



Final Operations Report
on the
Surprise 3D Seismic Survey

for
Terrex Seismic Pty Ltd
and
Central Petroleum Ltd

June 2011



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The Business Development Manager
Terrex Spatial
100 Rockhampton Road
Yeppoon QLD 4703
Telephone: 07 4939 2866
International: +61 7 4939 2866
Facsimile: +61 7 4939 2867
E-mail: info@terrexspatial.com

**Dynamic Satellite Surveys Pty Ltd Trading As Terrex Spatial
has a Quality Management System,
externally certified to AS/NZS ISO 9001:2008 standards by
SAI Global Pty Ltd (Lic #QEC10046).**

This project was undertaken for Central Petroleum Ltd and Terrex Seismic Pty Ltd.

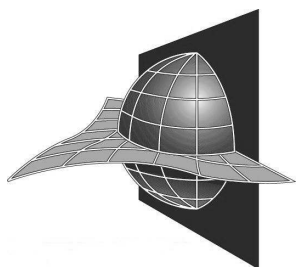
The sole purpose of the job was to install and survey 3D seismic lines and support the line clearing operations. The use of the data for any other purpose is not authorised.

All data contained in this report and on the attached DVD is deemed to be final and overrides any previous data received from TSp, unless otherwise stated.

**Dynamic Satellite Surveys Pty Ltd was sold to Terrex Seismic Pty Ltd, effective July 2011, and now trades as Terrex Spatial, part of the Terrex Group.*

Table of Contents

INTRODUCTION.	1
INSTRUMENTATION AND PERSONNEL.	2
2.1 Personnel and Logistics.....	2
2.2 Equipment.	3
SURVEY REFERENCE SYSTEMS.....	4
3.1 Geodetic Datum	4
3.3 Height Datum.....	6
SURVEY CONTROL.....	7
MONUMENTATION.	8
METHOD OF SURVEY.....	9
6.1 Line Preparation.....	9
6.2 GPS Surveying.	10
6.3 Processing and Quality Control.	11
DATA PRESENTATION.	12
HEALTH, SAFETY AND ENVIRONMENT.	13
OPERATIONAL ASPECTS.....	14
CONCLUSIONS AND RECOMMENDATIONS.	15
APPENDICES.....	16
Project Map.....	A - 1
Survey Control.	B - 1
Line Lengths Summary.....	C - 1
Environmental Monitoring Points.....	D - 1
Panel Maps.....	E - 1



1

INTRODUCTION

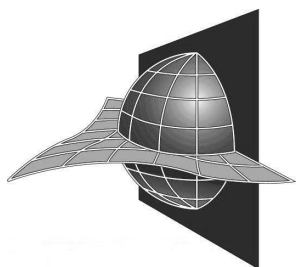
The following report covers the **2012 Surprise 3D Seismic Survey**, performed by **Terrex Spatial (TSp)** whilst contracted to **Terrex Seismic Pty Ltd (TS)** for **Central Petroleum Ltd**.

The survey area was located approximately 380 kilometres west of Alice Springs, Northern Territory, see **Appendix A - Project Map**.

A total of **486.5** kilometres of 3D seismic lines were surveyed. This consisted of **241.25** kilometres of receiver lines (0.9 kilometres of hand carry) pegged at 50-metre station intervals and **245.25** kilometres of source lines pegged at 50-metre station intervals.

Terrex Contracting (TC) carried out the line clearing operation with the aid of machine guidance units supplied by TSp.

Survey operations were completed between the 13th and the 26th of June 2012.



2

INSTRUMENTATION AND PERSONNEL

2.1 *Personnel and Logistics*

TSp personnel involved in the survey were as follows:

Ben Allsopp	<ul style="list-style-type: none">- Project Manager- Bachelor of Surveying
Dirk Smit	<ul style="list-style-type: none">- Senior Surveyor- Bachelor of Surveying
Louis Gilsenan	<ul style="list-style-type: none">- Surveyor- Bachelor of Science (Geomatics)

Personnel and equipment logistics were supported by the TSp Yeppoon office.

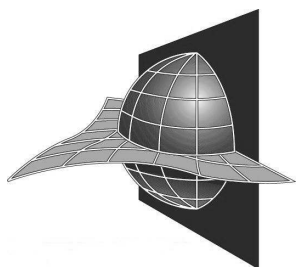
Survey operations were based from the Terrex Contracting #1 camp site located west of the Surprise 3D Grid.

GDA94 S 23°39'26" E 129°56'33"

2.2 Equipment

Equipment provided by TSp and used on this project:

	Description	Qty
Vehicles	Toyota Landcruiser Trayback Utes (778 RPF and 831 KZM)	2
	Caravan trailer (520 QTF)	1
Communications	UHF Radios (Channel #17)	3
	SAT Phone	1
GPS receivers	NovAtel GPS Receivers with VHF Telemetry and Omnistar	3
Computers	Toshiba Laptops	2
	Motion Tablet	6
	iPAQ PC	2
Software	Nav05 Field Software	Ver 5.05
	NavMini Machine Guidance Software	Ver 4.21
	MIB for Windows	Ver 7.20
	MapInfo Professional	Ver 8.5b
	GrafNet	Ver 8.2
Miscellaneous	Canon iX5000 Printer	1
	Sundry Office and Transport Equipment	
	Field and Office Consumables	



3

SURVEY REFERENCE SYSTEMS

3.1 Geodetic Datum

This project was based on the Geocentric Datum of Australia 1994 (GDA94), which is based on the Geodetic Reference System 1980 (GRS80) model defined by the following parameters:

<i>Datum:</i>	GDA94 (Geocentric Datum of Australia 1994)
<i>Spheroid:</i>	GRS80
<i>Reference Frame:</i>	ITRF92 (International Terrestrial Reference Frame)
<i>Semi-Major Axis Length:</i>	6 378 137.0
<i>Inverse Flattening:</i>	298.257222101
<i>The Unit of Measure:</i>	International Metre

3.2 Map Projections

Final rectangular coordinates were based on the Map Grid of Australia 1994 (MGA94).

