

Atlas Geophysics Quotation Number Q2012022

Ooratippra EL28308 Gravity

CKA Resources Pty Ltd

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atlas
G E O P H Y S I C S

COMMERCIAL IN CONFIDENCE

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1.0 Company Overview

Atlas Geophysics Pty Ltd is an Australian company based in Morley, Western Australia, whose mission is to provide the highest quality geophysical resource data to the mining, petroleum and exploration industry in a safe and timely manner. Through experience, innovation and excellence, the company will exceed its client's expectations and will continually develop its technologies and methodologies to maintain its reputation for being the best in the business.

The company specialises in the acquisition, processing and interpretation of potential field datasets, with particular emphasis on gravity. The director of the company, Leon Mathews B.Sc. Hons (Geophysics), has over 15 years experience in the field of gravity and brings to the company, a young, vibrant and motivated approach to project management. Strategically, through development and research, the company aims to expand into other geophysical acquisition markets that encompass methods such as electrical, electromagnetic, induced polarisation and reflection seismic. The company also has interests in developing an airborne platform capable of acquiring high quality magnetic and radiometric data so it can offer its clients a complete airborne and ground geophysical solution.

Atlas Geophysics Pty Ltd is committed to the values and principles of Occupational Health and Safety and Environment. To this end, the company aims to prevent injuries and occupational illness to its employees and minimise any adverse environmental impact its activities may have.

2.0 Scope of Project

The proposed Ooratippra gravity project requires the acquisition and processing of a potential 230 regional spaced stations over a single tenement held by CKA Resources Pty Ltd. The tenement is located approximately 300km to the north east of Alice Springs, in the Northern Territory.

Atlas Geophysics Pty Ltd proposes to complete the gravity survey using either helicopter borne or UTV (Utility Terrain Vehicle) vehicle borne gravity techniques. Two pricing options have been provided in this quotation.

2.1 Location and Access

Tenement EL28308, is proximal to the abandoned Ooratippra Station and can be accessed via the Sandover Highway that runs east from the Stuart Highway (Figure 1). A station track intersects the survey area and should provide good access.

2.2 Survey Configuration

The regional stations would ideally be acquired by helicopter using a 1km square grid configuration.

Additional Infill may be carried out over areas of interest after initial supply of preliminary data.

3.0 Proposed Personnel and Subcontractors

Atlas Geophysics Pty Ltd engages only fit, motivated and safe working professionals to conduct its gravity operations. Acquisition staff members are from a range of backgrounds, usually from the geoscience or geotechnical fields, and all are trained in senior first aid, bush survival, and advanced four wheel driving. Overseeing the acquisition and processing is the company's team of geophysicists – a team with a combined total of over fifteen years experience in the acquisition, processing and quality analysis of gravity data.

3.1 Project Supervision

Supervising the project from Perth Operations would be director Leon Mathews, B.Sc. Hons. (Geophysics). Leon has been involved in the acquisition, processing and interpretation of potential field data for over 15 years and has directly overseen the acquisition and processing of over 1,000,000 gravity stations.

Leon will be responsible for project supervision as well as processing, quality analysis and final data delivery.

3.2 Acquisition/Other Personnel

Other Atlas personnel participating in field acquisition of the gravity data will be:

Luke Sneddon	<i>Supervising Field Technician</i>
Shane Nairn	<i>Supervising Field Technician</i>
Lex Mathews	<i>Camp Logistics</i>

3.3 Subcontractors

Adelaide based operator, Great Ocean Road Helicopters will supply the helicopter, pilots and engineering support.

4.0 Proposed Equipment and Instrumentation

4.1 GPS/Glonass Receiver Instrumentation

Leading-edge dual-frequency GPS technologies from Leica Geosystems such as the GPS1200 will be utilised on the project to allow for post-processed kinematic (PPK) centimetre level accuracy 3D positions. Specifications for this system can be found in the attached brochures (Figures 2-4). Atlas Geophysics Pty Ltd is the first gravity acquisition company in Australia to utilise GNSS technology enabled receivers. The GPS1200 system is equipped with future proof GNSS technology which is capable of tracking all available GNSS signals including the currently available GLONASS. These new generation receivers, in conjunction with full GNSS tracking and processing, offer a new level of unmatched solution accuracy and reliability, especially when compared to existing conventional L1L2 GPS technologies.

The use of Glonass technology in addition to GPS provides very significant advantages:

- Increased satellite signal observations
- Markedly increased spatial distribution of visible satellites
- Reduced Horizontal and Vertical Dilution of Precision (DOP) factors
- Improved post-processed-kinematic (PPK) performance
- Decreased occupation times means faster acquisition

Multiple Leica GPS1200 geodetic grade receivers will be utilised to conduct the survey. One receiver will operate as a base station, with the other receiver(s) operating as a kinematic rover(s). All receivers have recently been purchased new (post 2006) and all are covered under comprehensive maintenance agreements with Leica Geosystems. A spare receiver will be kept onsite in the event of malfunction (which is very uncommon for Leica).

4.2 Gravity Instrumentation

Complementing the company's GNSS/GPS technologies is the latest in gravity instrumentation from Scintrex Ltd, the Scintrex CG-5 (Figure 5). The CG-5 digital automated gravity meter offers all of the features of the low noise industry standard CG-3M micro-gravity unit, but is smaller and lighter. It also offers improved noise rejection. By constantly monitoring tilt sensors electronically, the CG-5 automatically compensates for errors in gravity meter tilt. Due to a low mass and the excellent elastic properties of fused quartz, tares are virtually eliminated.

The CG-5 can be transported over very rough terrain, on ATV's, foot, vehicle or helicopter without taring or drifting. In terms of repeatability, the CG-5 outperforms all existing gravity meter technologies, with a factory quoted repeatability of better than 0.005 mGal.

Two CG5 gravity meters will be supplied to the project.

4.3 Other Equipment

The company utilise the following additional equipment to fully support GPS-Gravity operations:

- HP Laptop computers for data download and processing
- Garmin autonomous GPS receivers for navigation
- Iridium and Thuraya satellite phones for long distance communications
- Personal Protective Equipment for all personnel
- Batteries, battery chargers, solar cells, UPS System
- Survey consumables
- Tools, engineering and maintenance equipment for vehicle servicing
- First aid and survival kits
- Tyres and recovery equipment

Leica GPS1200

Fast, accurate, rugged and reliable

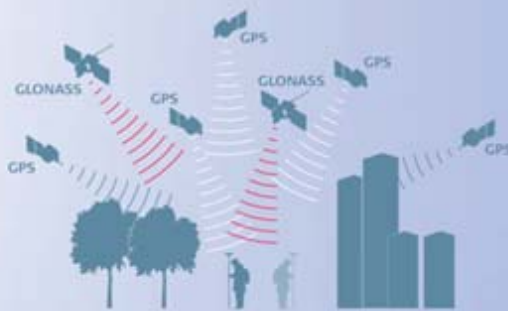


GNSS technology

GPS1200's SmartTrack+ measurement engine now utilizes two global navigation satellite systems increasing the number of tracked satellites. The new SmartTrack+ measurement engine tracks all available GNSS signals (L2C and GLONASS). More satellites means higher productivity, accuracy and reliability. SmartTrack+ acquires satellites within seconds, is ideal in urban canyons and obstructed areas where other receivers often fail. GPS1200 with SmartTrack+ is designed to support the future signals GPS L5 and Galileo.

SmartCheck+

Continuously checking provides the highest possible reliability. A unique, built-in integrity monitoring system checks all results immediately. SmartCheck+ now processes GPS and GLONASS measurements simultaneously for centimeter-accuracy, 20 Hz RTK at 30 km and more. Initialize within seconds and survey in obstructed areas with a GX1230/ATX1230 (GPS only) sensor or increase productivity with a GX1230 GG/ATX1230 GG (GPS and GLONASS).



GLONASS

For many years the GLONASS system was not reliable enough in terms of satellite availability and system performance. With recent launches and commitment from the Russian government, reliability and availability are significantly improved. Under normal conditions there are 2 to 5 additional satellites compared to a GPS only constellation – and even more satellites will be available over the next two years. Now is the time to invest in hybrid GNSS technology.

"The GLONASS system should be created before 2008, as it was originally planned ... We have the possibility. Let us see what can be done in 2006 – 2007"

(Russian President Vladimir Putin December 26th 2005).



Exceptionally rugged

Don't worry about how your crews handle GPS1200. It's built to MIL specs to withstand the roughest use. With its strong, precision-machined magnesium housing, GPS1200 stands up to drops and falls and the jolts and vibrations of machines.



Immune to bad weather

Designed for temperatures from -40° C to +65° C (storage +80° C), GPS1200 shrugs off arctic cold and blistering heat. Fully waterproof – withstands immersion to 1 m – sand and dustproof, it operates perfectly in any conditions from tropical rainfall to desert sandstorms. GPS1200 just keeps on working.

High contrast touch screen

The high quality 1/4 VGA (11 lines by 32 characters) with optional colour option (RX1250) touch screen guarantees perfect clarity and contrast. Whether in fading light or bright sunshine, you can always read the display perfectly. Operate using the touch screen or the QWERTY keyboard, whichever you prefer.

