868275.990	0.011	-0.013	0.000	0.000
			Pr_cor_3	410457.983	868267.399	410457.999	868267.391	-0.016	0.008	0.000	0.000
			Pr_cor_4	410431.856	868227.082	410431.949	868227.042	-0.093	0.040	0.009	0.002
shibre husseni(3)	Pr_36	OBID_148	Pr_cor_1	410461.254	868275.829	410461.242	868275.629	0.012	0.200	0.000	0.040
			Pr_cor_2	410450.850	868281.508	410450.870	868281.808	-0.020	-0.300	0.000	0.090
			Pr_cor_3	410459.332	868295.624	410459.537	868295.824	-0.205	-0.200	0.042	0.040
			Pr_cor_4	410469.511	868289.069	410469.516	868289.067	-0.005	0.002	0.000	0.000
jemal husen	Pr_37	OBID_147	Pr_cor_1	410471.290	868292.381	410471.280	868292.081	0.010	0.300	0.000	0.090
			Pr_cor_2	410461.040	868298.168	410461.030	868298.680	0.010	-0.512	0.000	0.262
			Pr_cor_3	410469.658	868311.903	410469.755	868311.803	-0.097	0.100	0.009	0.010
			Pr_cor_4	410479.687	868305.603	410479.657	868305.030	0.030	0.573	0.001	0.328
sultan salo	Pr_38		Pr_cor_1	410516.427	868361.698	410516.429	868361.691	-0.002	0.007	0.000	0.000
			Pr_cor_2	410506.331	868368.283	410506.322	868368.253	0.009	0.030	0.000	0.001
			Pr_cor_3	410514.759	868381.330	410514.787	868381.336	-0.028	-0.006	0.001	0.000
			Pr_cor_4	410524.957	868374.979	410524.949	868374.973	0.008	0.006	0.000	0.000
Jafer Mosqiwe	Pr_39	OBID_21	Pr_cor_1	410519.480	868292.728	410519.470	868292.718	0.010	0.010	0.000	0.000
			Pr_cor_2	410607.605	868413.670	410607.653	868413.672	-0.048	-0.002	0.002	0.000
			Pr_cor_3	410688.363	868356.145	410688.361	868356.145	0.002	0.000	0.000	0.000
			Pr_cor_4	410601.334	868237.036	410601.364	868237.036	-0.030	0.000	0.001	0.000
	Pr_40	OBID_22	Pr_cor_1	410566.910	868147.211	410566.910	868147.211	0.000	0.000	0.000	0.000
			Pr_cor_2	410613.988	868208.056	410613.947	868208.056	0.041	0.000	0.002	0.000
			Pr_cor_3	410684.452	868138.919	410684.452	868138.914	0.000	0.005	0.000	0.000

			Pr_cor_4	410646.847	868088.572	410646.839	868088.578	0.008	-0.006	0.000	0.000
Heji fedlu_pepesi campany	Pr_41	OBID_30	Pr_cor_1	410267.485	867634.547	410267.485	867634.547	0.000	0.000	0.000	0.000
			Pr_cor_2	410365.957	867637.198	410365.911	867637.193	0.046	0.005	0.002	0.000
			Pr_cor_3	410365.547	867524.097	410365.547	867524.057	0.000	0.040	0.000	0.002
			Pr_cor_4	410263.250	867527.136	410263.251	867527.126	-0.001	0.010	0.000	0.000
momina mossa	Pr_42	OBID_65	Pr_cor_1	410265.156	867320.633	410265.156	867320.629	0.000	0.004	0.000	0.000
			Pr_cor_2	410266.175	867367.778	410267.075	867367.772	-0.900	0.006	0.810	0.000
			Pr_cor_3	410365.521	867369.569	410365.521	867369.558	0.000	0.011	0.000	0.000
			Pr_cor_4	410366.396	867317.790	410366.386	867317.771	0.010	0.019	0.000	0.000
Temima reshid	Pr_43	OBID_66	Pr_cor_1	410266.075	867367.779	410266.075	867367.772	0.000	0.007	0.000	0.000
			Pr_cor_2	410267.537	867442.887	410267.537	867442.867	0.000	0.020	0.000	0.000
			Pr_cor_3	410364.169	867444.458	410364.269	867444.454	-0.100	0.004	0.010	0.000
			Pr_cor_4	410365.521	867369.568	410365.521	867369.558	0.000	0.010	0.000	0.000
bahre shesayid	Pr_44	OBID_33	Pr_cor_1	410418.775	867464.883	410418.775	867464.879	0.000	0.004	0.000	0.000
			Pr_cor_2	410378.742	867464.167	410378.742	867464.155	0.000	0.012	0.000	0.000
			Pr_cor_3	867464.085	867514.161	867464.155	867514.161	-0.070	0.000	0.005	0.000
			Pr_cor_4	410424.259	867514.289	410424.259	867514.269	0.000	0.020	0.000	0.000
mujiza salo	Pr_45	OBID_31	Pr_cor_1	410481.136	867466.077	410481.136	867466.007	0.000	0.070	0.000	0.005
			Pr_cor_2	410418.765	867464.897	410418.775	867464.879	-0.010	0.018	0.000	0.000
			Pr_cor_3	410424.259	867514.275	410424.259	867514.269	0.000	0.006	0.000	0.000
			Pr_cor_4	410490.936	867514.438	410490.926	867514.426	0.010	0.012	0.000	0.000
			Pr_cor_5	410492.776	867482.678	410492.778	867482.676	-0.002	0.002	0.000	0.000
hussen mossa	Pr_46	OBID_51	Pr_cor_1	410492.645	867541.237	410492.644	867541.234	0.001	0.003	0.000	0.000
			Pr_cor_2	410492.910	867525.880	410492.910	867525.878	0.000	0.002	0.000	0.000
			Pr_cor_3	410463.923	867525.808	410463.923	867525.878	0.000	-0.070	0.000	0.005
			Pr_cor_4	410464.117	867540.829	410464.111	867540.809	0.006	0.020	0.000	0.000
jemal hussen	Pr_47	OBID_53	Pr_cor_1	410492.394	867555.820	410492.393	867555.722	0.001	0.098	0.000	0.010
			Pr_cor_2	410492.544	867541.234	410492.644	867541.234	-0.100	0.000	0.010	0.000
			Pr_cor_3	410464.112	867540.819	410464.111	867540.809	0.001	0.010	0.000	0.000
			Pr_cor_4	410464.297	867555.657	410464.297	867555.677	0.000	-0.020	0.000	0.000
abdela werke	Pr_48	OBID_55	Pr_cor_1	410492.271	867568.105	410492.171	867568.200	0.100	-0.095	0.010	0.009
			Pr_cor_2	410492.393	867555.732	410492.393	867555.722	0.000	0.010	0.000	0.000
			Pr_cor_3	410464.497	867555.679	410464.297	867555.677	0.200	0.002	0.040	0.000
			Pr_cor_4	410464.460	867569.210	410464.466	867569.202	-0.006	0.008	0.000	0.000
sunko hussen	Pr_49	OBID_57	Pr_cor_1	410491.927	867582.611	410491.927	867582.600	0.000	0.011	0.000	0.000
			Pr_cor_2	410492.281	867568.522	410492.171	867568.500	0.110	0.022	0.012	0.000
			Pr_cor_3	410464.486	867569.200	410464.466	867569.202	0.020	-0.002	0.000	0.000
			Pr_cor_4	410464.639	867583.150	410464.639	867582.999	0.000	0.151	0.000	0.023
nuri abdela	Pr_50	OBID_60	Pr_cor_1	410491.677	867597.214	410491.677	867597.014	0.000	0.200	0.000	0.040
			Pr_cor_2	410491.927	867584.116	410491.927	867583.830	0.000	0.286	0.000	0.082
			Pr_cor_3	410464.679	867583.009	410464.639	867582.999	0.040	0.010	0.002	0.000
			Pr_cor_4	410464.815	867598.199	410464.815	867597.999	0.000	0.200	0.000	0.040

seyid umer	Pr_51	OBID_61	Pr_cor_1	410491.462	867610.589	410491.442	867610.568	0.020	0.021	0.000	0.000
			Pr_cor_2	410491.678	867597.010	410491.677	867597.014	0.001	-0.004	0.000	0.000
			Pr_cor_3	410464.815	867597.000	410464.985	867597.199	-0.170	-0.199	0.029	0.040
			Pr_cor_4	410464.992	867611.149	410464.992	867611.154	0.000	-0.005	0.000	0.000
	Pr_52		Pr_cor_1	410491.198	867624.937	410491.194	867624.837	0.004	0.100	0.000	0.010
			Pr_cor_2	410491.442	867610.688	410491.442	867610.568	0.000	0.120	0.000	0.014
			Pr_cor_3	410464.992	867611.254	410464.992	867611.154	0.000	0.100	0.000	0.010
			Pr_cor_4	410465.166	867624.970	410465.166	867624.963	0.000	0.007	0.000	0.000
dedgeba usman	Pr_53	OBID_49	Pr_cor_1	410490.925	867640.421	410490.926	867640.310	-0.001	0.111	0.000	0.012
			Pr_cor_2	410491.194	867624.937	410491.394	867624.837	-0.200	0.100	0.040	0.010
			Pr_cor_3	410465.176	867624.968	410465.166	867624.963	0.010	0.005	0.000	0.000
			Pr_cor_4	410465.358	867641.010	410465.358	867640.710	0.000	0.300	0.000	0.090
abdurezak hussen	Pr_54	OBID_50	Pr_cor_1	410437.569	867625.194	410437.568	867625.097	0.001	0.097	0.000	0.009
			Pr_cor_2	410437.348	867640.310	410437.348	867640.310	0.000	0.000	0.000	0.000
			Pr_cor_3	410465.258	867640.441	410465.358	867640.310	-0.100	0.131	0.010	0.017
			Pr_cor_4	410465.166	867624.663	410465.166	867624.963	0.000	-0.300	0.000	0.090
sefiya seyid	Pr_55	OBID_65	Pr_cor_1	410437.762	867611.758	410437.760	867611.758	0.002	0.000	0.000	0.000
			Pr_cor_2	410437.468	867625.080	410437.568	867625.097	-0.100	-0.017	0.010	0.000
			Pr_cor_3	410465.166	867625.163	410465.166	867624.963	0.000	0.200	0.000	0.040
			Pr_cor_4	410464.994	867611.164	410464.992	867611.154	0.002	0.010	0.000	0.000
	Pr_56		Pr_cor_1	410437.974	867596.988	410437.974	867596.985	0.000	0.003	0.000	0.000
			Pr_cor_2	410437.760	867611.958	410437.760	867611.758	0.000	0.200	0.000	0.040
			Pr_cor_3	410464.994	867613.154	410464.992	867613.240	0.002	-0.086	0.000	0.007
			Pr_cor_4	410464.815	867598.009	410464.815	867597.999	0.000	0.010	0.000	0.000
diltata ahmed	Pr_57		Pr_cor_1	410438.170	867583.585	410438.170	867583.485	0.000	0.100	0.000	0.010
			Pr_cor_2	410437.974	867596.985	410437.974	867596.985	0.000	0.000	0.000	0.000
			Pr_cor_3	410464.835	867596.010	410464.815	867596.090	0.020	-0.080	0.000	0.006
			Pr_cor_4	410464.639	867582.902	410464.639	867582.999	0.000	-0.097	0.000	0.009
sunko hussen	Pr_58	OBID_55	Pr_cor_1	410438.366	867569.904	410438.366	867569.864	0.000	0.040	0.000	0.002
			Pr_cor_2	410438.172	867583.600	410438.170	867583.385	0.002	0.215	0.000	0.046
			Pr_cor_3	410464.639	867582.009	410464.639	867582.099	0.000	-0.090	0.000	0.008
			Pr_cor_4	410464.477	867569.272	410464.466	867569.202	0.011	0.070	0.000	0.005
lebiba musema	Pr_59	OBID_56	Pr_cor_1	410438.571	867555.636	410438.571	867555.636	0.000	0.000	0.000	0.000
			Pr_cor_2	410438.376	867569.964	410438.366	867569.864	0.010	0.100	0.000	0.010
			Pr_cor_3	410464.466	867569.299	410464.466	867569.202	0.000	0.097	0.000	0.009
			Pr_cor_4	410464.297	867555.697	410464.297	867555.677	0.000	0.020	0.000	0.000
kedir hussen	Pr_60		Pr_cor_1	410438.791	867540.231	410438.791	867540.431	0.000	-0.200	0.000	0.040
			Pr_cor_2	410438.571	867555.536	410438.571	867555.636	0.000	-0.100	0.000	0.010
			Pr_cor_3	410464.287	867555.777	410464.297	867555.677	-0.010	0.100	0.000	0.010
			Pr_cor_4	410464.111	867540.909	410464.111	867540.809	0.000	0.100	0.000	0.010
hussen mossa	Pr_61		Pr_cor_1	410439.001	867525.678	410439.001	867525.878	0.000	-0.200	0.000	0.040
			Pr_cor_2	410438.781	867540.531	410438.791	867540.431	-0.010	0.100	0.000	0.010