Parameters for this projection are as follows:

<i>Projection:</i>	Universal Transverse Mercator (MGA Zone 52)
<i>Latitude of Origin:</i>	0°
<i>Central Meridian (CM):</i>	129° E
<i>Scale Factor at CM:</i>	0.9996
<i>False Easting:</i>	500 000
<i>False Northing:</i>	10 000 000
<i>The Unit of Measure:</i>	International Metre

3.3 *Height Datum*

All elevations obtained relative to GDA94 have been reduced to the Australian Height Datum (AHD) using the AUSGeoid98 Geoid - Ellipsoid separation model to determine the separation (N) for the particular area.

GPS observations are made on the GRS80 datum. The height associated with this datum is an ellipsoidal height (h). The Australian Height Datum (AHD), the height datum associated with AMG84 and MGA94, is an orthometric height, which is measured as the height above mean sea level, or the geoid (H).

The function that defines the relationship between the ellipsoid and orthometric heights is:

$$H = h - N$$

Or

$$\text{AHD} = \text{GDA94} - (\text{Geoid} / \text{Ellipsoid Separation})$$

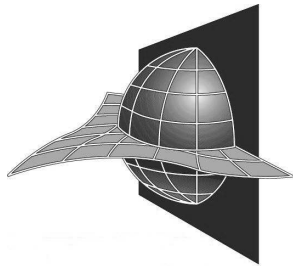
The value for the geoid/ellipsoid separation is interpolated from a national model called AUSGeoid98.

AUSGeoid98 is the third in a series of national geoid models produced for Australia by the Australian Surveying and Land Information Group (AUSLIG). The geoid-ellipsoid data is prepared for the Australian region from:

- EGM96 Global Geopotential Model;
- GRS80 ellipsoid (Moritz, 1980), which is compatible with WGS84;
- Australian Geological Survey Organisation's (AGSO) 1996 national gravity database;;
- AUSLIG / AGSO GEODATA nine-second digital elevation model;
- Satellite altimeter - derived free-air gravity anomalies offshore;
- Theories, techniques and software developed by Associate Professor Will Featherstone, Curtin University of Technology¹.

AUSGeoid98 N values were interpolated using the GrafNet Version 8.20 software, distributed by Waypoint Consulting Inc.

¹ Johnston, G.M., Featherstone, W.E. (1998) AUSGeoid98: A New Gravimetric Model for Australia

**4**

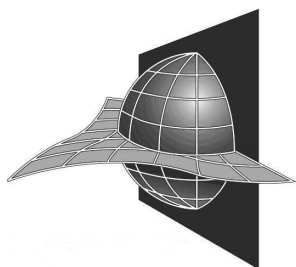
SURVEY CONTROL

Surveying control was established using existing control and AUSPOS GPS techniques.

The datum station adopted for this survey in MGA Zone 52 coordinates are listed below:

Station	Easting	Northing	R.L.	Comments
CJ03	617301.060	7371668.770	562.500	DSS Control

The survey datum, base stations established, misclose values and network map can be seen in **Appendix B - Survey Control**.



5

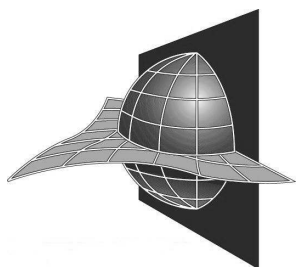
MONUMENTATION

All receiver and source lines were pegged at 50-metre station intervals.

Wooden pegs were placed at every second station on source and receiver lines and numbered front and back. Blue pin flags were used between pegs on receiver lines and pink pin flags were used on source lines.

Additional numbered pegs were placed at roads, fences, tracks and hand-carry sections.

Permanent Markers (PMs) were used for all GPS base-stations. These consisted of a cut-off star picket and witness star picket displaying a tag stating Base Identification Numbers.



6

METHOD OF SURVEY

6.1 *Line Preparation*

Line clearing was completed by Terrex Contracting Crew #1. GPS machine guidance and support from a line pointer were provided by Terrex Spatial. Dozing operations were completed on the 13th of June and grading finished on the 22nd of June, 2012.

Three dozers were used for the line clearing and one grader was used to touch-up some of the source lines and access tracks.

TSp supplied up to three Motion guidance systems for the dozers, which were loaded with NavMini software. A graphical depiction of line clearing was updated as necessary.

Features such as tracks, wells and restricted zones were added to the line clearer's machine guidance GPS systems as needed.

Maps were compiled on a regular basis for all operators to aid in line preparation. These contained information on areas that had already been dozed and surveyed to enable easier planning.

6.2 *GPS Surveying*

There are three modes of use in GPS surveying; static, kinematic and real-time kinematic. Pegging operations were completed using TSp's OEMV-RT2 real-time kinematic (RTK) with OmniSTAR surveying technique. This method enabled both position and elevation coordinates to be acquired in real-time and on the appropriate datum.

The survey method utilised phase data received from US Navy NAVSTAR satellites to provide three-dimensional positioning. When surveying with OmniSTAR, a base station is not required. The remote receiver in the vehicle can obtain RTK GPS through the OmniSTAR system, which utilises several geostationary satellites over the world in order to provide accurate positions to its users, regardless of their location.

NovAtel real-time kinematic methods using OmniSTAR can achieve accuracies of better than +/-0.1m in position and +/-0.2m elevation. The expected precision for locating pegged positions is better than 0.3 metres and is generally better than 0.2 metres.