With or without controller

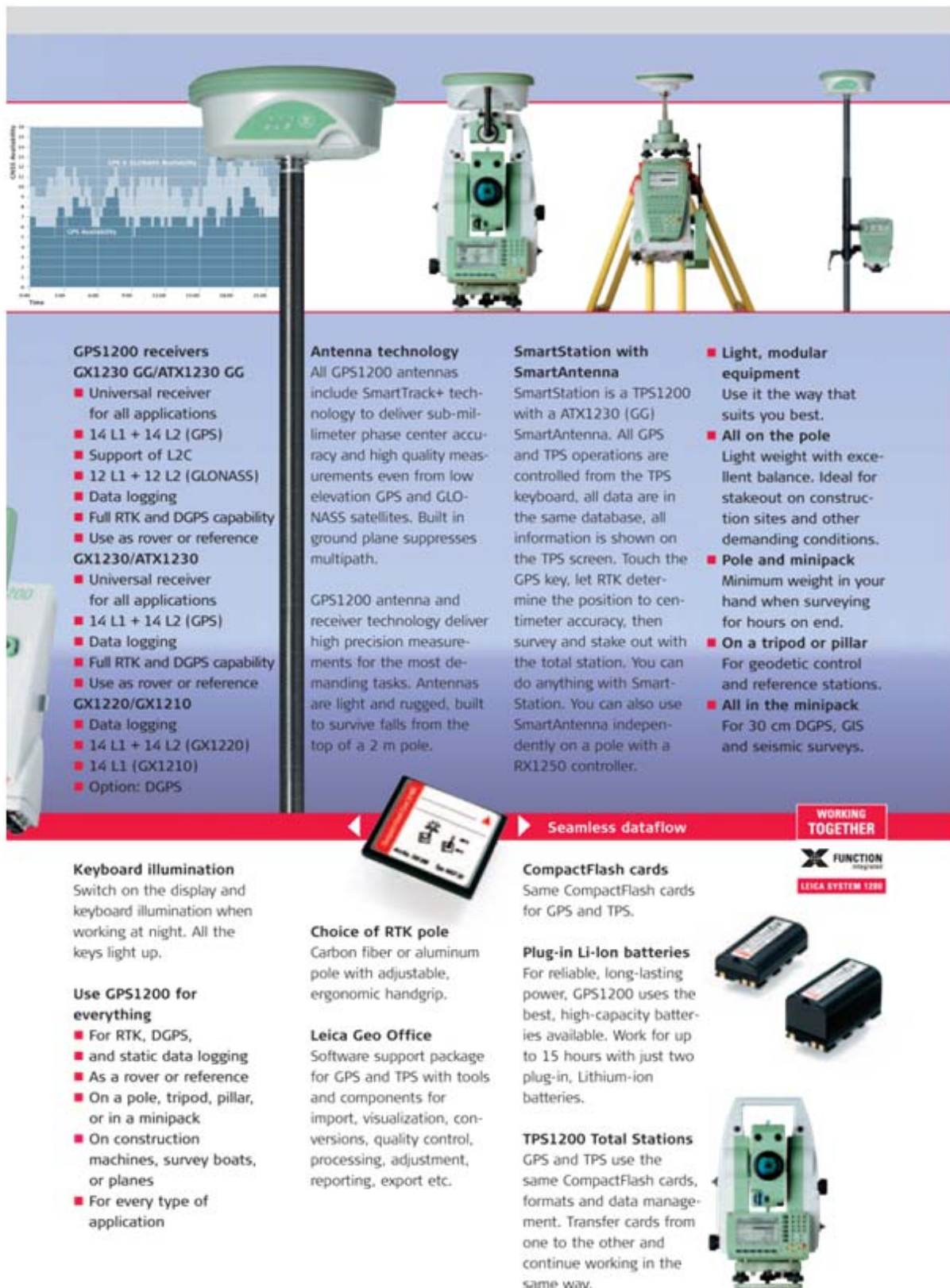
Connect the controller to the receiver when you need to input information and make full use of the on-board functions and programs.

RTK/DGPS communication

Radio modems, GSM, GPRS and CDMA modules fit in waterproof housings attached to the receiver. Attach either one or two devices for RTK/DGPS reference and rover applications.

With Bluetooth® Wireless Technology built in to the RX1250 controller complete cable free operation and connectivity to compatible wireless products is available.

Figure 2: Leica GPS1200 product brochure



The brochure features a top section with four images of the Leica GPS1200 system in different configurations: a pole-mounted antenna, a total station with a pole-mounted antenna, a total station on a tripod with a pole-mounted antenna, and a total station on a tripod with a pole-mounted antenna. Below these images is a graph showing GPS accuracy over time.

GPS1200 receivers
GX1230 GG/ATX1230 GG
 ■ Universal receiver for all applications
 ■ 14 L1 + 14 L2 (GPS)
 ■ Support of L2C
 ■ 12 L1 + 12 L2 (GLONASS)
 ■ Data logging
 ■ Full RTK and DGPS capability
 ■ Use as rover or reference
GX1230/ATX1230
 ■ Universal receiver for all applications
 ■ 14 L1 + 14 L2 (GPS)
 ■ Data logging
 ■ Full RTK and DGPS capability
 ■ Use as rover or reference
GX1220/GX1210
 ■ Data logging
 ■ 14 L1 + 14 L2 (GX1220)
 ■ 14 L1 (GX1210)
 ■ Option: DGPS

Antenna technology
 All GPS1200 antennas include SmartTrack+ technology to deliver sub-millimeter phase center accuracy and high quality measurements even from low elevation GPS and GLONASS satellites. Built in ground plane suppresses multipath.

GPS1200 antenna and receiver technology deliver high precision measurements for the most demanding tasks. Antennas are light and rugged, built to survive falls from the top of a 2 m pole.

SmartStation with SmartAntenna
 SmartStation is a TPS1200 with a ATX1230 (GG) SmartAntenna. All GPS and TPS operations are controlled from the TPS keyboard, all data are in the same database, all information is shown on the TPS screen. Touch the GPS key, let RTK determine the position to centimeter accuracy, then survey and stake out with the total station. You can do anything with SmartStation. You can also use SmartAntenna independently on a pole with a RX1250 controller.

■ **Light, modular equipment**
 Use it the way that suits you best.

■ **All on the pole**
 Light weight with excellent balance. Ideal for stakeout on construction sites and other demanding conditions.

■ **Pole and minipack**
 Minimum weight in your hand when surveying for hours on end.

■ **On a tripod or pillar**
 For geodetic control and reference stations.

■ **All in the minipack**
 For 30 cm DGPS, GIS and seismic surveys.

Seamless dataflow

Keyboard illumination
 Switch on the display and keyboard illumination when working at night. All the keys light up.

Use GPS1200 for everything
 ■ For RTK, DGPS, and static data logging
 ■ As a rover or reference
 ■ On a pole, tripod, pillar, or in a minipack
 ■ On construction machines, survey boats, or planes
 ■ For every type of application

Choice of RTK pole
 Carbon fiber or aluminum pole with adjustable, ergonomic handgrip.

Leica Geo Office
 Software support package for GPS and TPS with tools for import, visualization, conversions, quality control, processing, adjustment, reporting, export etc.

CompactFlash cards
 Same CompactFlash cards for GPS and TPS.

Plug-in Li-Ion batteries
 For reliable, long-lasting power, GPS1200 uses the best, high-capacity batteries available. Work for up to 15 hours with just two plug-in, Lithium-ion batteries.

TPS1200 Total Stations
 GPS and TPS use the same CompactFlash cards, formats and data management. Transfer cards from one to the other and continue working in the same way.

WORKING TOGETHER
 FUNCTION
 LEICA SYSTEM 1200

Figure 3: Leica GPS1200 product brochure

Leica GPS1200

Technical specifications and system features



GPS1200 receivers	GX1230 GG/ATX1230 GG	GX1230/ATX1230	GX1220	GX1210
GNSS technology	SmartTrack+	SmartTrack	SmartTrack	SmartTrack
Type	Dual frequency	Dual frequency	Dual frequency	Single frequency
Channels	14 L1 + 14 L2 GPS 2 SBAS 12 L1 + 12 L2 GLONASS 72 Channels	14 L1 + 14 L2 GPS 2 SBAS	14 L1 + 14 L2 GPS 2 SBAS (with DGPS option)	14 L1 2 SBAS (with DGPS option)
RTK	SmartCheck+	SmartCheck	No	No
Status indicators	3 LED indicators: for power, tracking, memory			

GPS1200 receivers	GX1230 GG/GX1230/GX1220	GX1210	ATX1230 GG/ATX1230
Ports	1 power port, 3 serial ports, 1 controller port, 1 antenna port		1 power/controller port, Bluetooth® Wireless-Technology port
Supply voltage, Consumption	Nominal 12 VDC 4.6 W receiver + controller + antenna		Nominal 12 VDC 1.8 W
Event input and PPS	Optional: 1 PPS output port 2 event input ports	Optional: 1 PPS output port 2 event input ports	
Standard antenna	SmartTrack+ AX1202 GG	SmartTrack AX1201	SmartTrack+ ATX1230 GG
Built-in groundplane	Built-in groundplane	Built-in groundplane	Built-in groundplane

The following apply to all receivers except where stated.

Power supply	Two Li-Ion 3.8 Ah/7.2 V plug into receiver. One Li-Ion 1.9 Ah/7.2 V plugs into ATX1230 and RX1250.	Temperature	Operation: Receiver -40° C to +65° C Antennas -40° C to +70° C ISO9022 MIL-STD-810F Controllers -30° C to +65° C Controller RX1250c -30° C to +50° C Storage: Receiver -40° C to +80° C Antennas -55° C to +85° C Controllers -40° C to +80° C Controller RX1250c -40° C to +80° C
Plug-in Li-Ion batteries	Power receiver + controller + SmartTrack antenna for about 15 hours (for data logging). Power receiver + controller + SmartTrack antenna + low power radio modem or phone for about 10 hours (for RTK/DGPS). Power SmartAntenna + RX1250 controller for about 5 hours (for RTK/DGPS)	Humidity	Receiver, antennas and controllers ISO9022, MIL-STD-810F Up to 100% humidity.
External power	External power input 10.5 V to 28 V.	Protection against water, dust and sand	Receiver, antennas and controllers: Waterproof to 1 m temporary submersion. IP67, MIL-STD-810F Dust tight
Weights	Receiver 1.20 kg. Controller 0.48 kg (RX1210) and 0.75 kg (RX1250). SmartTrack antenna 0.44 kg. SmartAntenna 1.12 kg. Plug-in Li-Ion battery 0.09 kg (1.9 Ah) and 0.19 kg (1.9 Ah). Carbon fiber pole with SmartTrack antenna and RX1210 controller: 1.80 kg. All on pole: carbon fiber pole with SmartAntenna, RX1250 controller and plug-in batteries: 2.84 kg.	Shock/drop onto hard surface	Receiver: withstands 1 m drop onto hard surface. Antennas: withstand 1.5 m drop onto hard surface.
		Topple over on pole	Receiver, antennas and controllers: withstand fall if pole topples over.
		Vibrations	Receiver, antennas and controllers: withstand vibrations on large construction machines. No loss of lock. ISO9022 MIL-STD-810F

Figure 4: Leica GPS1200 technical specifications



SPECIFICATIONS

Sensor Type

Fused Quartz using electrostatic nulling

Reading Resolution

1 microGal

Standard Field Repeatability

< 5 microGal

Operating Range

8,000 mGal without resetting

Residual Long-Term Drift (static)

Less than 0.02 mGal/day

Range of Automatic Tilt Compensation

± 200 arc sec

Tares

Typically less than 5 microGals for shocks up to 20 G.

Automated Corrections

Tide, Instrument Tilt, Temperature, Noisy Sample, Seismic Noise Filter.

Dimensions

31 cm (H) x 22 cm x 21 cm
12 in (H) x 8.5 in x 8 in

Weight (including batteries)

8 kg. (17.5 lbs.)

Battery Capacity

2 x 6Ah (10.8V) rechargeable Lithium-Ion Smart Batteries. Full day operation in normal survey conditions with two fully charged batteries.