			Pr_cor_3	410464.111	867540.899	410464.111	867540.809	0.000	0.090	0.000	0.008
			Pr_cor_4	410463.923	867525.848	410463.923	867525.878	0.000	-0.030	0.000	0.001
sheshifa begari	Pr_62	OBID_36	Pr_cor_1	410503.097	867437.187	410503.096	867437.167	0.001	0.020	0.000	0.000
			Pr_cor_2	410514.738	867444.049	410514.738	867444.047	0.000	0.002	0.000	0.000
			Pr_cor_3	410519.898	867444.077	410519.888	867444.047	0.010	0.030	0.000	0.001
			Pr_cor_4	410520.299	867417.186	410520.199	867417.660	0.100	-0.474	0.010	0.225
			Pr_cor_5	410503.328	867417.790	410503.327	867417.690	0.001	0.100	0.000	0.010
zahra shehassen	PR_63	OBID_47	Pr_cor_1	410519.898	867444.057	410519.888	867444.047	0.010	0.010	0.000	0.000
			Pr_cor_2	410533.424	867444.049	410533.424	867444.047	0.000	0.002	0.000	0.000
			Pr_cor_3	410533.546	867417.639	410533.546	867417.636	0.000	0.003	0.000	0.000
			Pr_cor_4	410520.199	867417.760	410520.199	867417.660	0.000	0.100	0.000	0.010
reshad adem	PR_64	OBID_45	Pr_cor_1	410533.424	867444.147	410533.424	867444.047	0.000	0.100	0.000	0.010
			Pr_cor_2	410549.633	867446.047	410549.933	867446.647	-0.300	-0.600	0.090	0.360
			Pr_cor_3	410548.390	867417.161	410548.380	867417.610	0.010	-0.449	0.000	0.202
			Pr_cor_4	410533.556	867417.836	410533.546	867417.636	0.010	0.200	0.000	0.040
nuri wabela	PR_65	OBID_43	Pr_cor_1	410548.633	867444.247	410548.633	867444.047	0.000	0.200	0.000	0.040
			Pr_cor_2	410561.223	867444.147	410561.223	867444.047	0.000	0.100	0.000	0.010
			Pr_cor_3	410561.850	867417.588	410561.850	867417.586	0.000	0.002	0.000	0.000
			Pr_cor_4	410548.381	867417.618	410548.380	867417.610	0.001	0.008	0.000	0.000
shemse kimbado	PR_66	OBID_41	Pr_cor_1	410561.223	867445.047	410561.223	867445.547	0.000	-0.500	0.000	0.250
			Pr_cor_2	410575.569	867444.147	410575.559	867444.047	0.010	0.100	0.000	0.010
			Pr_cor_3	410575.766	867417.661	410575.766	867417.561	0.000	0.100	0.000	0.010
			Pr_cor_4	410561.851	867417.486	410561.850	867417.586	0.001	-0.100	0.000	0.010
sultan ahmed	PR_67	OBID_39	Pr_cor_1	410575.459	867444.007	410575.559	867444.047	-0.100	-0.040	0.010	0.002
			Pr_cor_2	410588.917	867444.140	410588.917	867444.047	0.000	0.093	0.000	0.009
			Pr_cor_3	410589.584	867417.836	410589.583	867417.536	0.001	0.300	0.000	0.090
			Pr_cor_4	410575.766	867417.501	410575.766	867417.561	0.000	-0.060	0.000	0.004
anwar abdela	PR_68	OBID_37	Pr_cor_1	410588.917	867444.247	410588.917	867444.047	0.000	0.200	0.000	0.040
			Pr_cor_2	410603.087	867444.049	410603.087	867444.047	0.000	0.002	0.000	0.000
			Pr_cor_3	410603.678	867417.503	410603.678	867417.511	0.000	-0.008	0.000	0.000
			Pr_cor_4	410589.583	867417.546	410589.583	867417.536	0.000	0.010	0.000	0.000
bahriya shereshad	PR_69	OBID_35	Pr_cor_1	410603.087	867444.047	410603.087	867444.047	0.000	0.000	0.000	0.000
			Pr_cor_2	410618.192	867444.057	410618.191	867444.047	0.001	0.010	0.000	0.000
			Pr_cor_3	410618.597	867417.465	410618.597	867417.485	0.000	-0.020	0.000	0.000
			Pr_cor_4	410603.679	867417.531	410603.678	867417.511	0.001	0.020	0.000	0.000
neja mohammed	PR_70	OBID_34	Pr_cor_1	410520.496	867392.514	410520.496	867392.414	0.000	0.100	0.000	0.010
			Pr_cor_2	410503.626	867392.653	410503.626	867392.453	0.000	0.200	0.000	0.040
			Pr_cor_3	410503.328	867417.660	410503.327	867417.690	0.001	-0.030	0.000	0.001
			Pr_cor_4	410520.199	867417.760	410520.199	867417.660	0.000	0.100	0.000	0.010
bahre mohammed	PR_71	OBID_46	Pr_cor_1	410533.673	867392.484	410533.663	867392.384	0.010	0.100	0.000	0.010
			Pr_cor_2	410520.796	867393.414	410520.496	867393.514	0.300	-0.100	0.090	0.010
			Pr_cor_3	410520.200	867415.660	410520.199	867415.960	0.001	-0.300	0.000	0.090

			Pr_cor_4	410533.556	867417.436	410533.546	867417.636	0.010	-0.200	0.000	0.040
murshida	PR_72	OBID_44	Pr_cor_1	410548.128	867393.351	410548.138	867393.391	-0.010	-0.040	0.000	0.002
			Pr_cor_2	410533.663	867392.394	410533.663	867392.384	0.000	0.010	0.000	0.000
			Pr_cor_3	410533.546	867417.636	410533.546	867417.636	0.000	0.000	0.000	0.000
			Pr_cor_4	410548.380	867417.613	410548.380	867417.610	0.000	0.003	0.000	0.000
rameto mohammed	PR_73	OBID_42	Pr_cor_1	410562.450	867392.338	410562.450	867392.318	0.000	0.020	0.000	0.000
			Pr_cor_2	410548.138	867392.251	410548.138	867392.351	0.000	-0.100	0.000	0.010
			Pr_cor_3	410548.380	867417.610	410548.380	867417.610	0.000	0.000	0.000	0.000
			Pr_cor_4	410561.854	867419.586	410561.850	867419.589	0.004	-0.003	0.000	0.000
chumete mohammed	PR_74	OBID_40	Pr_cor_1	410575.983	867392.487	410575.963	867392.287	0.020	0.200	0.000	0.040
			Pr_cor_2	410562.450	867392.317	410562.450	867392.318	0.000	-0.001	0.000	0.000
			Pr_cor_3	410561.861	867417.576	410561.850	867417.586	0.011	-0.010	0.000	0.000
			Pr_cor_4	410575.766	867417.661	410575.766	867417.561	0.000	0.100	0.000	0.010
gulto umer	PR_75	OBID_38	Pr_cor_1	410590.200	867392.054	410590.218	867392.254	-0.018	-0.200	0.000	0.040
			Pr_cor_2	410575.963	867392.287	410575.963	867392.287	0.000	0.000	0.000	0.000
			Pr_cor_3	410575.866	867417.561	410575.766	867417.561	0.100	0.000	0.010	0.000
			Pr_cor_4	410589.583	867417.836	410589.583	867417.536	0.000	0.300	0.000	0.090
abdurehman salo	PR_76	OBID_39	Pr_cor_1	410604.341	867392.252	410604.242	867392.222	0.100	0.030	0.010	0.001
			Pr_cor_2	410590.233	867392.264	410590.218	867392.254	0.015	0.010	0.000	0.000
			Pr_cor_3	410589.584	867417.556	410589.583	867417.536	0.001	0.020	0.000	0.000
			Pr_cor_4	410603.678	410603.670	410603.678	410603.678	0.000	-0.008	0.000	0.000
nuredin wabela	PR_77	OBID_36	Pr_cor_1	410618.985	867392.198	410618.984	867392.188	0.001	0.010	0.000	0.000
			Pr_cor_2	410604.242	867392.092	410604.242	867392.222	0.000	-0.130	0.000	0.017
			Pr_cor_3	410603.674	410603.679	410603.678	410603.678	-0.004	0.001	0.000	0.000
			Pr_cor_4	410618.597	867417.485	410618.597	867417.485	0.000	0.000	0.000	0.000
nesre muzeyin	PR_78	OBID_70	Pr_cor_1	410217.215	867282.881	410217.215	867282.881	0.000	0.000	0.000	0.000
			Pr_cor_2	410217.219	867268.724	410217.319	867268.714	-0.100	0.010	0.010	0.000
			Pr_cor_3	410176.838	867266.535	410176.838	867266.535	0.000	0.000	0.000	0.000
			Pr_cor_4	410176.702	867282.846	410176.802	867282.816	-0.100	0.030	0.010	0.001
amina hassen	PR_79	OBID_69	Pr_cor_1	410217.013	867310.164	410217.013	867310.164	0.000	0.000	0.000	0.000
			Pr_cor_2	410217.119	867282.801	410217.215	867282.881	-0.096	-0.080	0.009	0.006
			Pr_cor_3	410176.802	867282.916	410176.802	867282.816	0.000	0.100	0.000	0.010
			Pr_cor_4	410176.740	867309.100	410176.744	867309.100	-0.004	0.000	0.000	0.000
belay assefa	PR_80	OBID_67	Pr_cor_1	410216.660	867358.236	410216.660	867358.060	0.000	0.176	0.000	0.031
			Pr_cor_2	410217.013	867310.264	410217.013	867310.164	0.000	0.100	0.000	0.010
			Pr_cor_3	410176.754	867309.210	410176.744	867309.100	0.010	0.110	0.000	0.012
			Pr_cor_4	410176.632	867357.128	410176.638	867357.148	-0.006	-0.020	0.000	0.000
ali kemal	PR_81	OBID_68	Pr_cor_1	410216.572	867383.518	410216.472	867383.508	0.100	0.010	0.010	0.000
			Pr_cor_2	410216.560	867358.160	410216.660	867358.060	-0.100	0.100	0.010	0.010
			Pr_cor_3	410176.638	867357.158	410176.638	867357.148	0.000	0.010	0.000	0.000
			Pr_cor_4	410176.562	867382.532	410176.582	867382.552	-0.020	-0.020	0.000	0.000
hulchafo salo	PR_82	OBID_72	Pr_cor_1	410167.007	867462.093	410167.007	867462.063	0.000	0.030	0.000	0.001