Initialisation of the OEMV rover GPS initially takes approximately 30 minutes. After the initial setup initialisation is constant, however, this is greatly dependant on satellite geometry, availability and overhanging vegetation.

6.3 *Processing and Quality Control*

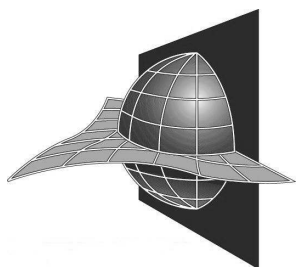
All survey data was immediately recorded internally on the Motion Tablets and subsequently downloaded to the office computer each evening.

Quality of the satellite data was monitored by careful examination of the various on-screen quality control statistics produced by the NAV05 software. These checks on data integrity are in the form of standard deviation (or sigma) values for Easting, Northing and Height and are generally better than 0.05 metres.

Any recording of positions where the standard deviation values exceeded 0.1 metre were highlighted to the surveyor at the time of recording. Following this, it was possible to re-initialise the GPS in order to obtain a more accurate solution. Any recorded position falling outside the required tolerances was flagged for further investigation and re-recording if necessary.

Numerous checks on pre-recorded marks were observed during each day's survey in order to confirm the integrity of the GPS base receiver and the placed markers.

Coordinates were also checked in the office by determining point-to-point direction and distance. Profile plots were examined in detail to identify any height anomalies. Any points showing unusual position or height details were flagged and checked in the field.



7

DATA PRESENTATION

All line files were checked and finalised before the survey crew demobilised from the prospect.

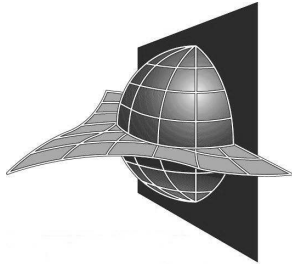
All final data were in UTM grid coordinate format on the MGA94 datum on the GRS80 reference spheroid. All elevations were on the Australian Height Datum (AHD71).

Final data produced were:

- | | |
|-----------------------------|---|
| Daily Reports Folder | <ul style="list-style-type: none">- PDF file of each daily report- PDF file of each daily production map |
| MapInfo Folder | <ul style="list-style-type: none">- Associated GIS mapping |
| Maps Folder | <ul style="list-style-type: none">- Various PDF maps used on-site |
| Survey Data Folder | <ul style="list-style-type: none">- RPS text files- SPS text files |
| EMP Folder | <ul style="list-style-type: none">- PDF of EMP form and JPG photos |

All files are backed up on digital disks in the Yeppoon office for future reference.

No hard copy data was provided.



8

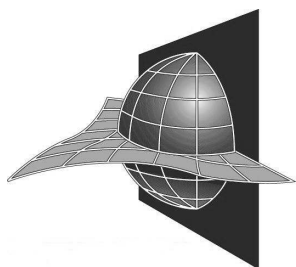
HEALTH, SAFETY AND ENVIRONMENT

All personnel are aware of safety conditions concerning all exploration seismic surveys. The Terrex Group “**Health, Safety, Environment and Quality Policy**” was adhered to at all times.

Terrex Spatial adhered to the Terrex Seismic ERP and SSSP documents, which governed this project.

All Terrex Spatial vehicles are fitted with a UHF radio, shovel, first-aid kit, dry powder and water fire extinguishers, vehicle recovery equipment, rotating beacon, IVMS systems and weekly vehicle maintenance check lists. There was also a satellite phone available on the crew.

Daily toolbox meetings were conducted and documented by Terrex Contracting.



9

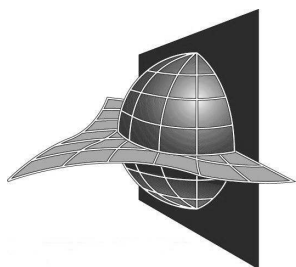
OPERATIONAL ASPECTS

Work was originally planned to commence in April but was shutdown until June, pending approvals.

The survey crew began pegging line on the 13th of June. To maintain survey production ahead of Terrex Seismic, the majority of pegging was carried out prior to the lines being graded. Thus, pegs and pin flags were kept approximately one metre outside the rill. The terrain consisted of mostly flat grass plains with dense bush and some dunes. Difficulties were experienced with some of the steeper dunes and areas on line where bushes could not be cleared. Pegging was completed on the 26th of June 2012.

TSp provided daily updated files and hard copy maps with features and line clearing progress. The Senior Surveyor was responsible for this aspect of the operation and also focussed on assisting line clearing, mapping features, processing survey data, writing reports and producing maps.

TSp personnel demobilised before Terrex Seismic began the seismic operations. Coordinate uploads for the recorder were updated and maps were provided to cover the project.



10

CONCLUSIONS AND RECOMMENDATIONS

The project start-up package from Central Petroleum enabled the efficient commencement of the project.

The surveying was completed in thirteen days. Lines being pegged prior to grading slowed the survey crew, as did tall, dense vegetation present on the prospect.

TSp provided expert GPS and associated software to navigate the line clearing machines. Some great feedback was received from the machine operators on its use for further improvement.

Hand-carry sections were clearly flagged and additional numbered pegs were installed to aid the Terrex Seismic front crew with their line preparation. Comprehensive maps were produced to assist the recorder and line crews.

TSp hopes to utilise the experience from this project to further develop and grow in our ability to face evermore challenging projects. TSp looks forward to again working with and meeting the staff of those companies involved in the 2012 Surprise 3D Survey.