Power Consumption

4.5 Watts at 25°C

Standard Operating Temperature Range

-40°C to +45°C

Ambient Temperature Coefficient

0.2 microGal/°C (typical)

Pressure Coefficient

0.15 microGal/kPa (typical)

Magnetic Field Coefficient

1 microGal/Gauss (typical)

Memory

Flash Technology (data security)
Standard 12 MBytes

Digital Data Output

RS-232 C and USB interface
Is optimized for Win XP™

Analog Data Output

Strip-Chart Recorder

Display Screen

¼ VGA 320 x 240 pixels

Keypad

27 key alpha/numeric

Standard System

- CG-5 Console
- Tripod base
- 2 rechargeable batteries
- Battery Charger, 110/240 V
- External Power 110/240 V
- RS-232 and USB Cables
- Carrying Bag
- Data dump and utilities software
- Operating Manual (CD)
- Transit Case

GPS

Enables GPS station referencing from an external 12 channel smart GPS antenna being connected via the RS-232 port. Standard GPS accuracy: <15m DGPS (WAAS) < 3m. Client has the option to use other higher accuracy GPS receivers outputting NMEA data string through the serial port.

OPTIONS

High Temperature Option

For use in climates that may exceed the normal operating temperature of 45°C. Allows operating temperatures of up to 55°C. This option is intended to be used in climates above freezing and needs to be ordered at the time of purchase.

Battery Belt

Suggested for cold weather operation.

COMPLETE GRAVITY SOLUTIONS

Special Applications

Please contact LRS Scintrex or your local representative.

Training Programs

LRS Scintrex can provide training programs at our office in Canada or at your location.

Application Software

LRS Scintrex can provide software packages to support your data processing, interpretation and mapping needs.

An ISO 9001:2000 registered company

* All specifications are subject to change without notice.



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Figure 5: Scintrex CG-5 specifications

5.0 Helicopter and Vehicle Transportation

5.1 Helicopter

A single Raven II helicopter will be used to traverse between the gravity stations during gravity acquisition (Photo 1). Robinson Helicopter Company is the world's leading producer of civil helicopters and is known worldwide for high performance, reliable helicopters. The Raven II is the latest derivative of the very successful and field proven Robinson R44 helicopter line. It is equipped with a fuel-injected, angle-valve, tuned-induction, IO-540 Lycoming engine which produces substantially more power and gives the Raven II greater altitude performance, more payload and increased speed. The helicopter is fitted with air-conditioning to offer comfortable flying to both pilot and gravity operator, even in the hottest conditions.



Photo 1: Robinson R44 Raven II helicopter

In addition to the standard safety equipment and communications carried by the helicopter, Atlas Geophysics Pty Ltd will equip each of the helicopters with the following:

- Iridium satellite phone and EPIRB for pilot and operator
- First aid and survival kit
- Food and water in the event of helicopter stranding
- Spare navigation grade GPS receiver with batteries
- Omnitrack and Iridium satellite tracking system

The company will ensure that all necessary flight permits are obtained prior to survey commencement and will advise landowners that a helicopter will be operating in the area for the duration of the project.

Aviation fuel and oils will supplied by an operator based in Alice Springs.

5.2 UTV Vehicles

UTV acquisition will be carried out with a Utility Terrain Vehicle (UTV) such as the Polaris Ranger 400HO or Kubota RTV 900 (Photo 2 and 3). With the assistance of four-wheel drive, huge suspension travel and fuel efficient engines, these UTV's are capable of negotiating all most every type of terrain, safely and easily. For very wet, boggy survey on salt lakes or floodplains, an amphibious 6x6 vehicle may be deployed with or without rubber tracks (Photo 4).

The vehicles have a very small footprint and as a result, have very low environmental impact. The physical dimension of the vehicle is about the same as a large quad-bike, but much less than that of a Landcruiser, with the width being only 1.3m. This means the vehicle is capable of weaving in between tight gaps of vegetation negating the need to "run down" stands of trees or vegetation when transiting between gravity stations or accessing difficult grids.

UTV's are considered much safer than conventional quad-bikes/ATV's and many mining and exploration companies have now banned quad-bikes from site due to numerous accidents and roll-overs. Table 1 below contains a safety feature comparison for the two types of vehicle. In addition to the safety benefits, UTV's offer a much smoother ride for both the operator and sensitive gravity meter.

Safety Feature	Atlas UTV	Quad-bike
Full time 4WD, diff lock differentials	✓	☒
Power steering	✓	☒
Seatbelts	✓	☒
Roll over protection system (ROPS)	✓	☒
Two operators per vehicle	✓	☒
Speed limited to 40kph	✓	☒
Roof for sun protection	✓	☒
Windscreen for eye/face protection	✓	☒
High visibility from the air / other vehicles	✓	☒
Long range fuel tank (min 30L)	✓	☒
Large toolkit, first aid and survival kit	✓	Limited
Large carry tray for extra fuel, water etc	✓	☒

Table 1: UTV / Quad-bike safety feature comparison

Whilst conducting operations, all operators wear long sleeve shirts, trousers and safety glasses. All operators have completed comprehensive training and undergone driver assessment.

All UTV's comply with all HSE requirements for light vehicles and all have recently been approved for use on Rio Tinto Iron Ore and Rio Tinto Exploration projects over environmentally sensitive areas. The vehicles also recently passed a comprehensive Rio

Tinto audit and inspection process. The company's comprehensive standard operating procedures and risk assessments for UTV operation can be supplied on request.

The UTV's are setup with custom engineered carry racks to safely transport the survey instrumentation, as well as a mount to carry the GPS and radio antennae. Each UTV is also equipped with the following:

- Iridium or Thuraya satellite phone
- UHF Radio
- First aid and survival kit
- Spare navigation grade GPS receiver with batteries
- Recovery equipment
- Comprehensive tool-kit to allow in field repairs
- 20L spare fuel and drinking water
- Mobile satellite tracking unit
- Winching unit

When conducting field operations, all operators carry out daily pre-start checks on the vehicle and these are documented in Atlas Geophysics pre-start log books. Vehicle servicing can be carried out on site by our operators who are suitably trained.

Atlas will ensure adequate spares are supplied to the campaign to allow in-field repairs e.g. CV boots, driveshaft, filters, etc.



Photo 2: Atlas Geophysics Ranger 400HO UTV



Photo 3: Atlas Geophysics Kubota RTV900 UTV



Photo 4: Atlas Geophysics Amphibious 6x6 on tracks

5.2 Support Vehicles

Supporting the operations will be two Landcruiser utilities and UTV transport trailer (Photo 5).

The support vehicle shall be fitted with:

- Iridium or Thuraya satellite phone
- Magellan FX324 navigation grade GPS receiver
- Spare navigation grade GPS receiver with batteries
- First aid and survival kit
- Two spare tyres
- Recovery equipment for tyre repair
- Recovery equipment including winch for bogging, stranding.
- Comprehensive tool-kit to effect in field repairs
- 10L of drinking water
- Flashing rotating beacon

All vehicles to be utilised on the project will be supplied, serviced and maintained by Atlas Geophysics. Daily pre-start checks will be carried out on all vehicles and these shall be documented in Atlas Geophysics pre-start log books.



Photo 5: UTV transportation

6.0 Camping / Accommodation

The crew would camp at either Ooratippra Station or at No.14 Bore along the Sandover Highway. At the conclusion of the project, the campsite would be left as it was found with all refuse removed from site.

7.0 Communications, Internet and Scheduled Calls

For the gravity operations, the primary method of communication will be via Iridium or Thuraya satellite phone. All vehicles including UTV's will be equipped with a satellite phone and high-power UHF transceivers.

Scheduled calls will be made between crews will be made every hour on the hour. In addition to this, all crews will call Perth Operations at 0800, 1200, 1500 and upon returning to camp.

All Atlas light vehicles and trucks are fitted with [Tracertrak](#) units and their location can be tracked via a web-based interface (Figure 6). In addition to this, all crews, whether they are on foot, helicopter or utilising UTV's, will also be supplied with at least one [GeoPro Messenger](#) portable messaging device to allow for personal satellite tracking and two way messaging. This revolutionary device allows for several weeks of tracking and messaging off a single battery charge and can be carried easily in a backpack or on an operator's belt. Further details concerning the device can be found in the brochure overleaf (Figure 7).

Internet connections for client contact and data server access will be established using BGAN.

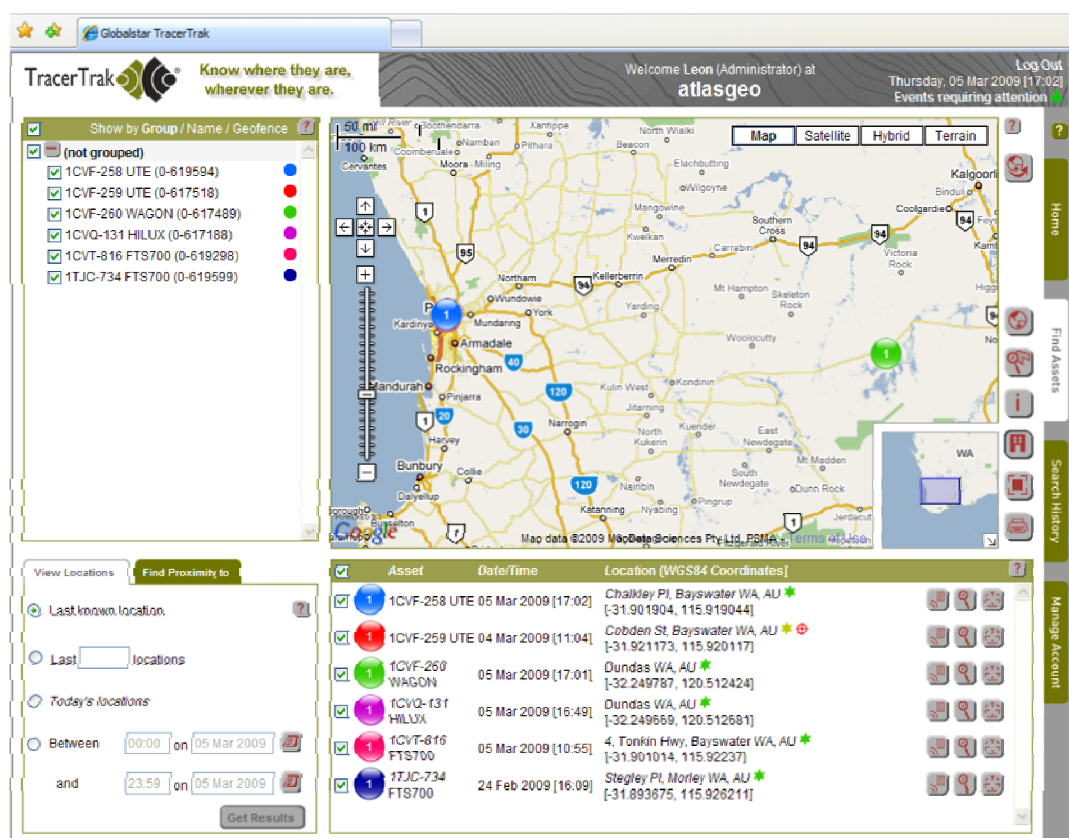


Figure 6: Tracertrak tracking interface



GeoPro Web Application

- Anywhere browser access to the secure hosted GeoPro Web Application
- Easily configure:
 - Role-based user permissions
 - User-based rules for emergency, check-in, and tracking including organization defined response teams
 - Enterprise-wide predefined message and address books
 - Assignment of workers into organizations and groups
- Mark dynamic or static waypoint locations specific to enterprise needs
- Flexible mapping solutions:
 - Bing™ or imported custom maps
 - User-defined bookmarks for quick access to key map areas
 - Support for multiple co-ordinate systems
 - View historical location message trail with the click of a button
- Device Manager – to view and configure personal data
- Comprehensive message and event audit trail