			Pr_cor_2	410150.372	867461.937	410150.372	867461.937	0.000	0.000	0.000	0.000
			Pr_cor_3	410149.799	867487.037	410149.799	867487.007	0.000	0.030	0.000	0.001
			Pr_cor_4	410166.313	867487.426	410166.313	867487.416	0.000	0.010	0.000	0.000
sultan selman	PR_83	OBID_74	Pr_cor_1	410150.272	867461.637	410150.372	867461.937	-0.100	-0.300	0.010	0.090
			Pr_cor_2	410135.870	867461.926	410135.866	867461.826	0.004	0.100	0.000	0.010
			Pr_cor_3	410135.749	867486.659	410135.749	867486.658	0.000	0.001	0.000	0.000
			Pr_cor_4	410149.789	867487.207	410149.799	867487.007	-0.010	0.200	0.000	0.040
towfik mohammed	PR_84	OBID_76	Pr_cor_1	410135.868	867461.626	410135.866	867461.826	0.002	-0.200	0.000	0.040
			Pr_cor_2	410116.314	867461.698	410116.314	867461.678	0.000	0.020	0.000	0.000
			Pr_cor_3	410116.658	867486.284	410116.638	867486.184	0.020	0.100	0.000	0.010
			Pr_cor_4	410135.749	867487.658	410135.749	867487.866	0.000	-0.208	0.000	0.043
	PR_85	OBID_73	Pr_cor_1	410116.981	867513.156	410116.981	867513.160	0.000	-0.004	0.000	0.000
			Pr_cor_2	410135.627	867512.555	410135.627	867512.355	0.000	0.200	0.000	0.040
			Pr_cor_3	410135.759	867486.668	410135.749	867486.658	0.010	0.010	0.000	0.000
			Pr_cor_4	410116.638	867486.284	410116.638	867486.184	0.000	0.100	0.000	0.010
shukre ahmed	PR_86	OBID_77	Pr_cor_1	410135.630	867512.365	410135.627	867512.355	0.003	0.010	0.000	0.000
			Pr_cor_2	410149.226	867512.510	410149.216	867512.500	0.010	0.010	0.000	0.000
			Pr_cor_3	410149.899	867487.117	410149.799	867487.107	0.100	0.010	0.010	0.000
			Pr_cor_4	410135.719	867486.758	410135.749	867486.658	-0.030	0.100	0.001	0.010
hussen amen	PR_87	OBID_75	Pr_cor_1	410149.216	867511.500	410149.216	867511.550	0.000	-0.050	0.000	0.003
			Pr_cor_2	410165.622	867510.676	410165.622	867510.776	0.000	-0.100	0.000	0.010
			Pr_cor_3	410166.320	867487.566	410166.313	867487.516	0.007	0.050	0.000	0.003
			Pr_cor_4	410149.855	867487.107	410149.799	867487.007	0.056	0.100	0.003	0.010
Silite cltural Hall	PR_88	OBID_	Pr_cor_1	410157.946	867685.028	410157.936	867684.985	0.010	0.043	0.000	0.002
			Pr_cor_2	410158.567	867523.856	410158.567	867523.836	0.000	0.020	0.000	0.000
			Pr_cor_3	410067.971	867526.777	410067.961	867526.677	0.010	0.100	0.000	0.010
			Pr_cor_4	410060.766	867685.791	410060.699	867685.791	0.067	0.000	0.004	0.000
	PR_89	FID_335	Pr_cor_1	409983.021	867764.837	409983.021	867764.827	0.000	0.010	0.000	0.000
			Pr_cor_2	409983.148	867754.199	409983.148	867754.099	0.000	0.100	0.000	0.010
			Pr_cor_3	409959.852	867753.480	409959.852	867753.480	0.000	0.000	0.000	0.000
			Pr_cor_4	409959.413	867764.261	409959.413	867764.251	0.000	0.010	0.000	0.000
shebahredin radi	PR_90	FID_686	Pr_cor_1	409982.905	867774.757	409982.903	867774.757	0.002	0.000	0.000	0.000
			Pr_cor_2	409983.021	867764.837	409983.021	867764.827	0.000	0.010	0.000	0.000
			Pr_cor_3	409959.413	867764.251	409959.413	867764.251	0.000	0.000	0.000	0.000
			Pr_cor_4	409959.017	867773.981	409959.017	867773.961	0.000	0.020	0.000	0.000
nuriya Ahemad	PR_91	OBID_113	Pr_cor_1	409982.784	867785.042	409982.781	867785.042	0.003	0.000	0.000	0.000
			Pr_cor_2	409982.903	867774.857	409982.903	867774.897	0.000	-0.040	0.000	0.002
			Pr_cor_3	409959.018	867773.961	409959.017	867773.961	0.001	0.000	0.000	0.000
			Pr_cor_4	409958.603	867784.210	409958.603	867784.110	0.000	0.100	0.000	0.010
amina muzeyin	PR_92	OBID_112	Pr_cor_1	409982.662	867795.229	409982.660	867795.229	0.002	0.000	0.000	0.000
			Pr_cor_2	409982.781	867785.842	409982.781	867785.897	0.000	-0.055	0.000	0.003
			Pr_cor_3	409958.613	867783.110	409958.603	867783.310	0.010	-0.200	0.000	0.040

			Pr_cor_4	409958.186	867794.433	409958.186	867794.437	0.000	-0.004	0.000	0.000
	PR_93	FID_337	Pr_cor_1	409982.548	867804.458	409982.548	867804.598	0.000	-0.140	0.000	0.020
			Pr_cor_2	409982.636	867795.329	409982.660	867795.229	-0.024	0.100	0.001	0.010
			Pr_cor_3	409958.186	867794.333	409958.186	867794.333	0.000	0.000	0.000	0.000
			Pr_cor_4	409957.831	867803.572	409957.801	867803.692	0.030	-0.120	0.001	0.014
	PR_94	OBID_111	Pr_cor_1	409982.310	867824.781	409982.310	867824.681	0.000	0.100	0.000	0.010
			Pr_cor_2	409982.548	867804.858	409982.548	867804.828	0.000	0.030	0.000	0.001
			Pr_cor_3	409957.801	867803.792	409957.801	867803.772	0.000	0.020	0.000	0.000
			Pr_cor_4	409956.956	867824.493	409956.956	867824.492	0.000	0.001	0.000	0.000
nasir adem	PR_95	OBID_110	Pr_cor_1	409982.118	867835.592	409982.180	867835.592	-0.062	0.000	0.004	0.000
			Pr_cor_2	409982.312	867824.881	409982.310	867824.889	0.002	-0.008	0.000	0.000
			Pr_cor_3	409956.956	867824.492	409956.956	867824.492	0.000	0.000	0.000	0.000
			Pr_cor_4	409956.512	867835.128	409956.522	867835.118	-0.010	0.010	0.000	0.000
shukre siraje	PR_96	OBID_108	Pr_cor_1	409981.953	867854.721	409981.953	867854.711	0.000	0.010	0.000	0.000
			Pr_cor_2	409982.220	867835.792	409982.180	867835.699	0.040	0.093	0.002	0.009
			Pr_cor_3	409956.522	867835.118	409956.522	867835.118	0.000	0.000	0.000	0.000
			Pr_cor_4	409955.773	867853.545	409955.773	867853.505	0.000	0.040	0.000	0.002
hamdala kere	PR_97	OBID_81	Pr_cor_1	409925.750	867645.759	409925.650	867645.757	0.100	0.002	0.010	0.000
			Pr_cor_2	409925.957	867629.336	409925.957	867629.326	0.000	0.010	0.000	0.000
			Pr_cor_3	409901.368	867629.068	409901.368	867629.068	0.000	0.000	0.000	0.000
			Pr_cor_4	409900.879	867645.114	409900.869	867645.014	0.010	0.100	0.000	0.010
sadiya nasir	PR_98	OBID_82	Pr_cor_1	409925.426	867657.562	409925.426	867657.762	0.000	-0.200	0.000	0.040
			Pr_cor_2	409925.650	867645.757	409925.650	867645.757	0.000	0.000	0.000	0.000
			Pr_cor_3	409900.989	867645.114	409900.869	867645.014	0.120	0.100	0.014	0.010
			Pr_cor_4	409900.479	867655.460	409900.479	867655.490	0.000	-0.030	0.000	0.001
mohammed umer	PR_99	OBID_84	Pr_cor_1	409925.151	867672.452	409925.151	867672.432	0.000	0.020	0.000	0.000
			Pr_cor_2	409925.436	867657.862	409925.426	867657.762	0.010	0.100	0.000	0.010
			Pr_cor_3	409900.579	867657.460	409900.479	867657.460	0.100	0.000	0.010	0.000
			Pr_cor_4	409900.010	867672.506	409900.010	867672.406	0.000	0.100	0.000	0.010
shukre musebo	PR_100	OBID_84	Pr_cor_1	409924.878	867686.566	409924.888	867686.536	-0.010	0.030	0.000	0.001
			Pr_cor_2	409925.151	867672.402	409925.151	867672.432	0.000	-0.030	0.000	0.001
			Pr_cor_3	409900.110	867672.416	409900.010	867672.406	0.100	0.010	0.010	0.000
			Pr_cor_4	409899.590	867686.150	409899.582	867686.159	0.008	-0.009	0.000	0.000
								8.277	**15.700**	**13.742**	**14.439**

Appendix_3: Planimetric Accuracy Assessment of Line map Extracted coordinate with RTK _GPS Measured coordinate

NB: planimetric accuracy assessment coordinates Adinda Ethiopia zone 37

parcel owner and parcel corner identification				***Line map Parcel Ex.coor***		*RTK_GPS measured coor*		***Devotion of Line mape_RTK***		***Discrepanciesof*** *Line mape_RTK*	
Parcel_Owner	*Parcel No*	*P_ID/OBID*	*P_corner*	***X_coordinat***	***y_coordinat***	*X_coordinat*	*y_coordinat*	*ΔX*	*ΔY*	*(ΔX)2*	*(ΔY)2*
	Pr_1	*FID_482*	*Pr_cor_1*	*410532.630*	*868388.653*	*410531.620*	*868388.223*	*1.010*	*0.430*	*1.020*	*0.185*
			Pr_cor_2	*410499.942*	*868408.985*	*410499.642*	*868408.951*	*0.300*	*0.034*	*0.090*	*0.001*
			Pr_cor_3	*410527.822*	*868447.688*	*410527.922*	*868447.648*	*-0.100*	*0.040*	*0.010*	*0.002*
			Pr_cor_4	*410558.848*	*868426.541*	*410558.828*	*868426.141*	*0.020*	*0.400*	*0.000*	*0.160*
fedlu kedir	*Pr_2*	*FID_481*	*Pr_cor_1*	*410499.942*	*868408.961*	*410499.642*	*868407.971*	*0.300*	*0.990*	*0.090*	*0.980*
			Pr_cor_2	*410474.496*	*868426.764*	*410473.396*	*868425.964*	*1.100*	*0.800*	*1.210*	*0.640*
			Pr_cor_3	*410501.443*	*868467.284*	*410501.143*	*868466.284*	*0.300*	*1.000*	*0.090*	*1.000*
			Pr_cor_4	*410558.928*	*868426.000*	*410558.828*	*868426.141*	*0.101*	*-0.141*	*0.010*	*0.020*
fuwad fedlu	*Pr_3*	*FID_492*	*Pr_cor_1*	*410474.399*	*868425.184*	*410473.396*	*868425.964*	*1.003*	*-0.780*	*1.007*	*0.608*
			Pr_cor_2	*410446.813*	*868443.460*	*410446.713*	*868443.260*	*0.100*	*0.200*	*0.010*	*0.040*
			Pr_cor_3	*410476.980*	*868484.183*	*410476.980*	*868483.098*	*0.000*	*1.085*	*0.000*	*1.177*
			Pr_cor_4	*410558.848*	*868426.151*	*410558.828*	*868426.141*	*0.020*	*0.010*	*0.000*	*0.000*
Beferacot	*Pr_4*	*FID_517*	*Pr_cor_1*	*410558.958*	*868426.341*	*410558.828*	*868426.141*	*0.130*	*0.200*	*0.017*	*0.040*
			Pr_cor_2	*410476.997*	*868483.190*	*410476.980*	*868483.098*	*0.017*	*0.092*	*0.000*	*0.008*
			Pr_cor_3	*410512.438*	*868528.737*	*410512.630*	*868529.744*	*-0.192*	*-1.007*	*0.037*	*1.014*
			Pr_cor_4	*410593.743*	*868473.393*	*410592.732*	*868473.393*	*1.011*	*0.000*	*1.021*	*0.000*
seyid umer	*Pr_5*	*5*	*Pr_cor_1*	*410438.660*	*868446.175*	*410437.360*	*868446.975*	*1.300*	*-0.800*	*1.690*	*0.640*
			Pr_cor_2	*410352.165*	*868500.615*	*410351.105*	*868500.315*	*1.060*	*0.300*	*1.124*	*0.090*
			Pr_cor_3	*410379.557*	*868544.956*	*410379.257*	*868544.976*	*0.300*	*-0.020*	*0.090*	*0.000*
			Pr_cor_4	*410469.786*	*868486.750*	*410468.696*	*868486.556*	*1.090*	*0.194*	*1.188*	*0.038*
radiya seid	*Pr_6*	*OBID_6*	*Pr_cor_1*	*410259.983*	*868485.504*	*410258.953*	*868485.454*	*1.030*	*0.050*	*1.061*	*0.002*
			Pr_cor_2	*410248.969*	*868492.709*	*410248.166*	*868492.699*	*0.803*	*0.010*	*0.645*	*0.000*
			Pr_cor_3	*410263.989*	*868516.710*	*410263.589*	*868515.995*	*0.400*	*0.715*	*0.160*	*0.511*
			Pr_cor_4	*410274.687*	*868508.979*	*410274.507*	*868508.926*	*0.180*	*0.053*	*0.032*	*0.003*
gudhager nuri	*Pr_7*	*OBID_7*	*Pr_cor_1*	*410248.436*	*868493.699*	*410248.166*	*868492.699*	*0.270*	*1.000*	*0.073*	*1.000*
			Pr_cor_2	*410238.997*	*868499.696*	*410237.897*	*868499.596*	*1.100*	*0.100*	*1.210*	*0.010*
			Pr_cor_3	*410253.361*	*868524.226*	*410253.131*	*868522.766*	*0.230*	*1.460*	*0.053*	*2.132*
			Pr_cor_4	*410263.799*	*868515.905*	*410263.589*	*868515.995*	*0.210*	*-0.090*	*0.044*	*0.008*
temima bamud	*Pr_8*	*OBID_16*	*Pr_cor_1*	*410238.997*	*868499.599*	*410237.897*	*868499.596*	*1.100*	*0.003*	*1.210*	*0.000*
			Pr_cor_2	*410229.698*	*868505.888*	*410228.598*	*868505.842*	*1.100*	*0.046*	*1.210*	*0.002*
			Pr_cor_3	*410243.233*	*868529.275*	*410244.423*	*868529.245*	*-1.190*	*0.030*	*1.416*	*0.001*
			Pr_cor_4	*410253.311*	*868522.866*	*410253.201*	*868522.766*	*0.110*	*0.100*	*0.012*	*0.010*
keyiro ale	*Pr_9*	*OBID_9*	*Pr_cor_1*	*410228.790*	*868505.852*	*410228.598*	*868505.842*	*0.192*	*0.010*	*0.037*	*0.000*
			Pr_cor_2	*410218.951*	*868512.482*	*410218.741*	*868512.462*	*0.210*	*0.020*	*0.044*	*0.000*

