Supervising Scientist
notes

DIFFERENTIAL GLOBAL POSITIONING SYSTEM

A differential Global Positioning System (dGPS) has been established at the Environmental Research Institute of the Supervising Scientist ***(eriss)*** to provide an accurate georeferencing, mapping and survey tool for the Alligator Rivers Region, Northern Territory, Australia. The dGPS was initially implemented as an integral part of a coastal monitoring program and is now used in many projects to provide accurate georeferenced information.

Differential GPS is a data collection and processing technique in which two or more receivers track and record the same satellites simultaneously. One receiver is located over a known reference point (benchmark) called the base station (fig 1). The other receiver is more mobile and is used to record or map the position of unknown points (fig 2).

What is a GPS?

Global Positioning Systems (GPS) have receivers that collect signals from 24 satellites positioned in orbit around the earth by the US Department of Defence to determine positions on the ground and in the air. These satellites provide worldwide, continuous weather information to users. GPS receivers use a coordinate system, known as World Geodetic System 1984 (WGS1984).

In Australia the 1994 Geocentric Datum of Australia (GDA94) is used. There is very little difference between WGS1984 and GDA1994.

Differential GPS at eriss

The dGPS at ***eriss*** utilises Ashtech (Magellan) equipment, comprising a dual frequency receiver (Z-12) as a base station and a single frequency receiver (Reliance) to be used as the *rover* or mapping receiver. The rover receiver can be hand held or mounted on quad bikes, boats cars etc (fig 2).

It is necessary to recognise three components or features of the environment before using dGPS as a mapping and georeferencing tool; namely points, lines and areas. For example:

- **Point Features** refer to discrete points such as soil sample locations, transect points, road sign locations etc,
- **Line Features** refer to boundaries or other linear features such as transect lines, woodland boundaries, dry creek beds etc,
- **Area Features** refer to areas or spatial features such as areas of dead trees or water bodies.

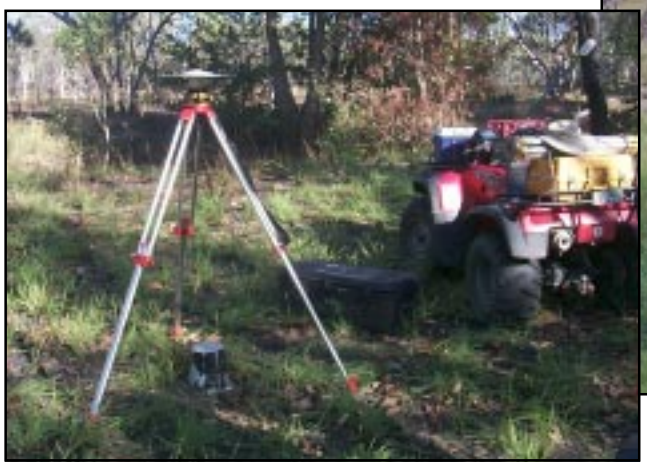

Figure 2 (above) Mobile rover dGPS receiver mounted on a 4WD quad bike; **Figure 1** (left) Base station set up