Signed,

Terrex Spatial

Dirk Smit

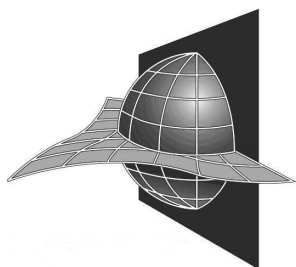
Surveyor

Checked and edited,

Terrex Spatial

Ben Allsopp

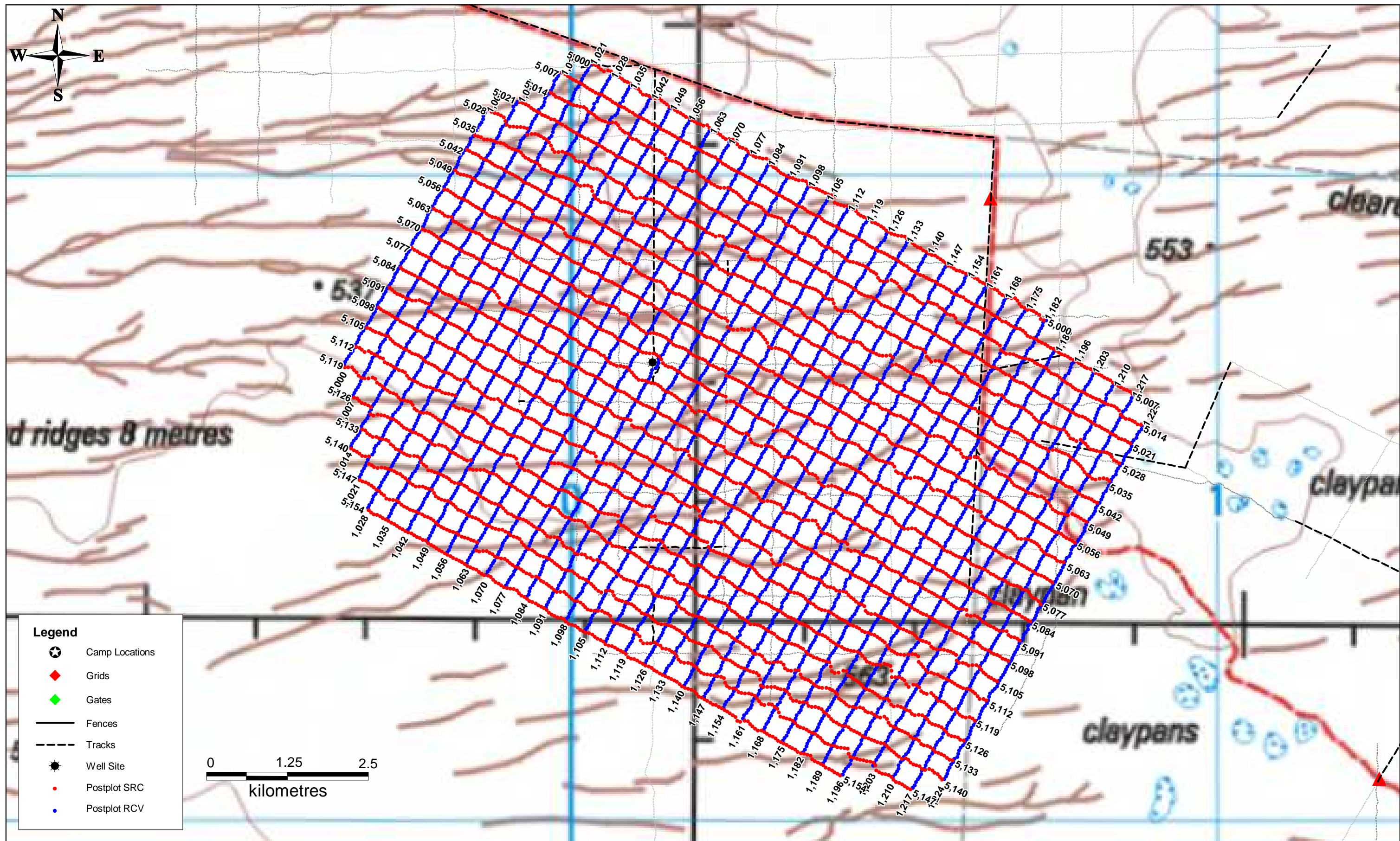
Project Manager



11

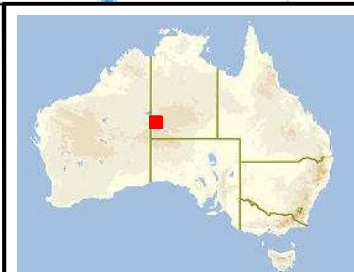
APPENDICES

Project Map



The purpose of this map is to represent the surveyed digital data in a pictorial manner only. The accuracy of the underlying topographic image in no way relates to the accuracy of the surveyed digital data. Features on the topographic map have not necessarily been surveyed by Terrex Spatial. Any use of this map for reasons other than the purpose for which it was created is not authorised.

Terrex Spatial : Phone 1800 060 407



Central Petroleum

Surprise 3D
Project Map

Scale	Not To Scale (A3)
Drawn	Dirk Smit
File	Project Map.pdf
Job #	12032
Date	27/06/2012

Survey Control

Survey Control

All values are MGA 94 (Zone 52), AHD71

Survey Datum Stations

Station	Easting	Northing	R.L.	Comments
CJ03	617301.060	7371668.770	562.500	DSS Control

Existing Permanent Marks

Station	Easting	Northing	R.L.	Comments
CJ03	617301.060	7371668.770	562.500	DSS
CJ04	606472.990	7379621.260	555.950	DSS
CP01	612475.710	7370665.710	553.340	RPS

New Permanent Marks

Station	Easting	Northing	R.L.	Comments
CP17	596173.417	7383414.847	531.287	AUSPOS