Network

Iridium®

- Two-way global satellite coverage with low message latency
- Highly reliable mesh network

GeoPro

- Multiple Tier 1 backbone connections
- HTTPS secure communication
- Multiple load balanced redundant server architecture
- Clustered database and storage area network (SAN) for data assurance and availability
- 24/7 network and application monitoring



GeoPro Messenger

Features

- Rugged two-way satellite/GPS messaging device
- Dedicated two step emergency button
- One handed non-slip form factor
- Easy to use and intuitive interface
 - Joystick to navigate on-display menus and keyboard
 - Dynamic softkeys for quick selection and response
- Automated tracking reports with flexible intervals
- Network/power optimized push messaging¹
- Multiple messaging options including free form text and predefined messages
- LED and audio alerts
- USB sync for predefined messages, address book and waypoints

Specifications

- Dimensions: 12.5 cm x 6.3 cm x 3.7 cm (5" x 2.5" x 1.5")
- Weight: 380 g (13.4 oz)
- Battery: Lithium-ion, field replaceable, field rechargeable
- Battery Life: Up to 1000 message reports (usage and condition dependent)
- Operating Temperature: -10°C to + 50°C (14°F to 122°F)
- Display: Monochrome, backlit, anti-glare
- IP66: Protected against powerful water jets and dust ingress
- GPS: U-blox chipset. Best in class acquisition and tracking sensitivity
- High Precision GPS (4 digits): Latitude, longitude, altitude, velocity, direction

¹ Patent pending.

Figure 7: GeoPro Messenger brochure

8.0 Proposed Survey Methodology

All gravity data will be acquired using proprietary Atlas Geophysics Pty Ltd UTV-borne or helicopter borne-techniques. These techniques, which utilise concurrent GPS and gravity acquisition, allow for rapid acquisition of very high quality data.

8.1 Gravity and GPS Control Establishment

GPS and gravity control stations will be established near to the survey area. At each station, a permanent monument will be erected to mark and witness the station. Each monument would consist of a 30cm star picket driven into the ground with about 10cm protruding alongside a small (30cm diameter) circular concrete slab also set in concrete. The star picket will mark the position of the GPS control station and the concrete slab the position of the gravity control station. A steel star picket of 1.25m length will be placed within 0.5m of each station and carries an Atlas Geophysics Pty Ltd witness plaque numbered with a unique station number (Figure 8).

The details of all Atlas Geophysics Pty Ltd control stations are recorded on Atlas Geophysics Pty Ltd control station summary sheets (see Appendix A for an example). This sheet includes the geodetic coordinates, observed gravity value, station description, locality sketch, locality map and digital photo of the station.



Figure 8: Atlas Geophysics Pty Ltd survey witness plaque

8.1.1 GPS Control

Primary GPS control will be established for all control stations within the survey area and will allow all position and height information obtained from the gravity survey to be tied to the Geocentric Datum of Australia (GDA94), the Geodetic Reference System 1980 (GRS80) and the Australian Height Datum (AHD).

Coordinates for the control stations will be derived from the 5 second static GPS data logged at the station whilst gravity surveying is underway. The static data will be submitted to Geoscience Australia's [AUSPOS](#) processing system to produce first-order geodetic control station coordinates accurate to better than 10mm for the x, y and z observables. Multiple

days of static GPS data using different GPS antenna heights will be submitted to ensure accuracy and reliability of the solution.

Initial surveying is usually conducted using adopted control station coordinates since the AUSPOS system requires approximately two weeks before a Final Ephemeris Solution can be delivered. The adopted coordinates are derived from an autonomous GPS measurement at the control station giving an accuracy of better than 0.5m for x, y coordinates and better than 10m for the z coordinate. Once the final ephemeris solution for control station coordinates has been delivered by AUSPOS, all control and field GPS measurements have the necessary DC shift applied to give accurate, absolute positions for east, north and elevation.

8.1.2 Gravity Control

Primary gravity control stations will be established at the same location as the primary GPS control stations. Once tied to the [Australian Fundamental Gravity Network](#) (AFGN), the gravity control stations allow all field gravity observations to be tied to the AAGD07 gravity datum employed by Geoscience Australia.

An accurate observed or absolute gravity value for the control stations will be established via “ABABABA” ties with all of the project gravity meters to nearby AFGN stations or to existing primary control. Expected accuracy of the individual tie surveys would be better than 0.1 gu (or 0.01 mGal).

8.2 GPS Data Acquisition, Processing and Quality Analysis

GPS-Glonass data will be collected in static mode at the control station and in kinematic mode on the rover using geodetic grade Leica GPS1200 receivers. Rigorous post-processing of the recorded kinematic data will allow for excellent GPS-Glonass ambiguity resolution and 3-D solution coordinate qualities better than 3cm for each of the gravity station locations. Atlas Geophysics quality analysis (QA) procedures will ensure that all data will meet and exceed industry standards for data quality.

8.2.1 GPS-Glonass Acquisition

Each gravity station location (GSL) will be positioned using Leica GPS1200 receivers operating in stakeout mode. Accuracy of the autonomous positioning system will be better than 5m and where possible, the crew will position the station as close to the programmed location as possible. Some stations may need to be offset or omitted where it is not possible to find a suitable spot e.g. heavily vegetated, hilly and built up areas or unsafe landing areas for the helicopter.

For the helicopter operations, the GPS-Glonass sensor will be mounted on the tail-boom of the aircraft, with the receiver logging phase data inside the cabin. Data will be logged at five second epochs onto Compact Flashcard (CF) for later downloading and processing.

For the UTV operations, the GPS-Glonass sensor will be mounted on the roof of the vehicle and kinematic phase data logged by the GPS receiver mounted in a protective case in the rear carry tray. Static data will also be concurrently logged at the primary GPS control station(s) to allow for later AUSPOS submission and kinematic post-processing.

8.2.2 GPS-Glonass Processing

The acquired raw GPS-Glonass data will be processed nightly using [Novatel Waypoint Grafnav](#) v8.4 post-processing software (Figure 9). GrafNav is a fully-featured kinematic and static GPS/Glonass post-processing package that uses Waypoint's robust GPS/Glonass processing carrier phase kinematic (CPK) filter engine. The software is capable of processing raw kinematic GPS/Glonass data from most GPS/GNSS receivers and allows the user to process the roving data from as many as eight separate control stations to achieve accuracies at the centimetre level. The software can automatically switch from static to kinematic processing and has a fixed static solution for static initialisation of short or medium baselines that are below 30km. A float static solution is available for baselines longer than this. Kinematic Ambiguity Resolution (KAR) allows the session to start in kinematic mode and can help fix otherwise unrecoverable cycle slips. Ionospheric processing and modelling is also included with the software and can help improve accuracy, especially over long baselines. Advantages of the Waypoint processing engine over other packages include:

- *Fast Processing* – The Grafnav engine is one of the fastest on the market. For a single base station, a 2.40 Mhz PIII CPU can expect to process GPS data at 670 epochs/second. This means that a 4-hour 2 Hz data set will process one direction in 22 seconds. For two bases, processing takes 250 epochs/second or about 1 minute for the same 4-hour data set. For 4 bases, these times are 50 epochs/second or about 5 minutes.
- *Reliable OTF Processing* – Waypoint's on-the-fly KAR algorithm has had years of development and testing. Various implementations and numerous options are available to control this powerful feature.
- *Multi-Base (MB) processing* – With Version 8.40, GrafNav now supports true multiple control station processing where all of the baselines are incorporated into one sophisticated Kalman filter. This can spatially decorrelate some of the error sources while also allowing integer ambiguity determination using the closest base station. Satellite drop-outs at one base will also be compensated by the others. The two biggest advantages are improved overall accuracies and much less operator effort required to process and QC such data.
- *Accurate Static Processing* – Three modes of static processing are implemented in the main processing kernel.
- *Dual Frequency Support* – Full dual frequency GPS processing comes with the software. For ambiguity resolution, this entails wide/narrow

lane solutions for KAR, fixed static and quick static. The GrafNav kernel implements two ionospheric processing modes including the iono-free and relative models. The relative model is especially useful for airborne applications where initialization is near the base station, and this method is much less susceptible to L2 phase cycle slips.

- *Forward and Reverse* – Processing can be performed in both the forward and reverse directions. GrafNav also has the ability to combine these two solutions to obtain a globally optimum one.
- *GPS + GLONASS* – The GrafNav kernel has the ability to also process GPS+GLONASS data. This is especially advantageous for applications in forested areas, where the additional satellite coverage can improve accuracies.
- *Velocity Determination* – Since the GrafNav kernel includes the L1 doppler measurement in its Kalman filter, velocity determination is very accurate. In addition to this, a considerable amount of code has been added specifically for the detection and removal of Doppler errors.
- *High Dynamics* – The GrafNav kernel can handle extremely high dynamics from missiles, rockets, dropped ordinances, and fast flying aircraft.
- *Long Baseline* - Because precise ephemeris and dual frequency processing is supported, long baselines accuracies can be as good as 0.1 PPM.