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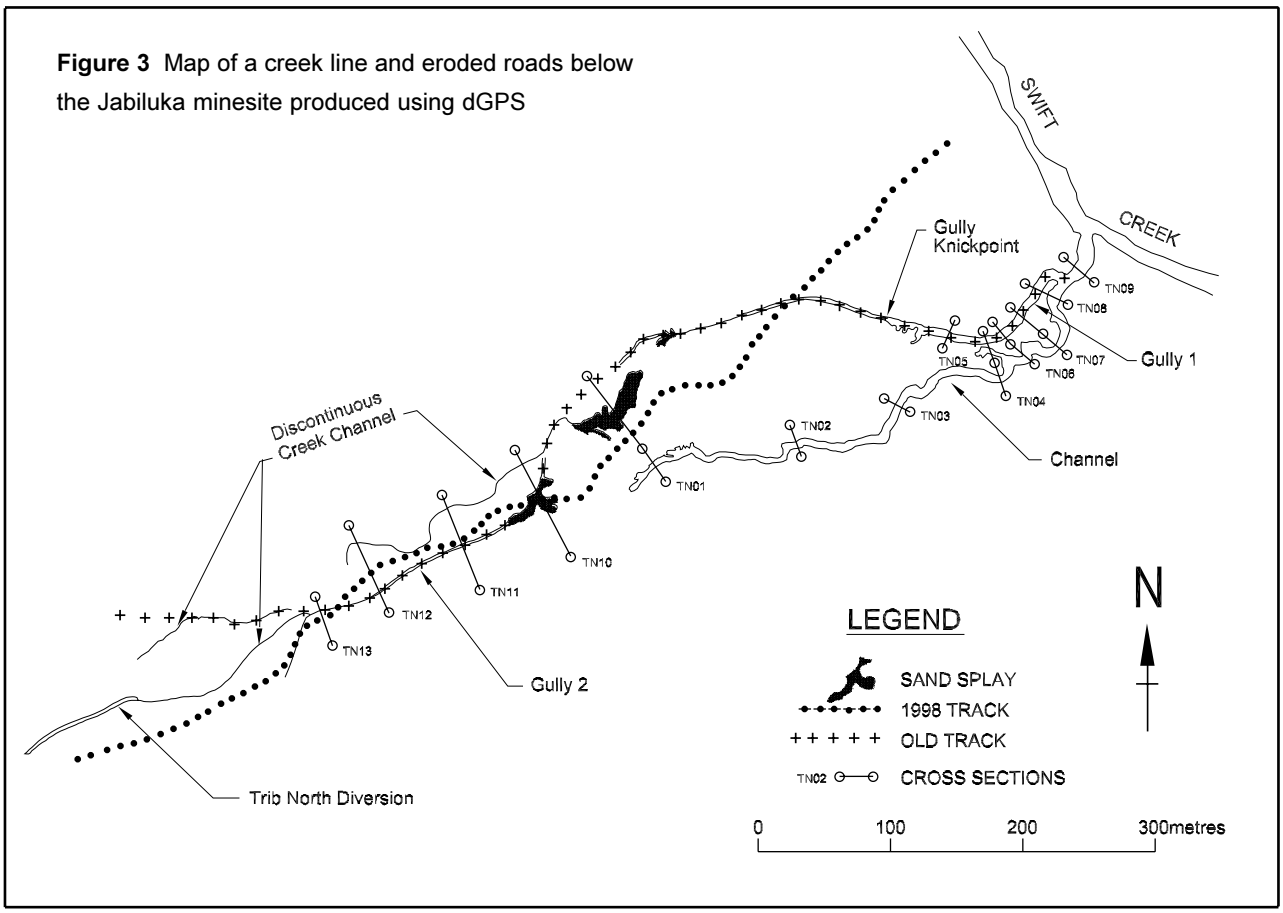

Figure 3 Map of a creek line and eroded roads below the Jabiluka minesite produced using dGPS

The data are processed after the fieldwork has been completed as the dGPS does not have a real time facility. Once processed, the data can then be used to produce maps and can be exported in various forms for use in GIS and mapping software and word processing.

Accuracy varies from sub-centimetre level to within 100 metres depending on how the signals are collected and processed. The ***eriss*** dGPS generally has an accuracy of better than 1 m resolution.

Use of dGPS at eriss

Initial use of dGPS at ***eriss*** has included:

- Mapping areas of salt water intrusion and tidal creek extension at sites along the Kakadu coastline,
- Mapping parts of the Jabiluka mine site,
- Georeferencing aerial photograph sites to generate a digital elevation model for the rehabilitated Nabarlek minesite in Arnhem Land,
- Mapping areas of Ngarradj (Swift Creek) below the Jabiluka minesite (fig 3).

The dGPS allows the investigator to map various areas quickly and accurately and then inspect the map to determine if all required features have been adequately mapped. If more information is required it is easy to revisit the site and add the required detail. The map in figure 3 was compiled after at least three separate visits.

Conclusions

Establishment of a dGPS at ***eriss*** has provided flexibility for mapping and georeferencing of field sites for existing and future projects. It has provided a survey framework for baseline monitoring and has enabled ***eriss*** to develop the capacity to locate, map and georeference many features in the Alligator Rivers Region. The linkage of the dGPS with a GIS to store the information provides a mechanism where maps can be generated. This also allows the development of baseline data maps which could be used to monitor and assess environmental change.

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