Miscloses

Station	Easting	Northing	AHD	Comments
CJ03	617301.060	7371668.770	562.500	DSS
	617300.937	7371668.614	562.244	TSp
	-0.123	-0.156	-0.256	Misclose
CJ04	606472.990	7379621.260	555.950	DSS
	606473.262	7379620.913	555.496	TSp
	0.272	-0.347	-0.454	Misclose
CP01	612475.710	7370665.710	553.340	RPS
	612475.514	7370665.447	553.102	TSp
	-0.196	-0.263	-0.238	Misclose
CP17	596173.417	7383414.847	531.287	AUSPOS
	596173.393	7383414.837	531.190	TSp
	-0.024	-0.010	-0.097	Misclose

Line Lengths Summary

Receiver Lines

Station Interval = 50m

Line	From	To	Length (km)
1000	5028	5118	4.50
1007	5021	5125	5.20
1014	5007	5139	6.60
1021	5000	5146	7.30
1028	5000	5153	7.65
1035	5000	5153	7.65
1042	5000	5153	7.65
1049	5000	5153	7.65
1056	5000	5153	7.65
1063	5000	5153	7.65
1070	5000	5153	7.65
1077	5000	5153	7.65
1084	5000	5153	7.65
1091	5000	5153	7.65
1098	5000	5153	7.65
1105	5000	5153	7.65
1112	5000	5153	7.65
1119	5000	5153	7.65
1126	5000	5153	7.65
1133	5000	5153	7.65
1140	5000	5153	7.65
1147	5000	5153	7.65
1154	5000	5153	7.65
1161	5000	5153	7.65
1168	5000	5153	7.65
1175	5000	5153	7.65
1182	5000	5153	7.65
1189	5007	5153	7.30
1196	5007	5153	7.30
1203	5007	5146	6.95
1210	5007	5146	6.95
1217	5007	5146	6.95
1224	5014	5139	6.25
Total:			241.25km

Source Lines
Station Interval = 50m

Line	From	To	Length (km)
5000	1021	1181	8.00
5007	1014	1216	10.10
5014	1014	1223	10.45
5021	1007	1223	10.80
5028	1000	1223	11.15
5035	1000	1223	11.15
5042	1000	1223	11.15
5049	1000	1223	11.15
5056	1000	1223	11.15
5063	1000	1223	11.15
5070	1000	1223	11.15
5077	1000	1223	11.15
5084	1000	1223	11.15
5091	1000	1223	11.15
5098	1000	1223	11.15
5105	1000	1223	11.15
5112	1000	1223	11.15
5119	1000	1223	11.15
5126	1007	1223	10.80
5133	1014	1223	10.45
5140	1014	1223	10.45
5147	1021	1216	9.75
5154	1028	1195	8.35
Total :			245.25km

Environmental Monitoring Points



EMP/ERF LOCATION DIAGRAM

TSp-FF-36
REV 2.0
December 2011

PROJECT / JOB # 12032 CLIENT Central Petroleum DAY / DATE 15/06/12

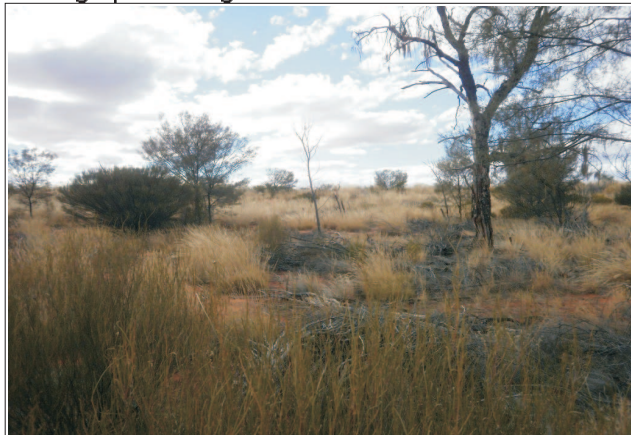
NAME: Surprise EMP01

AREA: Johnstone Hill - NT MAP REFERENCE : _____

<u>Grid Coordinates</u>		<u>Geographical Coordinates</u>	
Easting:	601393.85	Latitude:	-23°42' 24.1"
Northing:	7377890.96	Longitude:	129°59' 40.6"
Datum:	MGA94	Zone:	52
		Datum:	GDA94

Mark Description: **Station is located at the intersection of line R1077 and S5056 and is surrounded by sandy terrain covered by long grass and trees. Station is approximately 120m east of track leading to Surprise Well #1.**

Photograph looking North-East at station.



Photograph looking North-West at station.



Photograph looking South-West at station.



Photograph looking South-East at station.





EMP/ERF LOCATION DIAGRAM

TSp-FF-36
REV 2.0
December 2011

PROJECT / JOB # 12032 CLIENT Central Petroleum DAY / DATE 16/06/12

NAME: Surprise EMP02

AREA: Johnstone Hill - NT MAP REFERENCE : _____

<u>Grid Coordinates</u>		<u>Geographical Coordinates</u>	
Easting:	606199.43	Latitude:	-23°44' 42.8"
Northing:	7373590.59	Longitude:	130°02' 31.4"
Datum:	MGA94	Zone:	52
		Datum:	GDA94

Mark Description: **Station is located at the intersection of line R1203 and S5084 and is surrounded by sandy terrain covered by long grass and trees.**

Photograph looking North-East at station.



Photograph looking North-West at station.