			Pr_cor_3	410234.593	868535.458	410233.493	868535.480	1.100	-0.022	1.210	0.000
			Pr_cor_4	410243.343	868529.345	410243.123	868529.245	0.220	0.100	0.048	0.010
	Pr_10	OBID_10	Pr_cor_1	410218.847	868512.562	410218.741	868512.462	0.106	0.100	0.011	0.010
			Pr_cor_2	410208.670	868519.311	410208.560	868519.300	0.110	0.011	0.012	0.000
			Pr_cor_3	410223.547	868542.337	410223.057	868542.237	0.490	0.100	0.240	0.010
			Pr_cor_4	410233.793	868535.581	410233.493	868535.480	0.300	0.101	0.090	0.010
behre musebo	Pr_11	OBID_11	Pr_cor_1	410208.567	868519.422	410208.560	868519.300	0.007	0.122	0.000	0.015
			Pr_cor_2	410197.978	868527.213	410197.969	868526.413	0.009	0.800	0.000	0.640
			Pr_cor_3	410213.284	868548.597	410213.264	868548.577	0.020	0.020	0.000	0.000
			Pr_cor_4	410223.517	868542.337	410223.057	868542.237	0.460	0.100	0.212	0.010
bahre musebo	Pr_12	FID_563	Pr_cor_1	410208.680	868519.421	410208.560	868519.300	0.120	0.121	0.014	0.015
			Pr_cor_2	410188.194	868534.247	410187.693	868533.047	0.501	1.200	0.251	1.440
			Pr_cor_3	410218.118	868578.701	410218.114	868578.731	0.004	-0.030	0.000	0.001
			Pr_cor_4	410229.154	868572.460	410229.054	868571.460	0.100	1.000	0.010	1.000
habib jemal	Pr_13	FID_558	Pr_cor_1	410188.198	868533.247	410188.093	868533.047	0.105	0.200	0.011	0.040
			Pr_cor_2	410166.302	868547.882	410166.302	868547.682	0.000	0.200	0.000	0.040
			Pr_cor_3	410189.277	868582.976	410189.273	868582.776	0.004	0.200	0.000	0.040
			Pr_cor_4	410212.031	868567.757	410210.837	868567.657	1.194	0.100	1.426	0.010
mulu segude	Pr_14	FID_572	Pr_cor_1	410211.857	868567.667	410210.837	868567.657	1.020	0.010	1.040	0.000
			Pr_cor_2	410189.373	868582.876	410189.273	868582.776	0.100	0.100	0.010	0.010
			Pr_cor_3	410196.192	868594.336	410196.172	868593.316	0.020	1.020	0.000	1.040
			Pr_cor_4	410218.144	868578.031	410218.114	868578.731	0.030	-0.700	0.001	0.490
	Pr_15	FID_563	Pr_cor_1	410223.157	868542.337	410223.057	868542.237	0.100	0.100	0.010	0.010
			Pr_cor_2	410213.284	868548.510	410213.264	868548.577	0.020	-0.067	0.000	0.005
			Pr_cor_3	410229.154	868572.560	410229.054	868571.460	0.100	1.100	0.010	1.210
			Pr_cor_4	410237.888	868565.631	410237.838	868565.621	0.050	0.010	0.002	0.000
Awel jemal	Pr_16	FID_564	Pr_cor_1	410233.497	868535.148	410233.493	868535.480	0.004	-0.332	0.000	0.110
			Pr_cor_2	410223.087	868571.660	410223.057	868571.460	0.030	0.200	0.001	0.040
			Pr_cor_3	410237.881	868565.631	410237.838	868565.621	0.043	0.010	0.002	0.000
			Pr_cor_4	410248.358	868558.962	410248.338	868558.642	0.020	0.320	0.000	0.102
Albeyan hitsan masadegiya	Pr_17	FID_558	Pr_cor_1	410243.020	868529.345	410243.123	868529.245	-0.103	0.100	0.011	0.010
			Pr_cor_2	410233.413	868535.448	410233.493	868535.480	-0.080	-0.032	0.006	0.001
			Pr_cor_3	410257.502	868552.521	410257.562	868552.510	-0.060	0.011	0.004	0.000
			Pr_cor_4	410248.338	868558.646	410248.338	868558.642	0.000	0.004	0.000	0.000
Dilsebo Reshid	Pr_18	FID_555	Pr_cor_1	410253.031	868522.566	410253.131	868522.766	-0.100	-0.200	0.010	0.040
			Pr_cor_2	410243.163	868529.345	410243.123	868529.245	0.040	0.100	0.002	0.010
			Pr_cor_3	410248.398	868558.643	410248.338	868558.642	0.060	0.001	0.004	0.000
			Pr_cor_4	410268.099	868545.534	410268.089	868545.514	0.010	0.020	0.000	0.000
Abdela Barkeda	Pr_19	FID_552	Pr_cor_1	410263.389	868515.905	410263.589	868515.995	-0.200	-0.090	0.040	0.008
			Pr_cor_2	410253.251	868522.786	410253.131	868522.766	0.120	0.020	0.014	0.000
			Pr_cor_3	410268.009	868545.544	410268.089	868545.514	-0.080	0.030	0.006	0.001
			Pr_cor_4	410278.634	868538.537	410278.534	868538.570	0.100	-0.033	0.010	0.001

Akme Bahre	Pr_20	FID_541	Pr_cor_1	410274.547	868508.966	410274.507	868508.926	0.040	0.040	0.002	0.002
			Pr_cor_2	410263.589	868515.795	410263.589	868515.995	0.000	-0.200	0.000	0.040
			Pr_cor_3	410278.504	868538.567	410278.534	868538.570	-0.030	-0.003	0.001	0.000
			Pr_cor_4	410289.576	868532.368	410289.376	868531.364	0.200	1.004	0.040	1.008
adminstration	Pr_21	FID_529	Pr_cor_1	410060.696	868537.879	410060.686	868537.879	0.010	0.000	0.000	0.000
			Pr_cor_2	410026.810	868560.769	410026.819	868560.739	-0.009	0.030	0.000	0.001
			Pr_cor_3	410059.809	868603.485	410059.839	868603.285	-0.030	0.200	0.001	0.040
			Pr_cor_4	410092.446	868581.484	410092.436	868581.483	0.010	0.001	0.000	0.000
market center	Pr_22		Pr_cor_1	410036.273	868396.081	410036.253	868395.213	0.020	0.868	0.000	0.753
			Pr_cor_2	409937.848	868436.763	409937.828	868436.753	0.020	0.010	0.000	0.000
			Pr_cor_3	410020.398	868548.342	410020.378	868548.142	0.020	0.200	0.000	0.040
			Pr_cor_4	410108.488	868492.554	410108.484	868491.522	0.004	1.032	0.000	1.065
	Pr_23	OBID_146	Pr_cor_1	409850.499	868344.265	409850.497	868344.065	0.002	0.200	0.000	0.040
			Pr_cor_2	409834.598	868355.572	409834.428	868355.272	0.170	0.300	0.029	0.090
			Pr_cor_3	409848.531	868375.787	409848.350	868375.787	0.181	0.000	0.033	0.000
			Pr_cor_4	409863.561	868366.375	409863.541	868366.275	0.020	0.100	0.000	0.010
	Pr_24	OBID_147	Pr_cor_1	409835.428	868355.202	409834.428	868355.272	1.000	-0.070	1.000	0.005
			Pr_cor_2	409820.869	868364.705	409820.839	868364.750	0.030	-0.045	0.001	0.002
			Pr_cor_3	409833.102	868384.901	409833.757	868384.925	-0.655	-0.025	0.429	0.001
			Pr_cor_4	409864.571	868366.375	409863.741	868366.275	0.830	0.100	0.689	0.010
	Pr_25	OBID_145	Pr_cor_1	409821.839	868364.755	409820.839	868364.750	1.000	0.005	1.000	0.000
			Pr_cor_2	409786.225	868389.244	409786.005	868389.044	0.220	0.200	0.048	0.040
			Pr_cor_3	409812.008	868424.470	409810.238	868424.670	1.770	-0.200	3.133	0.040
			Pr_cor_4	409844.956	868402.485	409844.935	868402.385	0.021	0.100	0.000	0.010
	Pr_26	OBID_151	Pr_cor_1	409844.015	868402.305	409844.935	868402.385	-0.920	-0.080	0.846	0.006
			Pr_cor_2	409859.895	868392.794	409859.885	868392.784	0.010	0.010	0.000	0.000
			Pr_cor_3	409848.353	868375.889	409848.350	868375.787	0.003	0.102	0.000	0.010
			Pr_cor_4	409833.778	868384.945	409833.757	868384.925	0.021	0.020	0.000	0.000
	Pr_27	OBID_150	Pr_cor_1	409859.890	868392.789	409859.885	868392.784	0.005	0.005	0.000	0.000
			Pr_cor_2	409873.944	868384.849	409873.844	868383.819	0.100	1.030	0.010	1.061
			Pr_cor_3	409863.551	868366.375	409863.541	868366.275	0.010	0.100	0.000	0.010
			Pr_cor_4	409848.650	868375.987	409848.350	868375.787	0.300	0.200	0.090	0.040
Finance and economy mamrya	Pr_28	OBID_106	Pr_cor_1	410195.436	868228.268	410194.436	868227.968	1.000	0.300	1.000	0.090
			Pr_cor_2	410263.021	868180.596	410261.531	868180.496	1.490	0.100	2.220	0.010
			Pr_cor_3	410229.301	868130.693	410227.399	868130.093	1.902	0.600	3.618	0.360
			Pr_cor_4	410162.020	868177.554	410160.529	868177.454	1.491	0.100	2.223	0.010
Zone party office	Pr_29	OBID_26	Pr_cor_1	410173.080	868244.126	410171.784	868243.996	1.296	0.130	1.680	0.017
			Pr_cor_2	410195.436	868227.978	410194.436	868227.968	1.000	0.010	1.000	0.000
			Pr_cor_3	410161.529	868177.554	410160.529	868177.454	1.000	0.100	1.000	0.010
			Pr_cor_4	410138.705	868193.607	410138.605	868193.619	0.100	-0.012	0.010	0.000
Hed Adminstr.silite zone	Pr_30		Pr_cor_1	410311.130	868145.809	410311.960	868145.879	-0.830	-0.070	0.689	0.005
			Pr_cor_2	410238.008	868043.322	410238.258	868043.022	-0.250	0.300	0.063	0.090

			Pr_cor_3	410197.218	868073.127	410197.528	868072.127	-0.310	1.000	0.096	1.000
			Pr_cor_4	410269.206	868176.326	410269.496	868176.306	-0.290	0.020	0.084	0.000
Fate shehhassen	Pr_31		Pr_cor_1	410352.411	868117.804	410352.011	868117.844	0.400	-0.040	0.160	0.002
			Pr_cor_2	410331.970	868086.135	410331.770	868085.035	0.200	1.100	0.040	1.210
			Pr_cor_3	410295.582	868109.545	410295.522	868109.245	0.060	0.300	0.004	0.090
			Pr_cor_4	410319.074	868141.227	410319.270	868141.127	-0.196	0.100	0.038	0.010
hayishuk baltina	Pr_32		Pr_cor_1	410398.997	868094.454	410398.957	868094.340	0.040	0.114	0.002	0.013
			Pr_cor_2	410368.208	868049.55	410368.258	868049.54	-0.050	0.010	0.002	0.000
			Pr_cor_3	410403.965	868023.7	410403.935	868022.78	0.030	0.923	0.001	0.852
			Pr_cor_4	410433.390	868071.93	410433.490	868070.9	-0.100	1.030	0.010	1.061
juher parek	Pr_33		Pr_cor_1	410377.991	867952.595	410377.931	867952.495	0.060	0.100	0.004	0.010
			Pr_cor_2	410414.714	868003.428	410414.714	868002.328	0.000	1.100	0.000	1.210
			Pr_cor_3	410436.611	867987.124	410436.691	867987.024	-0.080	0.100	0.006	0.010
			Pr_cor_4	410401.380	867936.484	410401.389	867936.482	-0.009	0.002	0.000	0.000
Ezedin	Pr_34		Pr_cor_1	410327.555	867986.487	410327.645	867986.887	-0.090	-0.400	0.008	0.160
			Pr_cor_2	410363.015	868038.309	410363.015	868038.329	0.000	-0.020	0.000	0.000
			Pr_cor_3	410414.716	868002.528	410414.764	868002.328	-0.048	0.200	0.002	0.040
			Pr_cor_4	410377.941	867952.695	410377.931	867952.495	0.010	0.200	0.000	0.040
surur nuri(3)	Pr_35	OBID_138	Pr_cor_1	410417.998	868236.343	410417.978	868236.303	0.020	0.040	0.000	0.002
			Pr_cor_2	410443.465	868275.699	410443.425	868275.990	0.040	-0.291	0.002	0.085
			Pr_cor_3	410458.977	868267.491	410457.999	868267.391	0.978	0.100	0.956	0.010
			Pr_cor_4	410433.749	868227.342	410431.949	868227.042	1.800	0.300	3.240	0.090
shibre husseni(3)	Pr_36	OBID_148	Pr_cor_1	410461.262	868275.229	410461.242	868275.629	0.020	-0.400	0.000	0.160
			Pr_cor_2	410450.890	868282.538	410450.870	868281.808	0.020	0.730	0.000	0.533
			Pr_cor_3	410459.437	868295.804	410459.537	868295.824	-0.100	-0.020	0.010	0.000
			Pr_cor_4	410469.560	868289.267	410469.516	868289.067	0.044	0.200	0.002	0.040
jemal husen	Pr_37	OBID_147	Pr_cor_1	410471.284	868292.181	410471.280	868292.081	0.004	0.100	0.000	0.010
			Pr_cor_2	410461.001	868298.618	410461.030	868298.680	-0.029	-0.062	0.001	0.004
			Pr_cor_3	410469.205	868311.823	410469.755	868311.803	-0.550	0.020	0.302	0.000
			Pr_cor_4	410479.877	868305.233	410479.657	868305.030	0.220	0.203	0.048	0.041
sultan salo	Pr_38		Pr_cor_1	410516.829	868362.091	410516.429	868361.691	0.400	0.400	0.160	0.160
			Pr_cor_2	410506.522	868368.453	410506.322	868368.253	0.200	0.200	0.040	0.040
			Pr_cor_3	410514.757	868381.536	410514.787	868381.336	-0.030	0.200	0.001	0.040
			Pr_cor_4	410524.999	868374.970	410524.949	868374.973	0.050	-0.003	0.002	0.000
Jafer Mosqiwe	Pr_39	OBID_21	Pr_cor_1	410519.670	868292.748	410519.470	868292.718	0.200	0.030	0.040	0.001
			Pr_cor_2	410607.703	868413.670	410607.653	868413.672	0.050	-0.002	0.002	0.000
			Pr_cor_3	410688.361	868356.445	410688.361	868356.145	0.000	0.300	0.000	0.090
			Pr_cor_4	410601.364	868237.136	410601.364	868237.036	0.000	0.100	0.000	0.010
	Pr_40	OBID_22	Pr_cor_1	410566.915	868147.521	410566.910	868147.211	0.005	0.310	0.000	0.096
			Pr_cor_2	410613.937	868208.256	410613.947	868208.056	-0.010	0.200	0.000	0.040
			Pr_cor_3	410684.122	868138.924	410684.452	868138.914	-0.330	0.010	0.109	0.000
			Pr_cor_4	410646.339	868088.678	410646.839	868088.578	-0.500	0.100	0.250	0.010