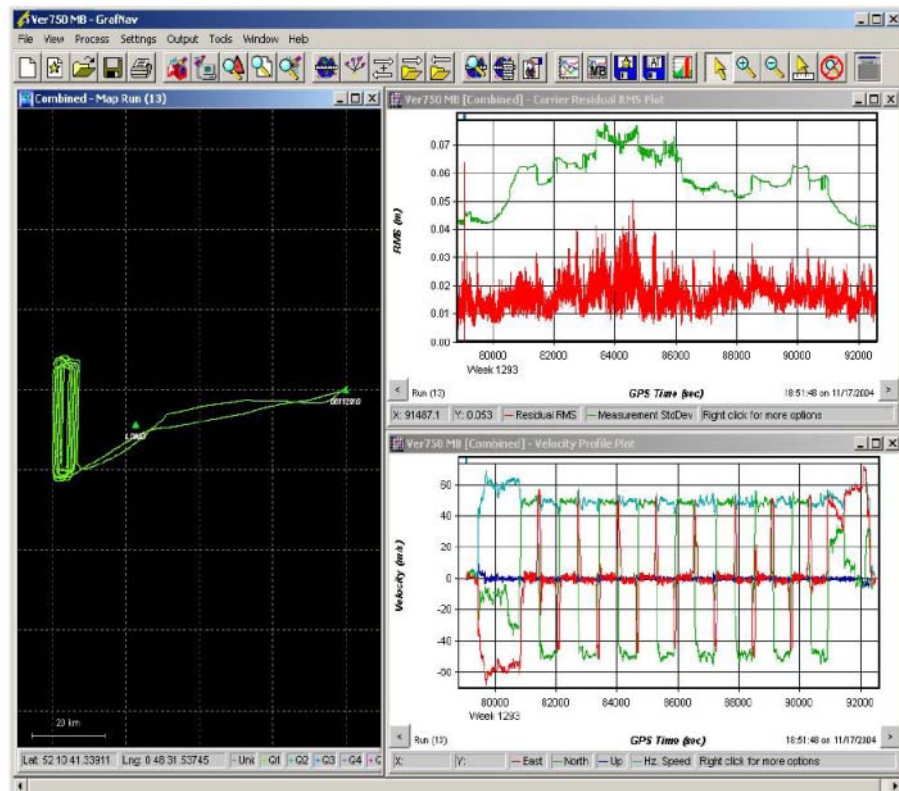


Figure 9: Waypoint Grafnav Processing Software

Once each epoch is processed to give a solution for the WGS84/GRS80 position and elevation at ground level (i.e. corrected for sensor height), transformations and projections to local grid can be conducted within Waypoint.

8.2.3 GPS/Glonass Quality Analysis

Rigorous quality analysis procedures will be routinely applied to the acquired GPS-Glonass data on a daily basis using Waypoint Grafnav's built in QA tools. Some of the tools that may be employed on the project include:

- Combined Separation Plot:** This plot shows the difference between the forward and reverse solutions (Figure 10). A perfect solution would have a separation of zero as this indicated the carrier phase ambiguities have been determined to be exactly the same value in both directions. A separation of better than 0.1m on a quad-bike survey would indicate that the data is of high quality.

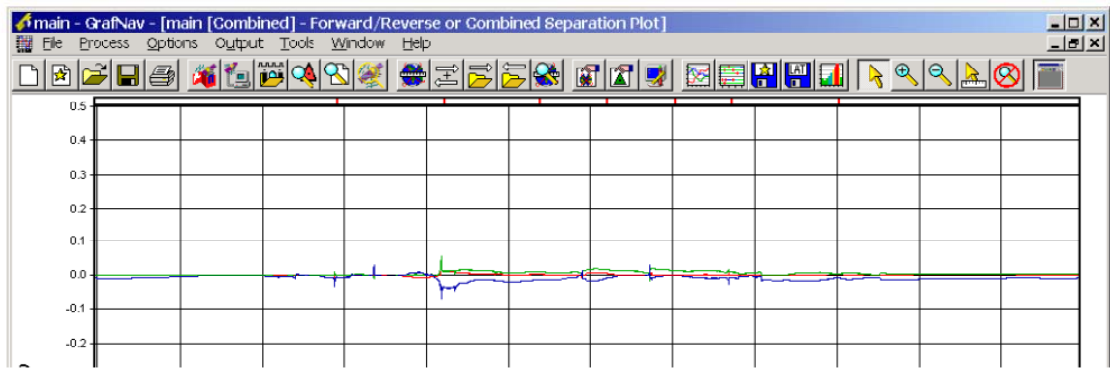


Figure 10: Combined Separation Plot

- **Float or Fixed Ambiguity Status Plot:** This plot shows if the final solution is float or fixed (Figure 11). Fixed integer ambiguities generally have better accuracies (usually < 10cm accuracy). Ideally the plot should show fixed as this indicated an integer ambiguity fix on both forward and reverse directions.

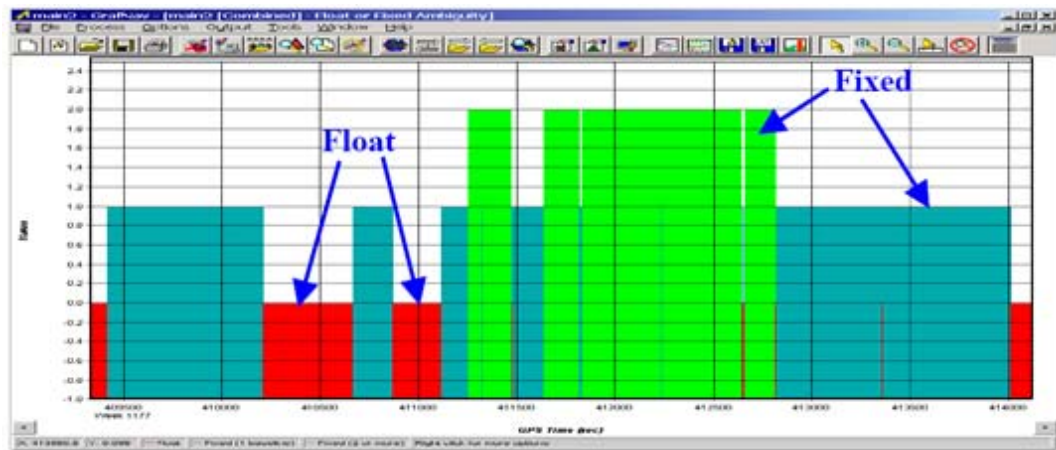


Figure 11: Float or Fixed Ambiguity Status Plot

- **Quality Factor Plot:** This plot shows the quality of the final solution (Figure 12). There are five different quality factors plotted and these factors are also output in the Atlas Geophysics Pty Ltd GPS data file.

Quality 1 – Fixed Integer (Green)
 Quality 2 – Stable Float (Aqua)
 Quality 3 – Converging Float (Blue)
 Quality 4 – DGPS or worse (Red)
 Quality 5 – Single Point (Yellow)

Increasing quality factors indicate a worse solution. This is not a perfect indication, but it can be useful to isolate problems.

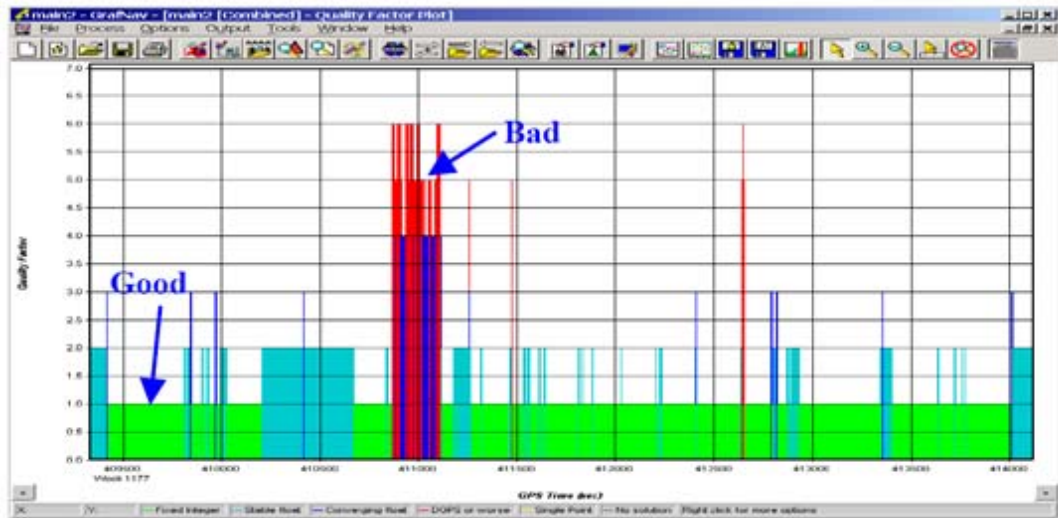


Figure 12: Quality factor plot

Complementing Waypoint GrafNav QA tools is the company's own in-house GPS quality analysis software. A module built into AGRIS (Atlas Geophysics Reduction and Information Software) allows the user to import the Waypoint output files and examine quality factors such as station repeatability, coordinate velocity, dilution of precision, coordinate quality factor and standard error for each gravity station location. The procedure is carried out before merging the positional data with gravity data for final reduction to Bouguer Anomaly. Comprehensive statics, repeatability analysis and histogram plotting are also performed.

Any gravity stations not conforming to contract/project specifications for GPS repeatability will be repeated by the company at no cost to the client.

8.3 Gravity Data Acquisition, Processing and Quality Analysis

Gravity data will be gained using the company's rapid acquisition, high accuracy UTV borne techniques. The company's own in-house reduction and QA software will be used to reduce the data on a daily basis to ensure quality and integrity.

8.3.1 Calibration of the Gravity Meters

All gravity meters to be used on the project have recently been recently calibrated on the calibration range at Helena Valley, Western Australia. The calibration process has validated each gravity meter's scale factor to ensure reduction of the survey data produces correct Observed Gravities from measured dial reading values.

Weekly tilt-tests and cycles will be conducted to ensure meter drift and tilt correction factors are valid. Gravity meter drift rates will be monitored on a day to day basis using AGRIS software.

8.3.2 Acquisition of the Gravity Data

Gravity data will be acquired concurrently with GPS-Glonass data using Scintrex CG5 gravity meters (Photo 6). Data will be acquired in a single shift of 10 hours duration, with each shift consisting of a single loop controlled by observations at the gravity control stations. Each loop will contain a minimum of two repeated readings so that an interlocking network of closed loops is formed. A minimum of **3% repeats** will be acquired for quality control purposes. Repeat readings will be evenly distributed on a time-basis throughout each of the gravity loops. All gravity operators are experienced and trained in identifying spurious or bad data. If wind or seismic conditions prevent the operator from gaining the highest quality data, then the gravity survey can be suspended until conditions improve.

For the helicopter operations, the pilot will be responsible for navigating to each station, and once at the station, the operator will safely disembark from the helicopter to acquire the gravity data. The observation point is always situated in front of the aircraft, in the pilot's view. Under no circumstances are readings taken outside of the pilot's view as this can jeopardise the safety of the operator. As the helicopter always lands on flat ground, the error due to the gravity observation not being coincident with the GPS-Glonass observation (which is at the tail-boom) is minimal. A small latitude based error of less than 0.005 mGal would apply, but this is not seen to be appreciable on a regional gravity survey, so is not corrected for.

When acquiring data using the UTV, the operator will, after navigating safely to the station, take readings alongside the UTV with the engine turned off and park brake applied. Where possible the UTV is always parked on flat, level ground.

At each GSL, the gravity operator will take a minimum of two gravity readings of 20 second duration so that any seismic or wind noise can be detected. Control station readings will be set to 120 second duration. Before taking a reading, the operator will ensure that the

instrument tilt-reading is restricted to less than 5 arc-seconds and after the reading, not higher than 20 arc-seconds. In some instances in very soft sand or mud, it is impossible to keep tilt-readings under 50 arc seconds due to the soft nature of the ground. This is not found to adversely affect the quality of the data since the gravity meter is equipped with online tilt correction. All meters will be tilt tested before the project commences.