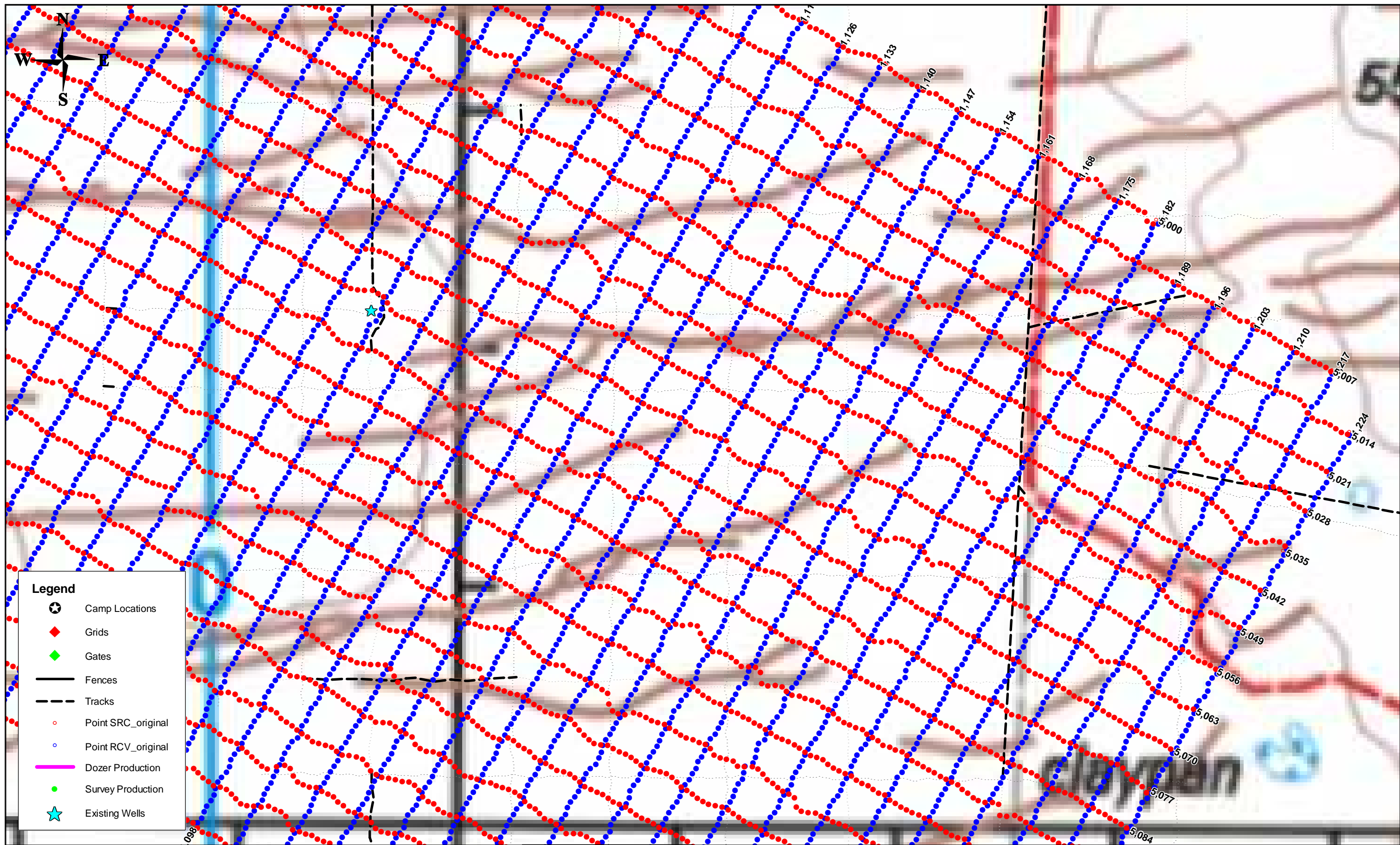
Photograph looking South-West at station.



Photograph looking South-East at station.



Panel Maps



Legend

- ⊙ Camp Locations
- ◆ Grids
- ◆ Gates
- Fences
- - Tracks
- Point SRC_original
- Point RCV_original
- Dozer Production
- Survey Production
- ★ Existing Wells



The purpose of this map is to represent the surveyed digital data in a pictorial manner only. The accuracy of the underlying topographic image in no way relates to the accuracy of the surveyed digital data. Features on the topographic map have not necessarily been surveyed by Terrex Spatial. Any use of this map for reasons other than the purpose for which it was created is not authorised.

