**BENEFITS OF GPS OVER OTHER MEASURING EQUIPMENTS**

GPS stands for Global Positioning System. The system uses signals transmitted by orbiting satellites to pinpoint a device's location and determine any movement over time. On its own, GPS has limitations as it only provides basic information such as coordinates and a few other statistics, but when combined with other technology, such as maps, and incorporated into navigational systems, it becomes a powerful tool.

## **Highly Accurate and Fast Processing**

 The GPS technology is faster with improved accuracy when compared with conventional surveying equipment, being that the data collection process is faster, the time for getting final results and making decisions is beneficially shorter and all this is simultaneously done with the minimal allowance for mistakes which are not unusual with conventional methods.

 In other conventional methods, despite all the meticulous manual work, a single mistake can ruin the progress of the whole project without easily being discovered although, with the application of GPS in land surveying this is no longer the case and as a result, it improves the quality of work. Due to this discovery the surveying and mapping association has fully adopted the use of the GPS system.

## **Time, Cost and Labor Saving Technique**

## The conventional surveying methods can be a very costly and time-consuming process. In the past, surveyors had to make several visits to one site in order to use each and every piece of equipment, going step by step to gather accurate data.

This advanced GPS surveying system reduces both equipment and labor that was once required for completion of a single surveying hence, the preferred option if time and cost is to be minimized. Nowadays, a single surveyor can complete all the tasks in one day instead of a whole team labouring to complete it in a longer period in the past. Furthermore, given that there’s wiser use of the resources it’s safe to say it contributes to sustainability too.

##  **Easy to Use**

 Navigation using GPS is generally very easy and requires minimal skill or effort, certainly when compared to traditional methods and technologies, such as map-reading. In most cases, the user just has to input the destination and the device will do the rest. GPS is also an easier and more efficient technology to use for tasks like surveying and the study of the movement of tectonic plates Despite the complexity of this new technology it’s still created to be user-friendly, meaning the additional advantages of GPS are lesser needs of highly trained crews since even less trained operators can do the job.

1. **Not Affected by Weather Conditions**

 A very important benefit is that the GPS surveying and measurement is not affected by weather conditions such as snow, rainfall, or extremely high or low temperatures. Unlike the conventional surveying techniques, the GPS surveying is not affected by constraints such as the line of site visibility between the survey locations too.

## **Portability**

 The use of the GPS system in surveying has brought about the reduction of unnecessary weight in this kind of survey equipment and certainly relieves one of packing up and going to the site where surveying ought to take place. Before, when all sorts of equipment were required, all the weight was a burden to the surveyors thereby slowing the process down.

 Also, there was the risk of damaging equipment, and having to replace it, something one wouldn’t have to worry about with the latest GPS technology, designed to be of quality and provide longer use. Best of all, their design of size keeps decreasing, though not at the expense of efficiency or price.

## **Location and Area Size**

 In the case of survey of waterways and coasts, even with few land-based points, surveyors can still collect data and carry out the process properly. Because the technology allows for accurate work over long distances, there is no obligation to keep relocating the base unit to be able to perform a survey at remote areas unlike conventional methods. In other words, the amount of operational limitations is significantly reduced. Also, regardless of the size of the area, small, big or extremely large, the level of accuracy remains the same with GPS technology.

**ERRORS IMPACTING GPS SYSTEM**

There are variant **errors** that can introduce inaccuracies in the final position, ranging from one meter to hundreds of meters, they include;

1. **Receiver Clock Errors**

 Since the GPS system depends on accurate time measurement. GPS satellite carry rubidium and cesium time standards that are usually accurate to one part in 1012 and one part in 1013 respectively, while most receiver clocks are accurate by quartz standard accurate of one part in 108.

1. **Selective Availability**

 This is a process applied by the US department of defense to the GPS signal. This is intended to deny civilian and hostile foreign powers from getting full accuracy of GPS by subjecting the satellite clocks to a process known as Dithering, which alters their time slightly.

1. **GPS Signal Multipath**

 It is a propagation medium related error, multipath describes an error affecting positioning that occurs when the signal arrives at the receiver from more than one part. This occurs when the GPS receiver is positioned closed to a large reflecting surface such as a lake, mountain, or a building, in this case the satellite signal does not travel directly to the antenna but hits the nearby object first and is reflected into the receiver’s antenna creating a false measurement. This increases the travel time of the signal, thereby causing errors.

1. **Lower atmosphere**

 The three lower layers of atmosphere (troposphere, tropopause, and stratosphere) extend from the Earth’s surface to an altitude of about 50 km. The lower atmosphere delays GPS signals, adding slightly to the calculated distances between satellites and receivers. Signals from satellites close to the horizon are delayed the most, since they pass through the most atmosphere.

1. **Satellite orbit**

 GPS receivers calculate coordinates relative to the known locations of satellites in space, a complex task that involves knowing the shapes of satellite orbits as well as their velocities, neither of which is constant. The GPS Control Segment monitors satellite locations at all times, calculates orbit eccentricities, and compiles these deviations in documents called ephemerides. An ephemeris is compiled for each satellite and broadcast with the satellite signal. GPS receivers that are able to process ephemerides can compensate for some orbital errors.