If two separate readings do not agree to better than 0.03 mGal (0.01 mGal for control station readings), then the operator will continue taking readings until the tolerance between consecutive readings is achieved. At the conclusion of the gravity reading, the final data display on the gravity meter will be analysed to ensure the instrument is performing to specification, and that the station observation provides data conforming to the project specifications. The operator will also verify that the temperature, standard deviation and rejection values are within required tolerance before recording the reading. At each station, the operator will record the data digitally in the gravity meter as well as in an Atlas Geophysics Pty Ltd field book so that instrument drift and reading repeatability can be analysed easily whilst in the field. Data recorded at each GSL is assigned a unique station code and station number.

Repeat stations will be marked with a biodegradable flagging tape for subsequent reoccupation. Repeat stations are always laid on flat, level ground. When reoccupying GSL's using a UTV, the operator will position the vehicle as close to the original location as possible. The UTV tracks are used as a guide for position and a scuff mark is used to mark the exact location of the gravity reading.



Photo 6: Gravity observation by helicopter

8.3.3 Processing of the Gravity Data

The acquired gravity data will be processed using the company's in-house gravity pre-processing and reduction software, AGRIS. This software allows for full data pre-processing, reduction to Bouguer Anomaly, repeatability and statistical analysis, as well as full quality analysis of the output dataset.

The software is capable of downloading Scintrex CG3/CG5, Burris and Lacoste Romberg gravity data. Once downloaded, the gravity data is analysed for consistency and preliminary QA is performed on the data to check that observations meet specification for standard deviation, reading rejection, temperature and tilt values. Once the data is verified, the software averages the multiple readings and performs a merge with the positional data (which it has also previously verified) and performs a linear drift correction and earth tide correction. Calculation of Free Air and Bouguer Anomalies is then performed using Geoscience Australia preferred formulae with both Spherical Cap and Geoidal Bouguer corrections.

Data can be supplied to the client in a wide variety of formats including ASEG-GDF2 format.

8.3.4 Quality Analysis of the Processed Gravity Data

Following reduction of the data to Bouguer Anomaly, repeatability and QA procedures will be applied to both the positional and gravity observations using AGRIS software. AGRIS checks the following as part of its QA processing:

- Easting Observation Repeatability and Histogram
- Northing Observation Repeatability and Histogram
- Elevation Observation Repeatability and Histogram
- Gravity Observation Repeatability and Histogram
- Gravity SD, Tilt XY, Temperature, Rejection, Reading Variance
- Gravity meter drift / closure
- Gravity meter loop time, drift per hour
- GPS Dilution of Precision, Coordinate Quality Factor, Standard Error
- Variation of surveyed station location from programmed location.

QA procedures will be applied to the gravity data on a daily basis and any gravity stations not conforming to contract specifications will be repeated by the company at no cost to the client.

8.3.5 Additional Processing, Gridding and Plotting

Complementing the QA procedures will be additional daily gridding, imaging and plotting of the elevation and gravity data. Once processed to Bouguer Anomaly and assessed for QA, data are imported into Geosoft Oasis Montaj or ChrisDBF software for gridding at 1/5th the station spacing to produce ERMapper compatible grid files. Resultant grids are contoured, filtered and interpreted using ERMapper and ArcMap software to check that data is smoothly varying and that no spurious anomalies are present. A first vertical, tilt angle and horizontal derivative filter are routinely applied to the data as these filters allow for excellent noise recognition. Once identified, any spurious stations can be field checked by the field crew the following day and repeated if required.

Plotting of the acquired stations on a daily basis allows for identification of any missed stations which can then be gained the following day.

At the conclusion of the project, Atlas Geophysics can offer additional processing services including:

- Rigorous terrain correction using laser, photographic or SRTM derived digital elevation models
- Reprocessing, merging and QA of historical datasets
- Gravity database establishment and administration
- Geophysical imaging using ERMMapper and Geosoft software
- GIS compilation and maintenance (Arcmap or Mapinfo)
- Modelling and inversion
- Large format plotting (photo quality).

9.0 Precision and Accuracy of the Gravity Survey

9.1 Gravity Observations

Gravity data will be measured to Scintrex CG5 gravity meter precision of 0.001 mGal or 0.01 gu (μms^{-2}). The standard deviation of all repeat gravity station differences after drift and tidal correction will be better than 0.03 mGal or 0.3 gu (μms^{-2}). The company will resurvey any gravity loop containing a repeat difference greater than two standard deviations.

9.2 Positional Observations

All positions x, y and z will be measured by GPS-Glonass to a precision of 0.001m. The standard deviation of all elevation repeat station differences will be better than 0.05m. The company will resurvey any gravity loop containing a repeat difference greater than two standard deviations.

10.0 Survey Deliverables

10.1 Preliminary Data

Whilst the survey is underway, preliminary data can be delivered to the client on a daily basis. Data can be delivered via email or uploaded to the Atlas Geophysics secure FTP server. Daily deliverables would include, but not be limited to:

- Raw gravity data in Scintrex CG5 format (.grv files)
- Raw GPS-Glonass data in Atlas AGRIS format (.gps files)
- Reduced gravity data in Atlas AGRIS format (.csv files)
- Ermapper compatible grids (.ers) of GPS derived elevation, Bouguer Anomaly and 1st vertical derivative of Bouguer Anomaly
- GIS compatible images of the above grids (A3 size, 300dpi)
- Daily production report detailing production, repeatability and survey cost.

10.2 Final Data

Final data is typically delivered within two weeks of survey completion. Timing is usually dependant on the delivery of final ephemeris solution coordinates for GPS control stations from AUSPOS. If control already exists on site, then final data can be delivered the day after survey completion. Final data delivery would include, but not be limited to:

- Raw gravity data in Scintrex CG5 format (.grv files)
- Raw GPS-Glonass data in Atlas AGRIS format (.gps files)
- Reduced gravity data in Atlas AGRIS format (.csv files) or in a client specified format
- Reduced gravity data in ASEG-GDF2 format
- Ermapper compatible grids (.ers) of GPS derived elevation, Bouguer Anomaly and 1st vertical derivative of Bouguer Anomaly
- GIS compatible images of the above grids (A3 size, 300dpi)
- Daily production report detailing production, repeatability and survey cost
- Hardcopy acquisition report or memorandum with all of the above supplied on PC compatible CD or DVD.

11.0 Pricing Schedule

11.1 Fixed Price per Station vs. Daily Rate and Estimate

This quotation has been provided on a fixed price per station basis. Atlas Geophysics believes that a fixed rate per station basis is a fairer option for its clients when compared to a daily rate charge where the total survey cost estimate is based on anticipated production rates. **If preferred, a daily rate quote can be provided on request.**

Typically, clients have a fixed exploration budget that can be expended on a gravity survey. The uncertainty associated with a daily rate/production estimate quotation can cause budgeting issues if the final survey cost exceeds or comes in under budget. A fixed price per station puts the pressure onto Atlas Geophysics and its crews to perform efficiently whilst on survey. If the survey crew encounters problems whilst surveying e.g. thick trees, poor access or steep terrain, then it is Atlas Geophysics who suffers the consequences of lower than anticipated production rates, not the client.

How can Atlas Geophysics offer a fixed price per station when other survey companies insist on charging out at daily rates with a total cost **estimate** only?

- ✓ The company director has been involved in conducting gravity surveys for over 14 years. Not only has he been responsible for quoting and estimating projects, but he had had extensive field experience and is familiar with every type of terrain encountered in Australia and overseas.
- ✓ The director is a geophysicist, not a surveyor or engineer.
- ✓ The director is backed up by an experienced, motivated and extremely hardworking team of supervisors and technicians that, more often than not, easily meet production expectations safely and efficiently whilst collecting the highest quality data possible.
- ✓ The company utilises and maintains only the latest in GPS-Glonass and gravity meter technologies - you won't find us using old Trimble receivers from the mid to late nineties! A large fleet of spares and components allows the company to quickly effect malfunction or failures to reduce downtime in the field.
- ✓ Ongoing research and development into new and existing technologies and methodologies gives us the competitive advantage over our competitors.

The total survey cost indicated overleaf will be the amount charged to the client, except for a possible variance in final accommodation and meal costs due to the inherent difficulty in estimating project duration. There may also be the possibility of standby charges due to inclement weather or necessary on-site crew inductions. **There will be no hidden costs due to satellite calls and/or internet communications, AUSPOS connections, fuel, meals or extra charges during mobilisation/demobilisation.**

Every project costing is assessed independently and the fixed price per station will be commensurate with expected production rates, project size, and crew availability.

11.2 Pricing for Helicopter Based Acquisition

11.2.1 Fixed Price per Station for Acquisition and Processing

Atlas Geophysics would like to offer the following **fixed price per station** for helicopter acquisition and processing. The price includes processing to Bouguer Anomaly, 3% repeats, fuel and oils for the helicopter, all communications and crew changeover costs. An additional charge to cover vehicle fuel, meals and accommodation for the two gravity crew members and two pilots will be charged per day.

Station Spacing	Fixed Price Per Station (ex GST)
1000m	\$A 80.00

11.2.2 Fixed Price for Helicopter Mobilisation and Demobilisation

Atlas Geophysics would like to offer the following fixed price for helicopter mobilisation and demobilisation ex Adelaide. Atlas may have a helicopter in Alice Springs at the time of the survey, so a lower mobilisation cost may apply. The price includes fuel and oils for the helicopter, meals and accommodation for the pilots and all landing fees. A discount may be applied to the mobilisation charge if Atlas Geophysics is undertaking helicopter operations in another location closer to the survey area at the time the survey takes place.

Mobilisation and Demobilisation each way (ex GST)
\$A 8,000.00 ex ADELAIDE
\$A 4,000.00 ex ALICE SPRINGS

11.3 Pricing for UTV Based Acquisition

11.3.1 Fixed Price per Station for UTV Acquisition and Processing

Atlas Geophysics would like to offer the following **fixed price per station** for UTV-borne gravity acquisition and processing. The price includes full processing to Bouguer Anomaly, 3% repeats, all communications and crew changeover costs.

Station Spacing	Fixed price per station (ex GST)
1000m	\$A 59.00

11.3.2 Fixed Price for UTV crew Mobilisation and Demobilisation

Atlas Geophysics would like to offer the following fixed rate for mobilisation and demobilisation for a single crew ex Adelaide. The rate includes all fuel, meals and accommodation. This rate may be reduced should Atlas have crews operating in nearby.