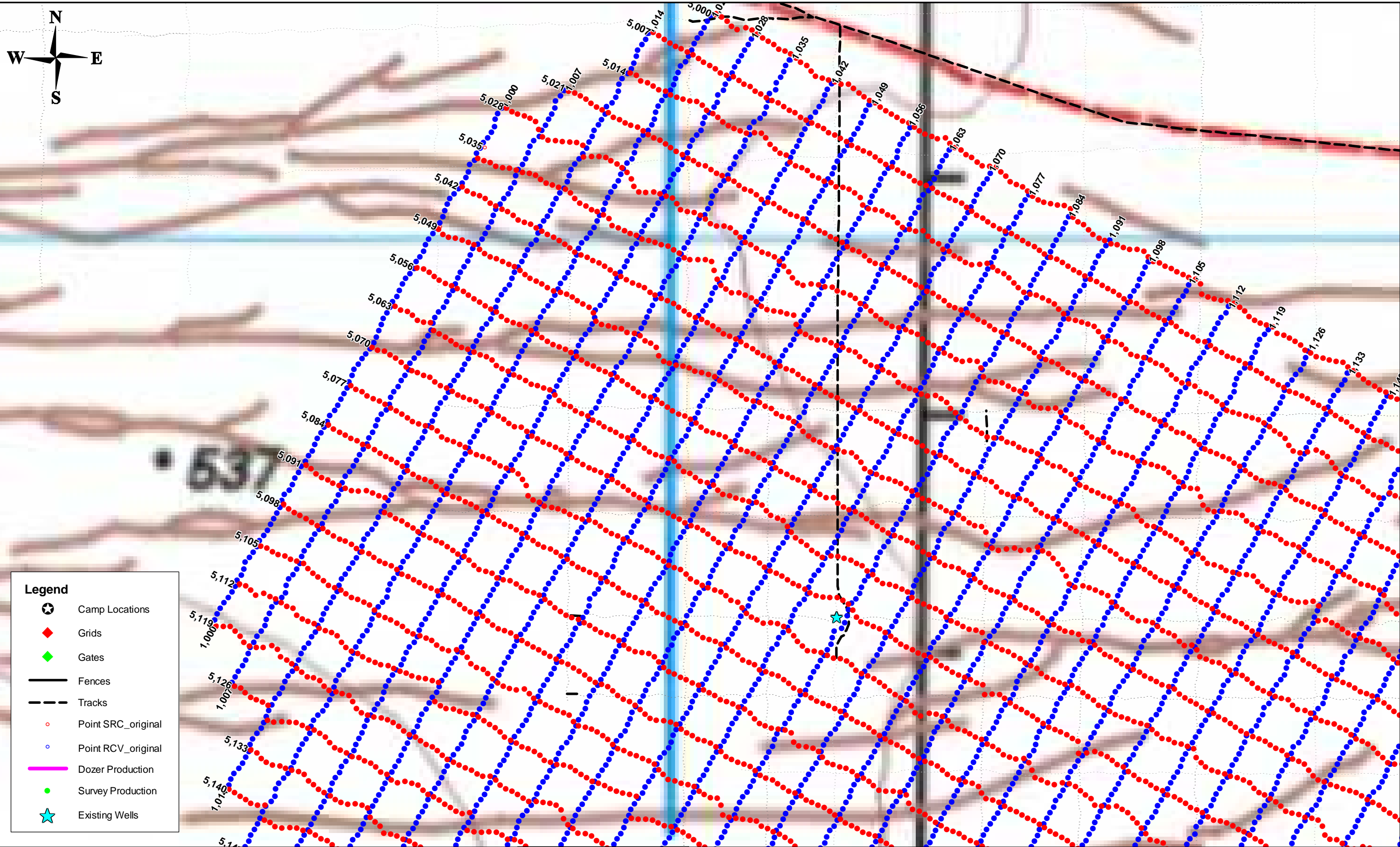
Terrex Spatial : Phone 1800 060 407



Central Petroleum

Surprise 3D
RCV & SRC MAP (NE)

Scale	Not To Scale (A3)
Drawn	Dirk Smit
File	Daily Production.pdf
Job #	12032
Date	26/06/2012



Legend

- Camp Locations
- Grids
- Gates
- Fences
- Tracks
- Point SRC_original
- Point RCV_original
- Dozer Production
- Survey Production
- Existing Wells



The purpose of this map is to represent the surveyed digital data in a pictorial manner only. The accuracy of the underlying topographic image in no way relates to the accuracy of the surveyed digital data. Features on the topographic map have not necessarily been surveyed by Terrex Spatial. Any use of this map for reasons other than the purpose for which it was created is not authorised.