Heji fedlu_pepesi campany	*Pr_41*	*OBID_30*	*Pr_cor_1*	*410267.405*	*867634.557*	*410267.485*	*867634.547*	*-0.080*	*0.010*	*0.006*	*0.000*
			Pr_cor_2	*410365.211*	*867637.393*	*410365.911*	*867637.193*	*-0.700*	*0.200*	*0.490*	*0.040*
			Pr_cor_3	*410365.597*	*867524.257*	*410365.547*	*867524.057*	*0.050*	*0.200*	*0.002*	*0.040*
			Pr_cor_4	*410263.271*	*867527.226*	*410263.251*	*867527.126*	*0.020*	*0.100*	*0.000*	*0.010*
momina mossa	*Pr_42*	*OBID_65*	*Pr_cor_1*	*410266.156*	*867320.659*	*410265.156*	*867320.629*	*1.000*	*0.030*	*1.000*	*0.001*
			Pr_cor_2	*410266.475*	*867367.972*	*410267.075*	*867367.772*	*-0.600*	*0.200*	*0.360*	*0.040*
			Pr_cor_3	*410365.621*	*867369.588*	*410365.521*	*867369.558*	*0.100*	*0.030*	*0.010*	*0.001*
			Pr_cor_4	*410366.486*	*867317.701*	*410366.386*	*867317.771*	*0.100*	*-0.070*	*0.010*	*0.005*
Temima reshid	*Pr_43*	*OBID_66*	*Pr_cor_1*	*410266.175*	*867367.072*	*410266.075*	*867367.772*	*0.100*	*-0.700*	*0.010*	*0.490*
			Pr_cor_2	*410267.547*	*867442.367*	*410267.537*	*867442.867*	*0.010*	*-0.500*	*0.000*	*0.250*
			Pr_cor_3	*410364.269*	*867444.404*	*410364.269*	*867444.454*	*0.000*	*-0.050*	*0.000*	*0.003*
			Pr_cor_4	*410365.541*	*867369.158*	*410365.521*	*867369.558*	*0.020*	*-0.400*	*0.000*	*0.160*
bahre shesayid	*Pr_44*	*OBID_33*	*Pr_cor_1*	*410418.795*	*867464.899*	*410418.775*	*867464.879*	*0.020*	*0.020*	*0.000*	*0.000*
			Pr_cor_2	*410378.749*	*867464.255*	*410378.742*	*867464.155*	*0.007*	*0.100*	*0.000*	*0.010*
			Pr_cor_3	*867464.355*	*867514.661*	*867464.155*	*867514.161*	*0.200*	*0.500*	*0.040*	*0.250*
			Pr_cor_4	*410424.259*	*867514.239*	*410424.259*	*867514.269*	*0.000*	*-0.030*	*0.000*	*0.001*
mujiza salo	*Pr_45*	*OBID_31*	*Pr_cor_1*	*410481.156*	*867466.207*	*410481.136*	*867466.007*	*0.020*	*0.200*	*0.000*	*0.040*
			Pr_cor_2	*410418.795*	*867464.849*	*410418.775*	*867464.879*	*0.020*	*-0.030*	*0.000*	*0.001*
			Pr_cor_3	*410424.759*	*867515.369*	*410424.259*	*867514.269*	*0.500*	*1.100*	*0.250*	*1.210*
			Pr_cor_4	*410490.926*	*867514.556*	*410490.926*	*867514.426*	*0.000*	*0.130*	*0.000*	*0.017*
			Pr_cor_5	*410493.178*	*867482.876*	*410492.778*	*867482.676*	*0.400*	*0.200*	*0.160*	*0.040*
hussen mossa	*Pr_46*	*OBID_51*	*Pr_cor_1*	*410492.244*	*867542.234*	*410492.644*	*867541.234*	*-0.400*	*1.000*	*0.160*	*1.000*
			Pr_cor_2	*410492.914*	*867526.080*	*410492.910*	*867525.878*	*0.004*	*0.202*	*0.000*	*0.041*
			Pr_cor_3	*410463.943*	*867525.878*	*410463.923*	*867525.878*	*0.020*	*0.000*	*0.000*	*0.000*
			Pr_cor_4	*410464.141*	*867540.009*	*410464.111*	*867540.809*	*0.030*	*-0.800*	*0.001*	*0.640*
jemal hussen	*Pr_47*	*OBID_53*	*Pr_cor_1*	*410492.193*	*867555.742*	*410492.393*	*867555.722*	*-0.200*	*0.020*	*0.040*	*0.000*
			Pr_cor_2	*410492.694*	*867542.334*	*410492.644*	*867541.234*	*0.050*	*1.100*	*0.003*	*1.210*
			Pr_cor_3	*410464.181*	*867540.921*	*410464.111*	*867540.809*	*0.070*	*0.112*	*0.005*	*0.013*
			Pr_cor_4	*410464.299*	*867555.654*	*410464.297*	*867555.677*	*0.002*	*-0.023*	*0.000*	*0.001*
abdela werke	*Pr_48*	*OBID_55*	*Pr_cor_1*	*410493.175*	*867568.235*	*410492.171*	*867568.200*	*1.004*	*0.035*	*1.008*	*0.001*
			Pr_cor_2	*410492.493*	*867555.702*	*410492.393*	*867555.722*	*0.100*	*-0.020*	*0.010*	*0.000*
			Pr_cor_3	*410464.497*	*867555.687*	*410464.297*	*867555.677*	*0.200*	*0.010*	*0.040*	*0.000*
			Pr_cor_4	*410464.966*	*867569.208*	*410464.466*	*867569.202*	*0.500*	*0.006*	*0.250*	*0.000*
sunko hussen	*Pr_49*	*OBID_57*	*Pr_cor_1*	*410491.967*	*867582.326*	*410491.927*	*867582.600*	*0.040*	*-0.274*	*0.002*	*0.075*
			Pr_cor_2	*410492.671*	*867568.655*	*410492.171*	*867568.500*	*0.500*	*0.155*	*0.250*	*0.024*
			Pr_cor_3	*410464.666*	*867569.672*	*410464.466*	*867569.202*	*0.200*	*0.470*	*0.040*	*0.221*
			Pr_cor_4	*410464.609*	*867583.109*	*410464.639*	*867582.999*	*-0.030*	*0.110*	*0.001*	*0.012*
nuri abdela	*Pr_50*	*OBID_60*	*Pr_cor_1*	*410491.107*	*867598.234*	*410491.677*	*867597.014*	*-0.570*	*1.220*	*0.325*	*1.488*
			Pr_cor_2	*410492.920*	*867582.966*	*410491.927*	*867583.830*	*0.993*	*-0.864*	*0.986*	*0.746*
			Pr_cor_3	*410464.649*	*867582.099*	*410464.639*	*867582.999*	*0.010*	*-0.900*	*0.000*	*0.810*
			Pr_cor_4	*410464.809*	*867597.769*	*410464.815*	*867597.999*	*-0.006*	*-0.230*	*0.000*	*0.053*
seyid umer	*Pr_51*	*OBID_61*	*Pr_cor_1*	*410491.488*	*867610.508*	*410491.442*	*867610.568*	*0.046*	*-0.060*	*0.002*	*0.004*

			Pr_cor_2	410491.897	867598.344	410491.677	867597.014	0.220	1.330	0.048	1.769
			Pr_cor_3	410464.855	867596.349	410464.985	867597.199	-0.130	-0.850	0.017	0.722
			Pr_cor_4	410464.900	867611.194	410464.992	867611.154	-0.092	0.040	0.008	0.002
	Pr_52		Pr_cor_1	410491.594	867624.867	410491.194	867624.837	0.400	0.030	0.160	0.001
			Pr_cor_2	410491.440	867610.588	410491.442	867610.568	-0.002	0.020	0.000	0.000
			Pr_cor_3	410464.932	867612.354	410464.992	867611.154	-0.060	1.200	0.004	1.440
			Pr_cor_4	410465.198	867624.992	410465.166	867624.963	0.032	0.029	0.001	0.001
dedgeba usman	Pr_53	OBID_49	Pr_cor_1	410491.906	867640.351	410490.926	867640.310	0.980	0.041	0.960	0.002
			Pr_cor_2	410491.194	867624.837	410491.394	867624.837	-0.200	0.000	0.040	0.000
			Pr_cor_3	410466.106	867625.983	410465.166	867624.963	0.940	1.020	0.884	1.040
			Pr_cor_4	410465.758	867640.331	410465.358	867640.710	0.400	-0.379	0.160	0.144
abdurezak hussen	Pr_54	OBID_50	Pr_cor_1	410437.768	867625.297	410437.568	867625.097	0.200	0.200	0.040	0.040
			Pr_cor_2	410437.358	867640.410	410437.348	867640.310	0.010	0.100	0.000	0.010
			Pr_cor_3	410465.058	867640.371	410465.358	867640.310	-0.300	0.061	0.090	0.004
			Pr_cor_4	410465.100	867624.968	410465.166	867624.963	-0.066	0.005	0.004	0.000
sefiya seyid	Pr_55	OBID_65	Pr_cor_1	410437.160	867611.958	410437.760	867611.758	-0.600	0.200	0.360	0.040
			Pr_cor_2	410437.598	867625.597	410437.568	867625.097	0.030	0.500	0.001	0.250
			Pr_cor_3	410465.186	867624.973	410465.166	867624.963	0.020	0.010	0.000	0.000
			Pr_cor_4	410465.992	867611.354	410464.992	867611.154	1.000	0.200	1.000	0.040
	Pr_56		Pr_cor_1	410437.974	867596.985	410437.974	867596.985	0.000	0.000	0.000	0.000
			Pr_cor_2	410437.786	867611.778	410437.760	867611.758	0.026	0.020	0.001	0.000
			Pr_cor_3	410464.002	867613.354	410464.992	867613.240	-0.990	0.114	0.980	0.013
			Pr_cor_4	410464.205	867597.239	410464.815	867597.999	-0.610	-0.760	0.372	0.578
diltata ahmed	Pr_57		Pr_cor_1	410438.199	867584.395	410438.170	867583.485	0.029	0.910	0.001	0.828
			Pr_cor_2	410437.971	867596.989	410437.974	867596.985	-0.003	0.004	0.000	0.000
			Pr_cor_3	410464.915	867596.909	410464.815	867596.090	0.100	0.819	0.010	0.671
			Pr_cor_4	410464.649	867582.949	410464.639	867582.999	0.010	-0.050	0.000	0.002
sunko hussen	Pr_58	OBID_55	Pr_cor_1	410438.386	867569.974	410438.366	867569.864	0.020	0.110	0.000	0.012
			Pr_cor_2	410438.177	867583.485	410438.170	867583.385	0.007	0.100	0.000	0.010
			Pr_cor_3	410464.649	867582.909	410464.639	867582.099	0.010	0.810	0.000	0.656
			Pr_cor_4	410464.469	867569.242	410464.466	867569.202	0.003	0.040	0.000	0.002
lebiba musema	Pr_59	OBID_56	Pr_cor_1	410438.578	867556.656	410438.571	867555.636	0.007	1.020	0.000	1.040
			Pr_cor_2	410438.300	867569.884	410438.366	867569.864	-0.066	0.020	0.004	0.000
			Pr_cor_3	410464.486	867569.402	410464.466	867569.202	0.020	0.200	0.000	0.040
			Pr_cor_4	410464.497	867555.607	410464.297	867555.677	0.200	-0.070	0.040	0.005
kedir hussen	Pr_60		Pr_cor_1	410438.701	867540.681	410438.791	867540.431	-0.090	0.250	0.008	0.063
			Pr_cor_2	410438.578	867555.756	410438.571	867555.636	0.007	0.120	0.000	0.014
			Pr_cor_3	410464.397	867555.877	410464.297	867555.677	0.100	0.200	0.010	0.040
			Pr_cor_4	410464.191	867541.879	410464.111	867540.809	0.080	1.070	0.006	1.145
hussen mossa	Pr_61		Pr_cor_1	410439.221	867525.808	410439.001	867525.878	0.220	-0.070	0.048	0.005
			Pr_cor_2	410438.201	867540.476	410438.791	867540.431	-0.590	0.045	0.348	0.002
			Pr_cor_3	410464.181	867540.839	410464.111	867540.809	0.070	0.030	0.005	0.001