Mobilisation/Demobilisation Daily Rate (ex GST)
\$A 2,190.00

11.4 Crew Standby

Standby will be charged where the following prevent the crew from working a full day:

- Inclement weather: Rain, thunderstorms, high wind or fire danger
- Excessive wind or seismic activity
- Client inductions and other site specific training
- Camp or operations base moves
- Stop work at client or landholder request
- Vehicle bogging due to wet weather
- Gravity control

Standby at the following rate will always be charged out as a percentage of the day worked and on a per crew basis.

Standby per crew per day (ex GST)
\$A 1,090.00

11.5 Reporting and Additional Processing

A survey acquisition memorandum can be supplied at the following charge:

Acquisition Memorandum (ex GST)
\$A FREE

If requested, additional processing such as terrain corrections, regional removal, filtering and digital imaging can be conducted at the hourly rate below.

Additional Processing (ex GST)
\$A 80.00 / hour

11.6 Ancillary Charges

All vehicle fuels, meals, communications and camp accommodation will be supplied by Atlas at the fixed rate below.

Ancillary Charges (ex GST)
\$A 100 / per person / day

11.7 Option 1: Complete regional stations by helicopter
Estimate of Total Time and Fixed Cost

The regional survey by helicopter would be completed in less than one day.

Charge	Cost \$A ex GST
Mobilisation of helicopter and crew to site (ex Alice)	\$4,000.00
Survey 230 stations at 1000m station spacing <i>@ \$80.00 per station</i>	\$18,400.00
AUSPOS connection	\$0.00
Communications and Internet	\$0.00
Demobilisation of helicopter and crew from site (to Alice)	\$4,000.00
Full Camp: fuel, meals and accommodation (six persons)	\$1,200.00
TOTAL FIXED COST OF SURVEY (ex GST)	\$27,600.00

11.8 Option 2: Complete regional stations by UTV
Estimate of Total Time and Fixed Cost

This survey would be completed in 4-5 days given good weather and traversable terrain

Charge	Cost \$A ex GST
Mobilisation of crew to site (ex Adelaide)	\$2,190.00
Survey 230 stations at 1000m station spacing <i>@ \$59.00 per station</i>	\$13,570.00
AUSPOS connection	\$0.00
Communications and Internet	\$0.00
Demobilisation of crew from site (to Adelaide)	\$2,190.00
Full Camp: fuel, meals and accommodation	\$1,000.00
TOTAL FIXED COST OF SURVEY (ex GST)	\$18,950.00

12.0 Project Timing and Availability

Atlas will make the crews available within three weeks of quotation acceptance. We currently have availability in May and June 2012. A purchase order, contract or letter of agreement will need to be supplied by the client before the company makes plans to mobilise.

13.0 Occupational Health, Safety, and Environment

Atlas Geophysics Pty Ltd recognises that excellence in managing Occupational Health and Safety and Environment (HSE) responsibilities is essential to the long term success of the company. To this end, the company aims to prevent injuries and occupational illness to its employees and minimise any adverse environmental impact its activities may have. Copies of the company's HSE and Drug and Alcohol policies are contained in Appendix B.

Risks associated with Atlas Geophysics business activities have been identified using the Atlas Geophysics Risk Rating procedure and a HSE risk management register has been established. Medium and High risk activities identified in the register triggered the need for documented controls. These controls, based on the accepted hierarchy of control, are documented in both an Atlas Geophysics Field Manual and Atlas Geophysics HSE Standard Operating Procedures. These documents can be provided to the client upon request along with a copy of the company's Health Safety and Environment Management Plan (HSEMP).

In establishing the Atlas Geophysics HSE system, potential and existing clients were approached to supply their Contractor HSE requirements. These requirements were factored into aspects of the HSE management system. To monitor performance of the system, a constant improvement and review process was incorporated; this review process includes feedback from regular workplace observations, outcomes from hazard/incident reports and an annual audit /review process.

Atlas Geophysics is committed to meeting client HSE requirements and if required, will work to client requested HSE procedures, provided they exceed Atlas Geophysics minimum requirements. The company has recently had its HSE management systems audited by Rio Tinto/Pilbara Iron and were successfully appointed as an Approved Contractor.

Prior to survey commencement, the company shall conduct a full risk assessment to evaluate any HSE risks pertaining to the project and will take appropriate action to minimise any potential risks. The risk assessment shall be documented and included with a comprehensive Field Operations Plan. This field planning document will detail all staff member details, contact telephone numbers, daily field itinerary with scheduled call timetable, and procedures in the event of an emergency.

14.0 Insurances

The company carries extensive insurance to cover all of its Australian and overseas operations. Copies of the policies and certificates of currency can be provided to the client upon request. Details of the relevant insurances are listed below:

Professional Indemnity

Limit of Indemnity: \$1,000,000

Insurer: Lumley General Insurance/Dual Australia Pty Ltd

Policy Number: SI/05526/000/08/Z

Expiry Date: 27/02/2013

Public Liability

Limit of Indemnity: Section A - Public Liability: \$10,000,000 any one occurrence, but limited to \$250,000 for property in the care custody or control of the Insured.

Section B - Pollution Liability: \$10,000,000 any one occurrence and in the aggregate during any one period of insurance.

Section C - Products Liability: \$10,000,000 in the aggregate during any one period of Insurance.

Insurer: Certain Underwriters at Lloyd's

Policy Number: ROLF-07-0040

Expiry Date: 27/02/2013

Workers Compensation

Limit of Liability: Benefits as under the local Workers' Compensation Act

Common Law Liability - \$50,000,000

Insurer: QBE Insurance (Australia) Limited

Policy Number: 710004905GWC

Expiry Date: 27/02/2013

General Property

Interest Insured: Specified tools of trade

Sum Insured: \$500,000 per list supplied

Insurer: QBE Insurance (Australia) Limited

Policy Number: 710004905GEN

Expiry Date: 27/02/2013

15.0 Company Experience and Referees

Although Atlas Geophysics is a relatively new company, we have successfully completed numerous large surveys in both the private and public sector and are now the preferred contractor for such companies as Rio Tinto Exploration, Rio Tinto Iron Ore, Barrick Gold of Australia and Goldfields.

In 2007, we safely completed Australia's largest ever helicopter gravity survey, the PIRSA PACE Northern G2 survey consisting of over 38,000 regional spaced stations (1.5km spacing). Testimonials concerning our performance on this survey can be found in Appendix C. The company also recently completed Western Australia's largest helicopter based gravity survey consisting of 14,700 regional spaced stations in the Eucla Region (February 2012). Figure 13 overleaf contains a plot of government funded stations acquired by Atlas Geophysics overlain on a map of Australia. Since inception in January 2007, Atlas Geophysics has safely acquired 143,025 new regional gravity stations by helicopter, more than any other contractor in Australia.

Adding to our vast experience with helicopter based gravity surveys are many ground based surveys in a multitude of environments and locations, with varying survey configurations ranging from walking microgravity to regional UTV/ATV gravity.

Referees that can attest to the company's performance in executing many types of gravity survey include:

Helicopter Gravity Surveys

Ray Tracey – Geophysicist, Head of Australian Fundamental Gravity Network Project
Geoscience Australia
T 02 6249 9279
email: ray.tracey@ga.gov.au

High Resolution Gravity Surveys

Geoff Garton – Senior Geophysicist
Rio Tinto Resource Development
T 08 6213 0731
email: geoff.garton@riotinto.com

Regional Gravity Surveys

Lee Sampson – Regional Geophysicist Australia-Pacific
Barrick Australia Pacific
T 08 9212 5777
email: lsampson@barrick.com

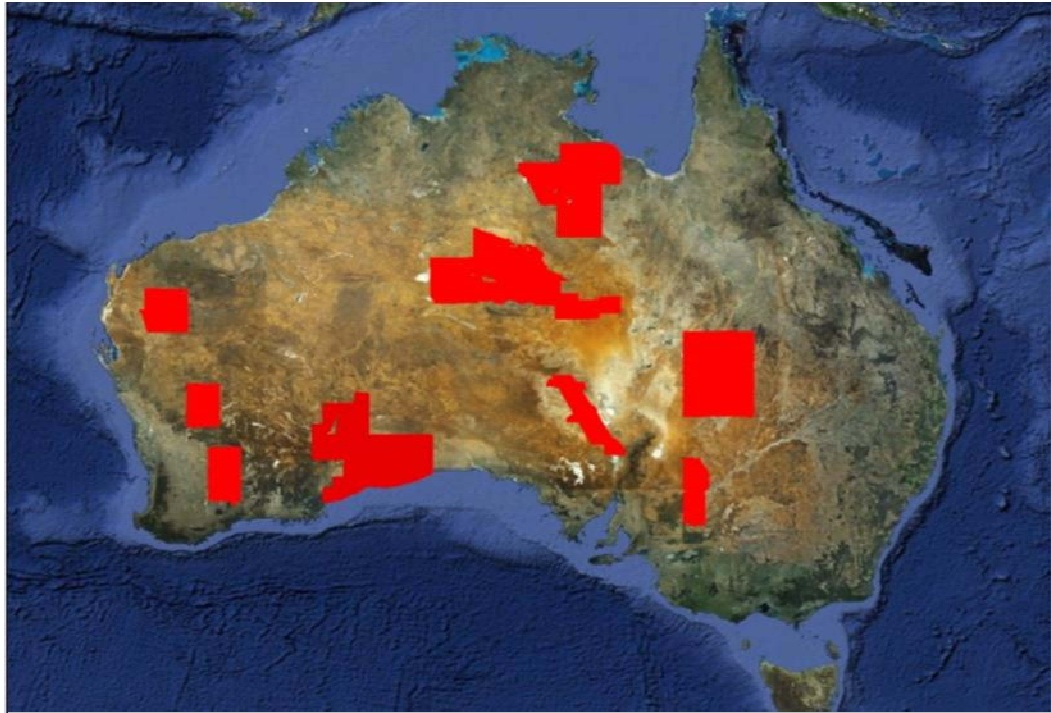


Figure 13: Government funded gravity stations acquired and processed by Atlas

16.0 General Terms and Conditions

16.1 Contractor Details

Invoices for services rendered will be issued by:

Atlas Geophysics Pty Ltd
PO BOX 1049
Morley WA 6943
ABN 68 123 110 243

16.2 Payment Terms

Services will be invoiced upon delivery of the final data and acquisition report. On large projects, progressive invoices may be submitted fortnightly. Payment terms will be strictly 14 days net from invoice date.

16.3 Currency of Quotation

This quotation shall remain current for a period of two months. After that date, Atlas Geophysics may alter the costs of the submitted quotation accordingly.

16.4 Project Schedules

All project schedules indicated in this quotation will be subject to confirmation by Atlas Geophysics depending on current project commitments at the time of quotation acceptance. If additional projects have been awarded to Atlas Geophysics before this quotation is accepted, then Atlas Geophysics reserves the right to undertake the work. The company will take all steps to avoid project conflicts through liaison with the interested parties.