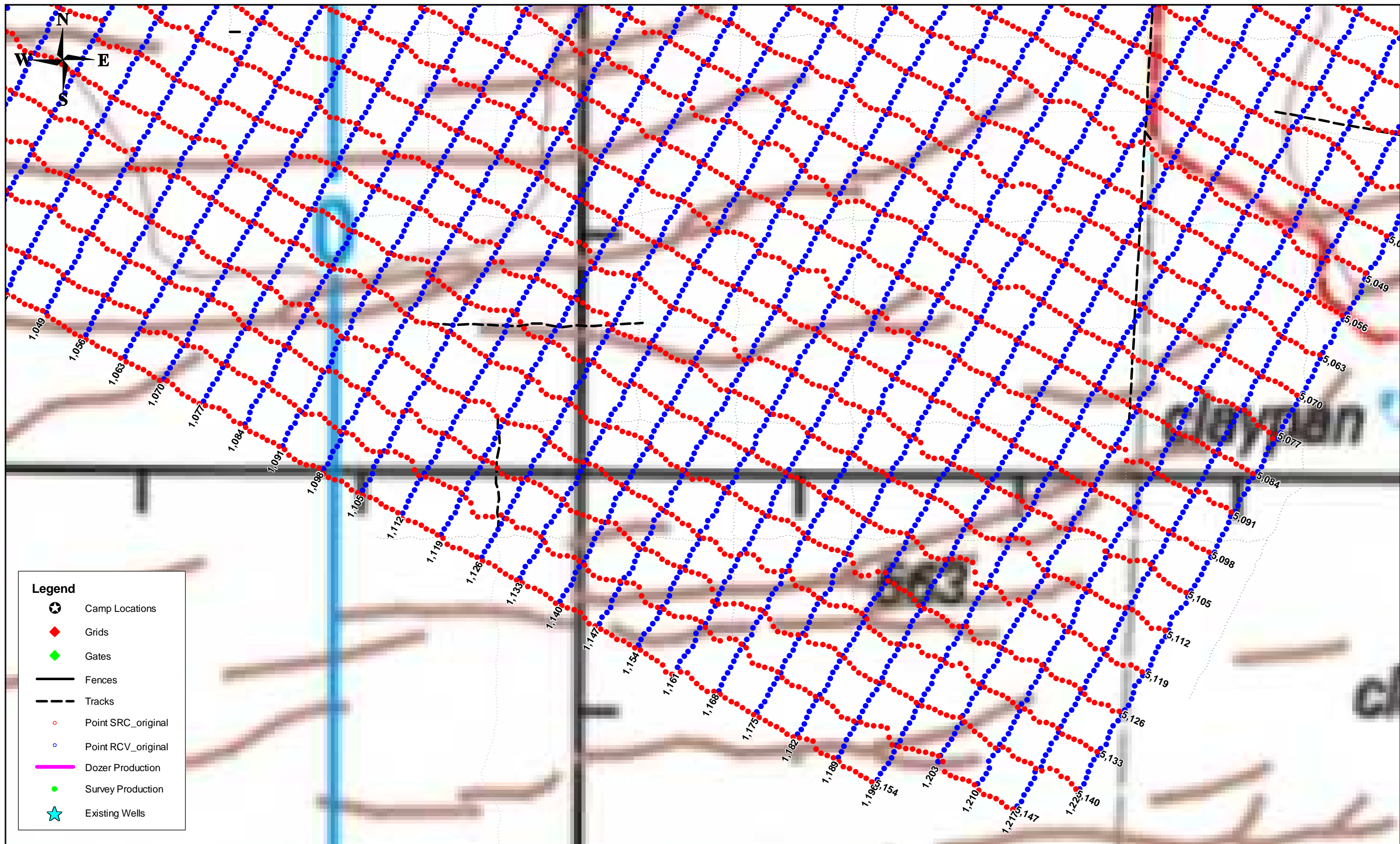
Terrex Spatial : Phone 1800 060 407



Central Petroleum

Surprise 3D
RCV & SRC MAP (NW)

Scale	Not To Scale (A3)
Drawn	Dirk Smit
File	Daily Production.pdf
Job #	12032
Date	26/06/2012



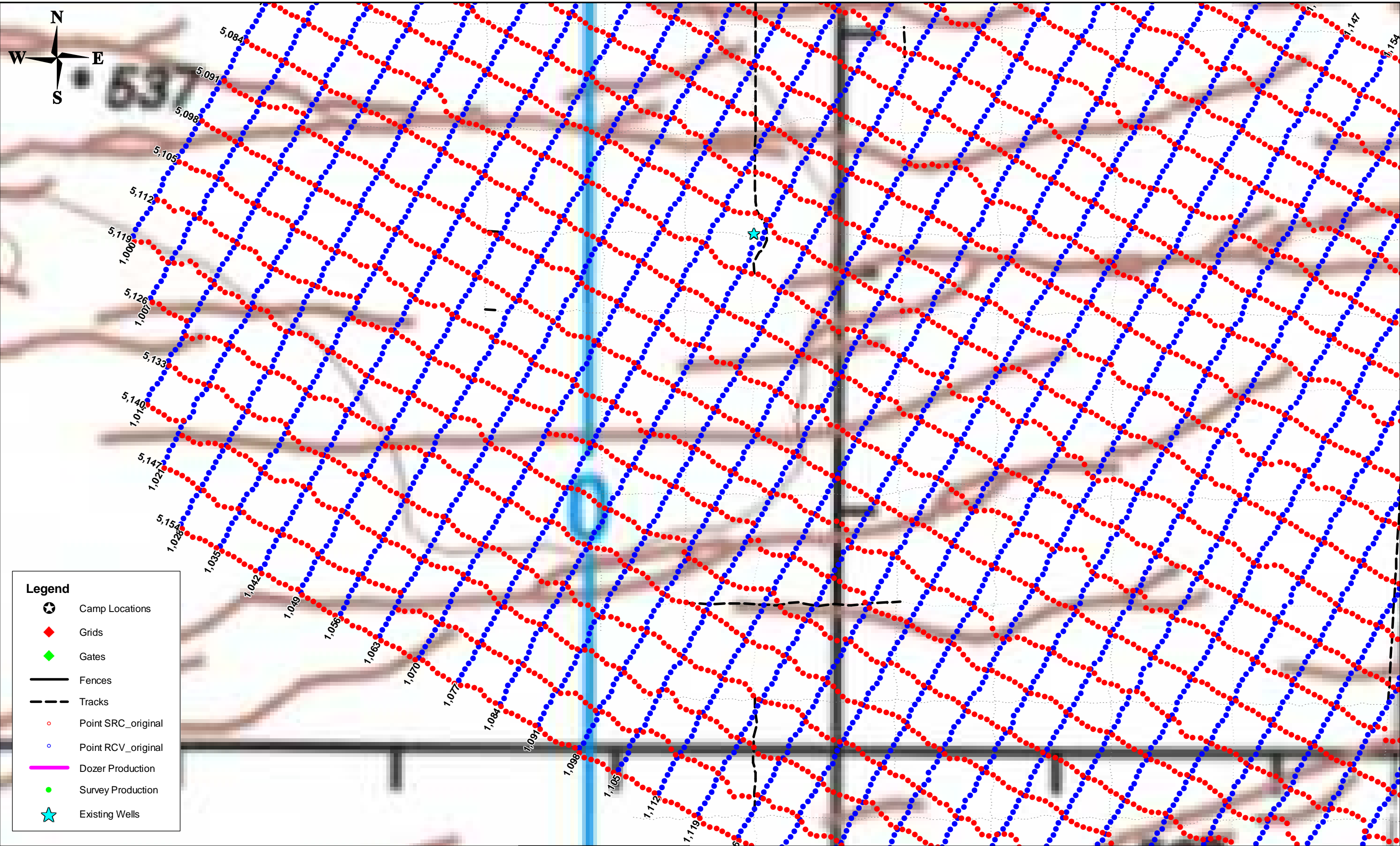
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Terrex Spatial : Phone 1800 060 407



Central Petroleum **Surprise 3D** **RCV & SRC MAP (SE)**

Scale	Not To Scale (A3)
Drawn	Dirk Smit
File	Daily Production.pdf
Job #	12032
Date	26/06/2012



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Terrex Spatial : Phone 1800 060 407



Central Petroleum

Surprise 3D
RCV & SRC MAP (SW)

Scale	Not To Scale (A3)
Drawn	Dirk Smit
File	Daily Production.pdf
Job #	12032
Date	26/06/2012