			Pr_cor_4	410463.900	867525.838	410463.923	867525.878	-0.023	-0.040	0.001	0.002
sheshifa begari	Pr_62	OBID_36	Pr_cor_1	410503.056	867438.367	410503.096	867437.167	-0.040	1.200	0.002	1.440
			Pr_cor_2	410514.731	867444.247	410514.738	867444.047	-0.007	0.200	0.000	0.040
			Pr_cor_3	410519.228	867444.007	410519.888	867444.047	-0.660	-0.040	0.436	0.002
			Pr_cor_4	410520.119	867417.126	410520.199	867417.660	-0.080	-0.534	0.006	0.285
			Pr_cor_5	410503.337	867418.890	410503.327	867417.690	0.010	1.200	0.000	1.440
zahra shehassen	PR_63	OBID_47	Pr_cor_1	410519.808	867444.147	410519.888	867444.047	-0.080	0.100	0.006	0.010
			Pr_cor_2	410533.429	867444.137	410533.424	867444.047	0.005	0.090	0.000	0.008
			Pr_cor_3	410533.509	867417.606	410533.546	867417.636	-0.037	-0.030	0.001	0.001
			Pr_cor_4	410520.909	867417.860	410520.199	867417.660	0.710	0.200	0.504	0.040
reshad adem	PR_64	OBID_45	Pr_cor_1	410533.464	867444.147	410533.424	867444.047	0.040	0.100	0.002	0.010
			Pr_cor_2	410548.663	867445.757	410549.933	867446.647	-1.270	-0.890	1.613	0.792
			Pr_cor_3	410548.312	867417.814	410548.380	867417.610	-0.068	0.204	0.005	0.042
			Pr_cor_4	410533.566	867417.606	410533.546	867417.636	0.020	-0.030	0.000	0.001
nuri wabela	PR_65	OBID_43	Pr_cor_1	410548.601	867444.007	410548.633	867444.047	-0.032	-0.040	0.001	0.002
			Pr_cor_2	410561.253	867444.087	410561.223	867444.047	0.030	0.040	0.001	0.002
			Pr_cor_3	410561.857	867418.596	410561.850	867417.586	0.007	1.010	0.000	1.020
			Pr_cor_4	410548.384	867417.651	410548.380	867417.610	0.004	0.041	0.000	0.002
shemse kimbado	PR_66	OBID_41	Pr_cor_1	410561.220	867444.777	410561.223	867445.547	-0.003	-0.770	0.000	0.593
			Pr_cor_2	410575.599	867444.147	410575.559	867444.047	0.040	0.100	0.002	0.010
			Pr_cor_3	410575.776	867418.571	410575.766	867417.561	0.010	1.010	0.000	1.020
			Pr_cor_4	410561.866	867417.696	410561.850	867417.586	0.016	0.110	0.000	0.012
sultan ahmed	PR_67	OBID_39	Pr_cor_1	410575.119	867444.067	410575.559	867444.047	-0.440	0.020	0.194	0.000
			Pr_cor_2	410588.017	867444.247	410588.917	867444.047	-0.900	0.200	0.810	0.040
			Pr_cor_3	410589.510	867417.556	410589.583	867417.536	-0.073	0.020	0.005	0.000
			Pr_cor_4	410575.786	867416.501	410575.766	867417.561	0.020	-1.060	0.000	1.124
anwar abdela	PR_68	OBID_37	Pr_cor_1	410588.987	867444.247	410588.917	867444.047	0.070	0.200	0.005	0.040
			Pr_cor_2	410603.087	867444.057	410603.087	867444.047	0.000	0.010	0.000	0.000
			Pr_cor_3	410604.678	867417.501	410603.678	867417.511	1.000	-0.010	1.000	0.000
			Pr_cor_4	410589.503	867416.956	410589.583	867417.536	-0.080	-0.580	0.006	0.336
bahriya shereshad	PR_69	OBID_35	Pr_cor_1	410603.007	867444.247	410603.087	867444.047	-0.080	0.200	0.006	0.040
			Pr_cor_2	410618.101	867444.247	410618.191	867444.047	-0.090	0.200	0.008	0.040
			Pr_cor_3	410618.517	867417.435	410618.597	867417.485	-0.080	-0.050	0.006	0.002
			Pr_cor_4	410603.618	867417.731	410603.678	867417.511	-0.060	0.220	0.004	0.048
neja mohammed	PR_70	OBID_34	Pr_cor_1	410520.016	867392.454	410520.496	867392.414	-0.480	0.040	0.230	0.002
			Pr_cor_2	410504.626	867392.451	410503.626	867392.453	1.000	-0.002	1.000	0.000
			Pr_cor_3	410503.337	867417.685	410503.327	867417.690	0.010	-0.005	0.000	0.000
			Pr_cor_4	410520.909	867417.760	410520.199	867417.660	0.710	0.100	0.504	0.010
bahre mohammed	PR_71	OBID_46	Pr_cor_1	410533.666	867392.304	410533.663	867392.384	0.003	-0.080	0.000	0.006
			Pr_cor_2	410520.495	867393.444	410520.496	867393.514	0.000	-0.070	0.000	0.005
			Pr_cor_3	410520.199	867416.700	410520.199	867415.960	0.000	0.740	0.000	0.548
			Pr_cor_4	410533.546	867417.656	410533.546	867417.636	0.000	0.020	0.000	0.000

murshida	*PR_72*	*OBID_44*	*Pr_cor_1*	*410548.038*	*867392.451*	*410548.138*	*867393.391*	*-0.100*	*-0.940*	*0.010*	*0.884*
			Pr_cor_2	*410533.963*	*867392.334*	*410533.663*	*867392.384*	*0.300*	*-0.050*	*0.090*	*0.002*
			Pr_cor_3	*410533.046*	*867417.636*	*410533.546*	*867417.636*	*-0.500*	*0.000*	*0.250*	*0.000*
			Pr_cor_4	*410548.388*	*867417.601*	*410548.380*	*867417.610*	*0.008*	*-0.009*	*0.000*	*0.000*
rameto mohammed	*PR_73*	*OBID_42*	*Pr_cor_1*	*410562.650*	*867392.348*	*410562.450*	*867392.318*	*0.200*	*0.030*	*0.040*	*0.001*
			Pr_cor_2	*410549.130*	*867393.371*	*410548.138*	*867392.351*	*0.992*	*1.020*	*0.984*	*1.040*
			Pr_cor_3	*410548.388*	*867417.630*	*410548.380*	*867417.610*	*0.008*	*0.020*	*0.000*	*0.000*
			Pr_cor_4	*410561.800*	*867417.706*	*410561.850*	*867419.589*	*-0.050*	*-1.883*	*0.002*	*3.546*
chumete mohammed	*PR_74*	*OBID_40*	*Pr_cor_1*	*410577.063*	*867392.297*	*410575.963*	*867392.287*	*1.100*	*0.010*	*1.210*	*0.000*
			Pr_cor_2	*410563.009*	*867392.518*	*410562.450*	*867392.318*	*0.559*	*0.200*	*0.313*	*0.040*
			Pr_cor_3	*410562.800*	*867417.186*	*410561.850*	*867417.586*	*0.950*	*-0.400*	*0.903*	*0.160*
			Pr_cor_4	*410575.806*	*867417.581*	*410575.766*	*867417.561*	*0.040*	*0.020*	*0.002*	*0.000*
gulto umer	*PR_75*	*OBID_38*	*Pr_cor_1*	*410591.218*	*867392.464*	*410590.218*	*867392.254*	*1.000*	*0.210*	*1.000*	*0.044*
			Pr_cor_2	*410576.063*	*867392.387*	*410575.963*	*867392.287*	*0.100*	*0.100*	*0.010*	*0.010*
			Pr_cor_3	*410575.765*	*867417.661*	*410575.766*	*867417.561*	*-0.001*	*0.100*	*0.000*	*0.010*
			Pr_cor_4	*410589.583*	*867417.546*	*410589.583*	*867417.536*	*0.000*	*0.010*	*0.000*	*0.000*
abdurehman salo	*PR_76*	*OBID_39*	*Pr_cor_1*	*410604.415*	*867392.242*	*410604.242*	*867392.222*	*0.173*	*0.020*	*0.030*	*0.000*
			Pr_cor_2	*410591.218*	*867392.354*	*410590.218*	*867392.254*	*1.000*	*0.100*	*1.000*	*0.010*
			Pr_cor_3	*410589.582*	*867418.554*	*410589.583*	*867417.536*	*-0.001*	*1.018*	*0.000*	*1.036*
			Pr_cor_4	*410603.678*	*410603.670*	*410603.678*	*410603.678*	*0.000*	*-0.008*	*0.000*	*0.000*
nuredin wabela	*PR_77*	*OBID_36*	*Pr_cor_1*	*410618.904*	*867392.288*	*410618.984*	*867392.188*	*-0.080*	*0.100*	*0.006*	*0.010*
			Pr_cor_2	*410604.042*	*867392.252*	*410604.242*	*867392.222*	*-0.200*	*0.030*	*0.040*	*0.001*
			Pr_cor_3	*410604.671*	*410604.778*	*410603.678*	*410603.678*	*0.993*	*1.100*	*0.986*	*1.210*
			Pr_cor_4	*410618.197*	*867417.585*	*410618.597*	*867417.485*	*-0.400*	*0.100*	*0.160*	*0.010*
nesre muzeyin	*PR_78*	*OBID_70*	*Pr_cor_1*	*410217.255*	*867282.881*	*410217.215*	*867282.881*	*0.040*	*0.000*	*0.002*	*0.000*
			Pr_cor_2	*410217.019*	*867268.914*	*410217.319*	*867268.714*	*-0.300*	*0.200*	*0.090*	*0.040*
			Pr_cor_3	*410176.238*	*867267.555*	*410176.838*	*867266.535*	*-0.600*	*1.020*	*0.360*	*1.040*
			Pr_cor_4	*410176.882*	*867282.836*	*410176.802*	*867282.816*	*0.080*	*0.020*	*0.006*	*0.000*
amina hassen	*PR_79*	*OBID_69*	*Pr_cor_1*	*410217.313*	*867310.364*	*410217.013*	*867310.164*	*0.300*	*0.200*	*0.090*	*0.040*
			Pr_cor_2	*410217.225*	*867282.081*	*410217.215*	*867282.881*	*0.010*	*-0.800*	*0.000*	*0.640*
			Pr_cor_3	*410176.832*	*867283.856*	*410176.802*	*867282.816*	*0.030*	*1.040*	*0.001*	*1.082*
			Pr_cor_4	*410176.764*	*867309.150*	*410176.744*	*867309.100*	*0.020*	*0.050*	*0.000*	*0.003*
belay assefa	*PR_80*	*OBID_67*	*Pr_cor_1*	*410216.009*	*867358.126*	*410216.660*	*867358.060*	*-0.651*	*0.066*	*0.424*	*0.004*
			Pr_cor_2	*410217.083*	*867311.264*	*410217.013*	*867310.164*	*0.070*	*1.100*	*0.005*	*1.210*
			Pr_cor_3	*410176.700*	*867309.210*	*410176.744*	*867309.100*	*-0.044*	*0.110*	*0.002*	*0.012*
			Pr_cor_4	*410176.610*	*867357.108*	*410176.638*	*867357.148*	*-0.028*	*-0.040*	*0.001*	*0.002*
ali kemal	*PR_81*	*OBID_68*	*Pr_cor_1*	*410216.478*	*867383.528*	*410216.472*	*867383.508*	*0.006*	*0.020*	*0.000*	*0.000*
			Pr_cor_2	*410216.609*	*867358.106*	*410216.660*	*867358.060*	*-0.051*	*0.046*	*0.003*	*0.002*
			Pr_cor_3	*410177.638*	*867357.248*	*410176.638*	*867357.148*	*1.000*	*0.100*	*1.000*	*0.010*
			Pr_cor_4	*410176.582*	*867382.502*	*410176.582*	*867382.552*	*0.000*	*-0.050*	*0.000*	*0.003*
hulchafo salo	*PR_82*	*OBID_72*	*Pr_cor_1*	*410166.007*	*867462.163*	*410167.007*	*867462.063*	*-1.000*	*0.100*	*1.000*	*0.010*
			Pr_cor_2	*410150.302*	*867461.947*	*410150.372*	*867461.937*	*-0.070*	*0.010*	*0.005*	*0.000*