APPENDIX A

Example Control Station Description

GRVGPS0045 – Mount Magnet A/S

GDA 94/GRS80		MGA Z50		AMG Z50	
Latitude	-28°07'03.2070"	Easting	582,878.316	Easting	582,738.710
Longitude	117°50'37.7644"	Northing	6,889,487.436	Northing	6,889,335.800
Ellipsoidal Height	386.600	Orthometric Height	405.826	Orthometric Height	405.826

OBSERVED GRAVITY

AAGD07 gu	9790577.13

Occupation Method/Location Details

The GPS control point consists of a dumpy steel picket driven into the ground to a height of 10cm above ground level. The gravity control point consists of a small concrete slab (30cm square) concreted into the ground, opposite the GPS control point. The control station is witnessed by an Atlas Geophysics survey plaque attached to a 1.5 metre steel picket placed within 0.5m of both control points.

Gravity Control was established via an ABABA loops to AFGN gravity base station 1967920221 located at the Mount Magnet Airstrip Shed. Expected accuracy would be better than 1gu.

GPS Control was established using AUSPOS. Three separate +10 hour sessions were submitted to AUSPOS's online processing system where returned coordinates were accurate to better than 0.01m.

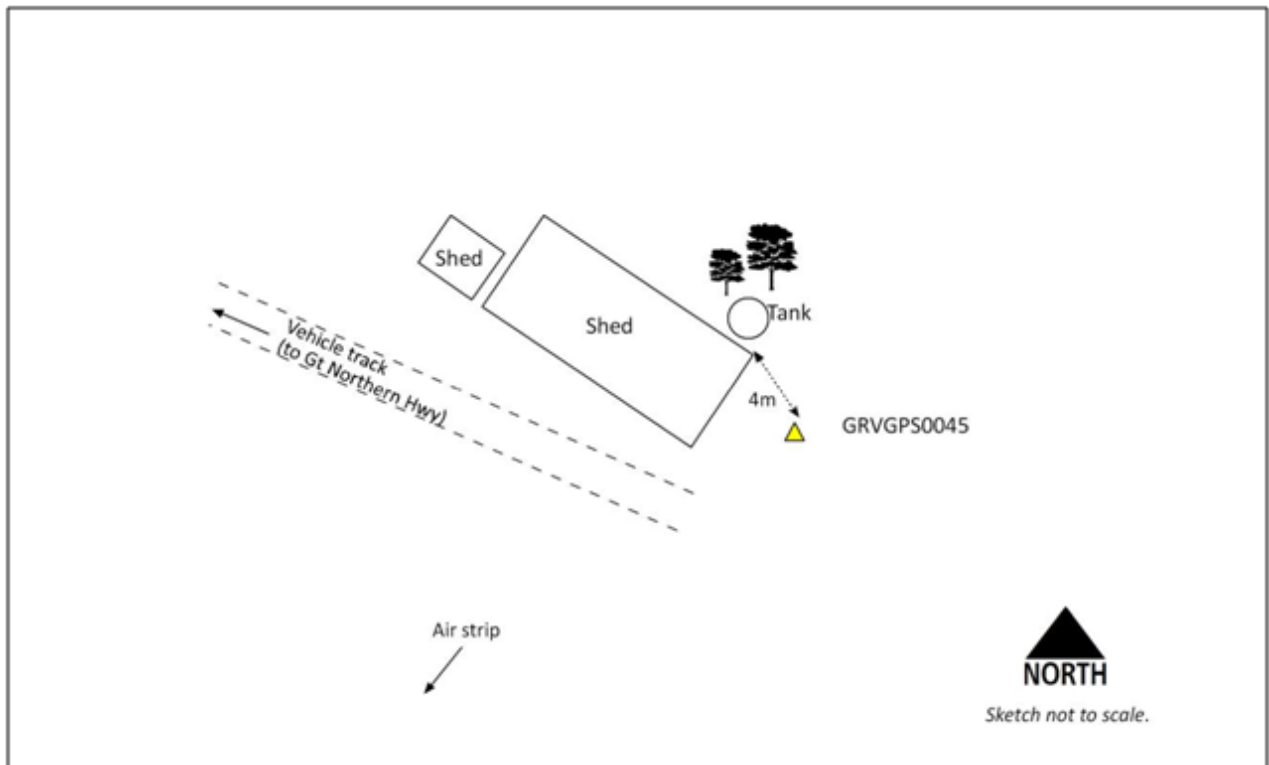
This control station is located within the grounds of the Mount Magnet Airstrip, nearby to a light brown metal storage shed. The storage shed lies between the airstrip (to the south) and the Great Northern Highway (to the north). Access to the shed is via an access track running south-east from the airstrip access road. The base station is located on the southern side of the shed, about 4m from the window. Access to the airstrip is via the Great Northern Highway, approximately 10km south of Mount Magnet township. Permission to access to the station should be sought from Jerry at the Mount Magnet shire on telephone 0427 634 241.



Photograph of Control Station GRVGPS0045 and surrounds



Location of Control Station GRVGPS0045



Locality Sketch of Control Station GRVGPS0045

APPENDIX B

HSE and Drug and Alcohol Policy



HEALTH, SAFETY AND ENVIRONMENT POLICY

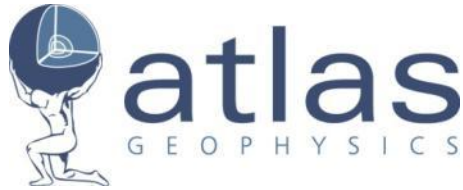
Atlas Geophysics Pty Ltd recognises that it is essential to the long term success of the company, that the health and safety of its employees, as well as its impact on the environment must be managed in an excellent manner. Atlas Geophysics Pty Ltd will meet all legal obligations and constantly strive to improve our HSE performance. Our aim is to prevent injuries and occupational illness to our employees, and to minimise any adverse environmental impact our activities may have. This aim will be achieved through effective procedures and the implementation of a HSE management system incorporating continuous review and improvement.

Atlas Geophysics Pty Ltd actions to achieve our goal are:

- Evaluate all activities with respect to HSE and take appropriate action to manage risks associated with these activities before they are carried out.
- Adopting a long term strategy for managing OHS and Environmental issues, incorporating regular reviews, research into improved technologies, and obtaining regular feedback from clients and employees in regard to HSE matters.
- Establishing procedures to ensure that proper and consistent implementation of the HSE policy.
- Ensure the efficient use of energy and water, so as to avoid excess pollution, and reduce the environmental impact of any activities carried out by Atlas Geophysics Pty Ltd.
- Ensure all employees are aware of our HSE policy and procedures, and are mindful of these when approaching and carrying out any routine or non routine task.

Leon Mathews

Director



DRUG AND ALCOHOL POLICY

Our aim is to prevent injuries and occupational illness to our employees and minimise any adverse environmental impact our activities may have.

Atlas Geophysics Pty Ltd recognizes that it is essential for the health and safety of all employees that an effective drug and alcohol policy is in place.

All Employees of Atlas Geophysics Pty Ltd must comply with the following requirements in respect to the presence and use of Drugs and Alcohol in the workplace.

- No employee will conduct work for Atlas Geophysics Pty Ltd if they have a blood alcohol level above 0.0%.
- No employee will conduct work for Atlas Geophysics Pty Ltd under the influence of illicit drugs
- All employees must inform Atlas Geophysics Pty Ltd of any medication (prescription and non-prescription) they are taking, so a risk assessment can be conducted for their proposed work program.
- Atlas Geophysics Pty Ltd will establish procedures to ensure that proper and consistent implementation of the Drug and Alcohol policy occurs.
- Atlas Geophysics Pty Ltd will implement disciplinary action based on the Two Strikes rule if this policy is breached.
- All employees are to be aware of the drug and alcohol policy, and will be kept informed of any changes to this policy.
- Atlas Geophysics Pty Ltd will comply with any client drug and alcohol policy requirements that exceed those of Atlas Geophysics Pty Ltd.

Leon Mathews
Director

APPENDIX C

Testimonials



Government of South Australia
Primary Industries and Resources SA

Our reference: 2007/00067-V02
Telephone No: 8463 3033

8 November 2007

Mr Leon Mathews
Director / Geophysicist
Atlas Geophysics Pty Ltd
PO Box 1049
MORLEY WA 6943

MINERALS AND ENERGY
RESOURCES

Executive Office
Level 7
101 Grenfell Street
Adelaide SA 5000
GPO Box 1671
Adelaide SA 5001
DX 667
Tel (08) 8463 3201
Fax (08) 8463 4155
www.pir.sa.gov.au

Dear Leon and Mark

I write to you to congratulate you on the outstanding contracting work you have recently completed for Primary Industries and Resources South Australia under the Plan for Accelerating Exploration (PACE) initiative.

PIRSA considers that the gravity data you have delivered under the terms of our Agreement for the Provision of Gravity Survey Services in the Northern G2 Region will set the benchmark for future government-sponsored gravity surveys in the State, and across Australia.

I would also like to praise you on your operational processes and your company's level of attention to safety. In PIRSA's view this survey was executed in an exemplary fashion.

I would be happy for you to use the PACE gravity dataset in your company's promotions. I would also be pleased to provide Atlas Geophysics with a reference in support of any future Government tenders in other states.

The PACE gravity data was released on 1st November at the Mining 2007 conference in Brisbane.

Once again, congratulations on a great job on this project. We look forward to working with your company in the future.

Yours sincerely

Dr Edward Tyne
DIRECTOR, MINERAL RESOURCES



To Whom It May Concern:

Atlas Geophysics conducted a helicopter-borne gravity survey for Primary Industries and Resources South Australia, Minerals and Energy Resources in the Northern Olympic Domain of South Australia during 2007. The survey comprised of approximately 38,893 new gravity stations at a varying grid spacing of 750m by 750m to 1.5km by 1.5km.

I was the supervisor of this survey and I was greatly impressed at all aspects of the survey in which was carried out with a high level of competence. The professionalism and expertise shown by all members of the field crew was of the highest standard. The survey area was in remote locations of South Australia in which Atlas Geophysics showed that they were well experienced in such environments. Production rates far exceeded that specified in the contract with two helicopters in operation they were able to regularly obtain more than 200 readings a day per helicopter. Gravity data updates and progress reports were provided to me throughout the duration of the survey regularly and the final data was provided promptly at the completion of the field survey. Final GPS and gravity survey data met or exceeded contract specifications.

The directors and field staff of Atlas Geophysics are highly competent with a great deal of experience in gravity surveying. They are more than capable of handling harsh and difficult environments and are able to carry out any type of gravity survey because of these reasons. I have no hesitation in highly recommending Atlas Geophysics and their services.

A handwritten signature in blue ink, appearing to read "D. Gray".

Daniel Gray
State Gravity Coordinator
Minerals and Energy Resources
Primary Industries and Resources South Australia

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Fax: +61 8 8463 3048
Email: gray.daniel@saugov.sa.gov.au