			Pr_cor_3	410149.719	867487.607	410149.799	867487.007	-0.080	0.600	0.006	0.360
			Pr_cor_4	410166.513	867488.016	410166.313	867487.416	0.200	0.600	0.040	0.360
sultan selman	PR_83	OBID_74	Pr_cor_1	410150.352	867462.967	410150.372	867461.937	-0.020	1.030	0.000	1.061
			Pr_cor_2	410135.806	867461.936	410135.866	867461.826	-0.060	0.110	0.004	0.012
			Pr_cor_3	410135.719	867486.008	410135.749	867486.658	-0.030	-0.650	0.001	0.423
			Pr_cor_4	410149.999	867487.007	410149.799	867487.007	0.200	0.000	0.040	0.000
towfik mohammed	PR_84	OBID_76	Pr_cor_1	410135.966	867462.756	410135.866	867461.826	0.100	0.930	0.010	0.865
			Pr_cor_2	410116.344	867461.878	410116.314	867461.678	0.030	0.200	0.001	0.040
			Pr_cor_3	410116.858	867487.284	410116.638	867486.184	0.220	1.100	0.048	1.210
			Pr_cor_4	410135.759	867486.958	410135.749	867487.866	0.010	-0.908	0.000	0.824
	PR_85	OBID_73	Pr_cor_1	410115.281	867512.256	410116.981	867513.160	-1.700	-0.904	2.890	0.817
			Pr_cor_2	410135.677	867513.455	410135.627	867512.355	0.050	1.100	0.003	1.210
			Pr_cor_3	410135.700	867486.608	410135.749	867486.658	-0.049	-0.050	0.002	0.003
			Pr_cor_4	410116.633	867486.284	410116.638	867486.184	-0.005	0.100	0.000	0.010
shukre ahmed	PR_86	OBID_77	Pr_cor_1	410135.647	867512.565	410135.627	867512.355	0.020	0.210	0.000	0.044
			Pr_cor_2	410149.236	867512.235	410149.216	867512.500	0.020	-0.265	0.000	0.070
			Pr_cor_3	410149.709	867487.077	410149.799	867487.107	-0.090	-0.030	0.008	0.001
			Pr_cor_4	410135.769	867485.558	410135.749	867486.658	0.020	-1.100	0.000	1.210
hussen amen	PR_87	OBID_75	Pr_cor_1	410149.246	867512.560	410149.216	867511.550	0.030	1.010	0.001	1.020
			Pr_cor_2	410165.662	867512.096	410165.622	867510.776	0.040	1.320	0.002	1.742
			Pr_cor_3	410166.343	867487.446	410166.313	867487.516	0.030	-0.070	0.001	0.005
			Pr_cor_4	410149.719	867487.207	410149.799	867487.007	-0.080	0.200	0.006	0.040
Silite cltural Hall	PR_88	OBID_	Pr_cor_1	410157.966	867686.785	410157.936	867684.985	0.030	1.800	0.001	3.240
			Pr_cor_2	410158.877	867523.946	410158.567	867523.836	0.310	0.110	0.096	0.012
			Pr_cor_3	410067.911	867526.777	410067.961	867526.677	-0.050	0.100	0.002	0.010
			Pr_cor_4	410060.099	867685.701	410060.699	867685.791	-0.600	-0.090	0.360	0.008
	PR_89	FID_335	Pr_cor_1	409983.221	867765.837	409983.021	867764.827	0.200	1.010	0.040	1.020
			Pr_cor_2	409984.158	867754.199	409983.148	867754.099	1.010	0.100	1.020	0.010
			Pr_cor_3	409959.962	867754.758	409959.852	867753.480	0.110	1.278	0.012	1.633
			Pr_cor_4	409959.416	867764.351	409959.413	867764.251	0.003	0.100	0.000	0.010
shebahredin radi	PR_90	FID_686	Pr_cor_1	409982.900	867774.967	409982.903	867774.757	-0.003	0.210	0.000	0.044
			Pr_cor_2	409983.001	867764.967	409983.021	867764.827	-0.020	0.140	0.000	0.020
			Pr_cor_3	409959.444	867765.301	409959.413	867764.251	0.031	1.050	0.001	1.102
			Pr_cor_4	409959.007	867773.991	409959.017	867773.961	-0.010	0.030	0.000	0.001
nuriya Ahemad	PR_91	OBID_113	Pr_cor_1	409982.181	867785.004	409982.781	867785.042	-0.600	-0.038	0.360	0.001
			Pr_cor_2	409983.923	867775.857	409982.903	867774.897	1.020	0.960	1.040	0.922
			Pr_cor_3	409959.077	867774.171	409959.017	867773.961	0.060	0.210	0.004	0.044
			Pr_cor_4	409958.806	867784.211	409958.603	867784.110	0.203	0.101	0.041	0.010
amina muzeyin	PR_92	OBID_112	Pr_cor_1	409982.634	867795.329	409982.660	867795.229	-0.026	0.100	0.001	0.010
			Pr_cor_2	409982.791	867786.142	409982.781	867785.897	0.010	0.245	0.000	0.060
			Pr_cor_3	409959.613	867784.211	409958.603	867783.310	1.010	0.901	1.020	0.812
			Pr_cor_4	409958.176	867794.343	409958.186	867794.437	-0.010	-0.094	0.000	0.009

	PR_93	FID_337	Pr_cor_1	409982.540	867803.868	409982.548	867804.598	-0.008	-0.730	0.000	0.533
			Pr_cor_2	409982.600	867796.329	409982.660	867795.229	-0.060	1.100	0.004	1.210
			Pr_cor_3	409958.146	867795.333	409958.186	867794.333	-0.040	1.000	0.002	1.000
			Pr_cor_4	409958.821	867803.972	409957.801	867803.692	1.020	0.280	1.040	0.078
	PR_94	OBID_111	Pr_cor_1	409982.312	867824.781	409982.310	867824.681	0.002	0.100	0.000	0.010
			Pr_cor_2	409982.849	867804.758	409982.548	867804.828	0.301	-0.070	0.091	0.005
			Pr_cor_3	409957.804	867803.172	409957.801	867803.772	0.003	-0.600	0.000	0.360
			Pr_cor_4	409956.988	867824.292	409956.956	867824.492	0.032	-0.200	0.001	0.040
nasir adem	PR_95	OBID_110	Pr_cor_1	409982.183	867835.552	409982.180	867835.592	0.003	-0.040	0.000	0.002
			Pr_cor_2	409983.312	867824.781	409982.310	867824.889	1.002	-0.108	1.004	0.012
			Pr_cor_3	409956.958	867825.292	409956.956	867824.492	0.002	0.800	0.000	0.640
			Pr_cor_4	409957.529	867835.318	409956.522	867835.118	1.007	0.200	1.014	0.040
shukre siraje	PR_96	OBID_108	Pr_cor_1	409982.453	867854.511	409981.953	867854.711	0.500	-0.200	0.250	0.040
			Pr_cor_2	409982.280	867836.192	409982.180	867835.699	0.100	0.493	0.010	0.243
			Pr_cor_3	409956.542	867835.218	409956.522	867835.118	0.020	0.100	0.000	0.010
			Pr_cor_4	409955.723	867853.725	409955.773	867853.505	-0.050	0.220	0.002	0.048
hamdala kere	PR_97	OBID_81	Pr_cor_1	409926.653	867645.977	409925.650	867645.757	1.003	0.220	1.006	0.048
			Pr_cor_2	409925.557	867629.446	409925.957	867629.326	-0.400	0.120	0.160	0.014
			Pr_cor_3	409901.328	867629.268	409901.368	867629.068	-0.040	0.200	0.002	0.040
			Pr_cor_4	409900.209	867645.314	409900.869	867645.014	-0.660	0.300	0.436	0.090
sadiya nasir	PR_98	OBID_82	Pr_cor_1	409925.406	867657.962	409925.426	867657.762	-0.020	0.200	0.000	0.040
			Pr_cor_2	409926.901	867645.707	409925.650	867645.757	1.251	-0.050	1.565	0.003
			Pr_cor_3	409900.819	867645.114	409900.869	867645.014	-0.050	0.100	0.002	0.010
			Pr_cor_4	409901.099	867656.560	409900.479	867655.490	0.620	1.070	0.384	1.145
mohammed umer	PR_99	OBID_84	Pr_cor_1	409925.121	867672.472	409925.151	867672.432	-0.030	0.040	0.001	0.002
			Pr_cor_2	409925.456	867657.792	409925.426	867657.762	0.030	0.030	0.001	0.001
			Pr_cor_3	409900.489	867658.346	409900.479	867657.460	0.010	0.886	0.000	0.785
			Pr_cor_4	409900.201	867672.206	409900.010	867672.406	0.191	-0.200	0.036	0.040
shukre musebo	PR_100	OBID_84	Pr_cor_1	409924.802	867686.736	409924.888	867686.536	-0.086	0.200	0.007	0.040
			Pr_cor_2	409925.351	867672.532	409925.151	867672.432	0.200	0.100	0.040	0.010
			Pr_cor_3	409900.015	867672.426	409900.010	867672.406	0.005	0.020	0.000	0.000
			Pr_cor_4	409899.512	867686.205	409899.582	867686.159	-0.070	0.046	0.005	0.002

Appendix_4: From Orthophoto, Digital Line map and parcel

Parcel_Owner	Parcel_No	parcel ID/OBID	parcel_Area in squire meter			Difference in m2		Variance	
			Orthophoto extr	Line mape	RTK meard	orthoph_ RTK	Line_ RTK	Orthoph _RTK	Line_RTK
hasen	Pr_1	FID_482	1790.030	1780.330	1790.330	-0.300	-10.000	0.090	100.000
fedlu kedir	Pr_2	FID_481	1546.806	1540.106	1546.806	0.000	-6.700	0.000	44.890
fuwad fedlu	Pr_3	FID_492	1513.632	1511.632	1513.632	0.000	-2.000	0.000	4.000
Beferacot	Pr_4	FID_517	5690.886	5680.186	5690.886	0.000	-10.700	0.000	114.490
seyid umer	Pr_5	OBID_5	260.803	260.803	260.803	0.000	0.000	0.000	0.000
radiya seid	Pr_6	OBID_6	364.638	360.008	364.638	0.000	-4.630	0.000	21.437
gudhager nuri	Pr_7	OBID_7	340.526	340.126	345.526	-5.000	-5.400	25.000	29.160
temima bamud	Pr_8	OBID_16	315.400	321.179	319.479	-4.079	1.700	16.638	2.890
keyiro ale	Pr_9	OBID_9	320.006	320.006	320.236	-0.230	-0.230	0.053	0.053
	Pr_10	OBID_10	336.271	330.171	336.271	0.000	-6.100	0.000	37.210
behre musebo	Pr_11	OBID_11	337.040	328.040	330.040	7.000	-2.000	49.000	4.000
bahre musebo	Pr_12	FID_563	680.074	689.174	684.574	-4.500	4.600	20.250	21.160
habib jemal	Pr_13	FID_558	1095.547	1090.047	1095.547	0.000	-5.500	0.000	30.250
mulu segude	Pr_14	FID_572	330.298	325.208	328.298	2.000	-3.090	4.000	9.548
	Pr_15	FID_563	309.902	310.172	307.972	1.930	2.200	3.725	4.840
Awel jemal	Pr_16	FID_564	350.002	350.142	345.342	4.660	4.800	21.716	23.040
Albeyan hitsan masadegiya	Pr_17	FID_558	2995.000	2994.000	3000.000	-5.000	-6.000	25.000	36.000
Dilsebo Reshid	Pr_18	FID_555	330.009	330.109	335.259	-5.250	-5.150	27.563	26.523
Abdela Barkeda	Pr_19	FID_552	340.300	341.305	339.375	0.925	1.930	0.856	3.725
Akme Bahre	Pr_20	FID_541	351.271	355.011	351.271	0.000	3.740	0.000	13.988
adminstration	Pr_21	FID_529	470.074	475.514	473.574	-3.500	1.940	12.250	3.764
market center	Pr_22		13477.002	13483.112	13483.942	-6.940	-0.830	48.164	0.689
	Pr_23	OBID_146	470.004	475.074	473.574	-3.570	1.500	12.745	2.250
	Pr_24	OBID_147	410.508	415.019	411.588	-1.080	3.431	1.166	11.770
	Pr_25	OBID_145	1820.200	1814.207	1826.297	-6.097	-12.090	37.173	146.168
	Pr_26	OBID_151	360.000	360.000	360.900	-0.900	-0.900	0.810	0.810
	Pr_27	OBID_150	350.580	355.080	352.580	-2.000	2.500	4.000	6.250
Finance and economy mamrya	Pr_28	OBID_106	4991.142	4995.142	4992.942	-1.800	2.200	3.240	4.840
Zone party office	Pr_29	OBID_26	330.071	332.021	328.071	2.000	3.950	4.000	15.602
Hed Adminstr.silite zone	Pr_30		1520.480	1523.487	1523.487	-3.007	0.000	9.042	0.000
Fate shehhassen	Pr_31		205.199	210.108	203.178	2.021	6.930	4.084	48.025
hayishuk baltina	Pr_32		2381.600	2380.124	2383.684	-2.084	-3.560	4.343	12.674
juher parek	Pr_33		3850.107	3851.107	3856.167	-6.060	-5.060	36.724	25.604
Ezedin	Pr_34		1700.530	1700.000	1704.530	-4.000	-4.530	16.000	20.521
surur nuri(3)	Pr_35	OBID_138	800.400	800.125	799.475	0.925	0.650	0.856	0.422

shibre husseni(3)	Pr_36	OBID_148	200.520	198.120	194.520	6.000	3.600	36.000	12.960
jemal husen	Pr_37	OBID_147	190.837	208.137	188.837	2.000	19.300	4.000	372.490
sultan salo	Pr_38	OBID_104	205. 500	210.501	201.120	4.380	9.381	19.184	88.003
Jafer Mosqiwe	Pr_39	OBID_21	14710.001	14701.101	14717.341	-7.340	-16.240	53.876	263.738
	Pr_40	OBID_22	6880.300	6885.006	6885.306	-5.006	-0.300	25.060	0.090
Heji fedlu_pepesi campany	Pr_41	OBID_30	11041.050	11050.051	11048.059	-7.009	1.992	49.126	3.968
momina mossa	Pr_42	OBID_65	4963.034	4965.014	4963.234	-0.200	1.780	0.040	3.168
Temima reshid	Pr_43	OBID_66	7350.000	7351.020	7356.029	-6.029	-5.009	36.349	25.090
bahre shesayid	Pr_44	OBID_33	2139.070	2137.107	2137.957	1.113	-0.850	1.239	0.722
mujiza salo	Pr_45	OBID_31	3352.359	3360.310	3350.359	2.000	9.951	4.000	99.022
hussen mossa	Pr_46	OBID_51	330.007	340.187	334.687	-4.680	5.500	21.902	30.250
jemal hussen	Pr_47	OBID_53	380.701	385.167	383.767	-3.066	1.400	9.402	1.960
abdela werke	Pr_48	OBID_55	355.902	350.172	351.972	3.930	-1.800	15.445	3.240
sunko hussen	Pr_49	OBID_57	284.200	286.102	280.282	3.918	5.820	15.351	33.872
nuri abdela	Pr_50	OBID_60	310.000	319.104	309.304	0.696	9.800	0.484	96.040
seyid umer	Pr_51	OBID_61	360.222	360.002	369.292	-9.070	-9.290	82.265	86.304
	Pr_52		365.362	360.302	368.362	-3.000	-8.060	9.000	64.964
dedgeba usman	Pr_53	OBID_49	390.540	395.048	397.548	-7.008	-2.500	49.112	6.250
abdurezak hussen	Pr_54	OBID_50	430.156	425.156	424.856	5.300	0.300	28.090	0.090
sefiya seyid	Pr_55	OBID_65	375.130	375.300	372.130	3.000	3.170	9.000	10.049
	Pr_56		390.053	395.053	391.053	-1.000	4.000	1.000	16.000
diltata ahmed	Pr_57		367.200	360.142	367.842	-0.642	-7.700	0.412	59.290
sunko hussen	Pr_58	OBID_55	355.000	359.000	359.000	-4.000	0.000	16.000	0.000
lebiba musema	Pr_59	OBID_56	358.588	350.088	359.588	-1.000	-9.500	1.000	90.250
kedir hussen	Pr_60		388.117	380.167	383.767	4.350	-3.600	18.923	12.960
hussen mossa	Pr_61		370.007	372.107	370.337	-0.330	1.770	0.109	3.133
sheshifa begari	Pr_62	OBID_36	340.008	342.008	340.308	-0.300	1.700	0.090	2.890
zahra shehassen	PR_63	OBID_47	300.194	315.104	312.194	-12.000	2.910	144.000	8.468
reshad adem	PR_64	OBID_45	340.741	340.141	343.741	-3.000	-3.600	9.000	12.960
nuri wabela	PR_65	OBID_43	371.100	375.101	373.149	-2.049	1.952	4.198	3.810
shemse kimbado	PR_66	OBID_41	311.488	320.018	318.488	-7.000	1.530	49.000	2.341
sultan ahmed	PR_67	OBID_39	340.096	345.006	342.096	-2.000	2.910	4.000	8.468
anwar abdela	PR_68	OBID_37	350.141	340.041	349.441	0.700	-9.400	0.490	88.360
bahriya shereshad	PR_69	OBID_35	310.289	300.089	309.589	0.700	-9.500	0.490	90.250
neja mohammed	PR_70	OBID_34	305.156	305.156	303.756	1.400	1.400	1.960	1.960
bahre mohammed	PR_71	OBID_46	321.087	320.607	319.687	1.400	0.920	1.960	0.846
murshida	PR_72	OBID_44	305.036	300.136	302.436	2.600	-2.300	6.760	5.290
rameto mohammed	PR_73	OBID_42	290.105	301.015	285.185	4.920	15.830	24.206	250.589
chumete mohammed	PR_74	OBID_40	320.007	321.207	321.237	-1.230	-0.030	1.513	0.001
gulto umer	PR_75	OBID_38	315.128	305.108	310.898	4.230	-5.790	17.893	33.524

abdurehman salo	PR_76	OBID_39	350.026	355.106	353.776	-3.750	1.330	14.063	1.769
nuredin wabela	PR_77	OBID_36	351.416	353.060	353.776	-2.360	-0.716	5.570	0.513
nesre muzeyin	PR_78	OBID_70	611.147	620.147	615.847	-4.700	4.300	22.090	18.490
amina hassen	PR_79	OBID_69	632.215	640.005	642.425	-10.210	-2.420	104.244	5.856
belay assefa	PR_80	OBID_67	323.143	320.100	317.126	6.017	2.974	36.204	8.845
ali kemal	PR_81	OBID_68	319.068	321.060	319.068	0.000	1.992	0.000	3.968
hulchafo salo	PR_82	OBID_72	303.090	310.019	308.090	-5.000	1.929	25.000	3.721
sultan selman	PR_83	OBID_74	372.318	370.118	376.318	-4.000	-6.200	16.000	38.440
towfik mohammed	PR_84	OBID_76	301.127	305.147	303.347	-2.220	1.800	4.928	3.240
	PR_85	OBID_73	483.677	480.177	487.677	-4.000	-7.500	16.000	56.250
shukre ahmed	PR_86	OBID_77	285.158	280.006	285.158	0.000	-5.152	0.000	26.542
hussen amen	PR_87	OBID_75	427.902	407.102	417.902	10.000	-10.800	100.000	116.640
Silite cltural Hall	PR_88	OBID_	15160.123	15150.103	15164.723	-4.600	-14.620	21.160	213.744
	PR_89	FID_335	250.206	250.106	252.276	-2.070	-2.170	4.285	4.709
shebahredin radi	PR_90	FID_686	258.306	260.006	258.306	0.000	1.700	0.000	2.890
nuriya Ahemad	PR_91	OBID_113	261.066	265.016	259.066	2.000	5.950	4.000	35.403
amina muzeyin	PR_92	OBID_112	240.193	230.123	235.693	4.500	-5.570	20.250	31.025
	PR_93	FID_337	235.307	235.300	232.377	2.930	2.923	8.585	8.544
	PR_94	OBID_111	520.106	524.106	514.556	5.550	9.550	30.802	91.202
nasir adem	PR_95	OBID_110	271.740	270.140	274.740	-3.000	-4.600	9.000	21.160
shukre siraje	PR_96	OBID_108	295.007	300.107	294.507	0.500	5.600	0.250	31.360
hamdala kere	PR_97	OBID_81	340.009	340.109	342.609	-2.600	-2.500	6.760	6.250
sadiya nasir	PR_98	OBID_82	310.105	300.005	304.135	5.970	-4.130	35.641	17.057
mohammed umer	PR_99	OBID_84	291.007	300.127	287.847	3.160	12.280	9.986	150.798
shukre musebo	PR_100	OBID_84	325.165	315.145	322.865	2.300	-7.720	5.290	59.591
								1655.234	**3678.261**

Appendix_5: Second Order GCP Point of Werabe Town.

UTM COORDINATES OF NEWLY ESTABLISHED SECOND ORDER /GCP / CONTROL POINTS AT WERABE TOWN

SYSTEM: Univ.TRANSVERSE MERC. (N)

DATUM: ADINDAN

TRANSLATION: : -162, -12.000, 206.000)

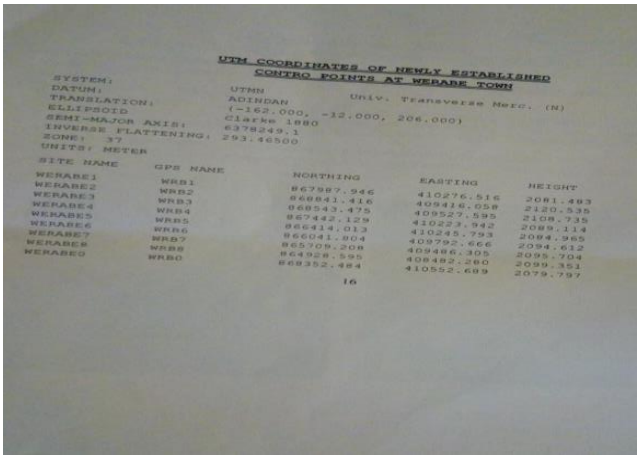
ELLIPSOID: CLARKE 1880

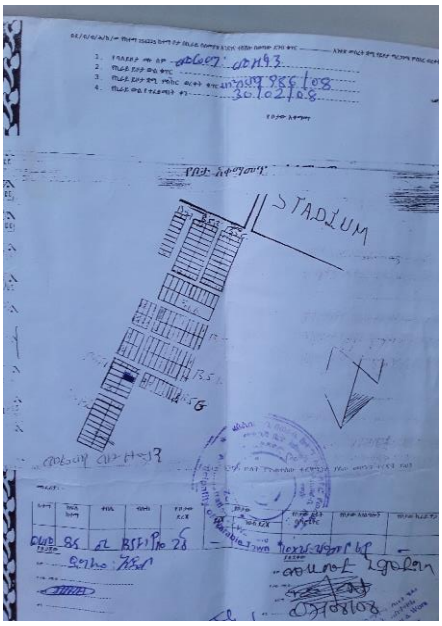
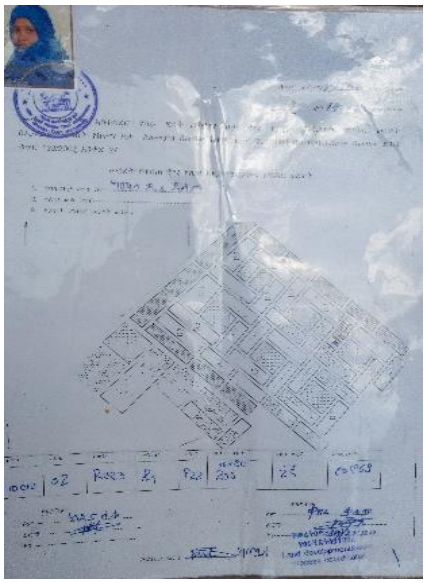
SEMI_MAJOR AXIS: 6378249.1

INVERSE FLATTENING: 293.46500

ZONE: 37

SITE NAME	GPS NAME	NORTHING	EASTING	HEIGHT	desecration
WERABE1	WRB1	867987.946	410276.516	2081.483	
WERABE2	WRB2	868841.416	409416.058	2120.535	
WERABE3	WRB3	868543.475	409527.595	2108.735	
WERABE4	WRB4	867442.129	410223.942	2089.114	
WERABE5	WRB5	866414.013	410245.793	2084.965	
WERABE6	WRB6	866041.804	409792.666	2094.612	
WERABE7	WRB7	865709.208	409486.305	2095.704	
WERABE8	WRB8	864928.595	408482.28	2099.351	
WERABE0	WRB0	868352.484	410552.689	2079.797	



E.G.IA.. Established GCP data

Sample land holding certificates