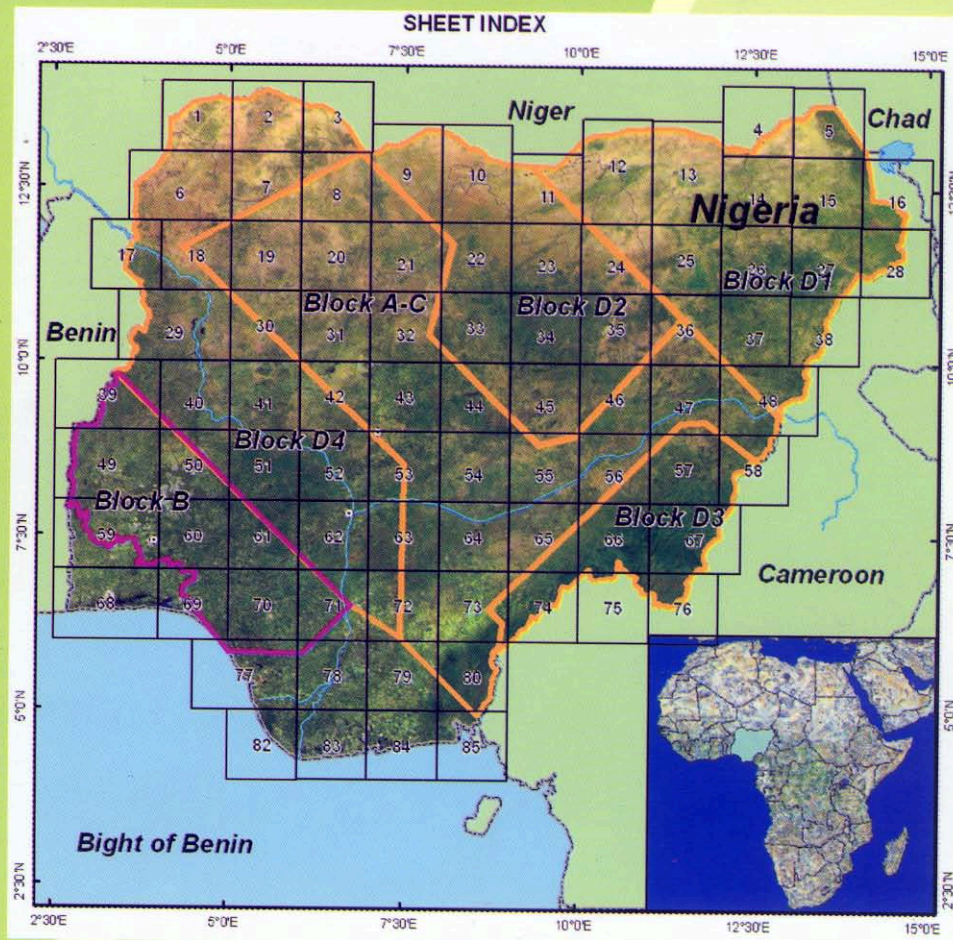




The Federal Republic of Nigeria

MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY

AIRBORNE GEOPHYSICAL DIGITAL DATA DISSEMINATION GUIDELINES



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AIRBORNE GEOPHYSICAL DIGITAL DATA DISSEMINATION GUIDELINES

A. INTRODUCTION

A High Resolution Airborne Geophysical Surveys involving magnetic, radiometric and limited electromagnetic surveys aimed at assisting and promoting mineral exploration were carried out in Nigeria between 2003 and 2009. The programme began with a pilot scheme in Ogun State in 2003. Following the success of the pilot scheme, the rest of the country was divided into project areas referred to as Phases I & II. Phase I covered 44% and phase II covered 56% (except for a small block in the Niger Delta) of the country.

The surveys for these two phases were carried out from 2004 to 2009. Fugro Airborne Survey Ltd carried out the flying for data collection in all the projects as well as for the interpretation of Ogun State and Phase I programmes. The interpretation of Phase II was carried out by Patterson Grant and West (PGW) Consultants of Canada.

B. OBJECTIVES OF THE DISSEMINATION GUIDELINES

The objective primarily is to put in place efficient, effective and transparent tools for easy access by investors, of airborne geophysical survey data of Nigeria. It is the intention to accelerate mining sector investments as a result of wide dissemination of airborne geophysical data.

C. STRATEGY FOR DISSEMINATING AIRBORNE GEOPHYSICAL DATA

The strategy for dissemination is driven by the need to integrate all airborne geophysical data in the Nigerian Geological Survey Agency into one modern digital format and to create a single easily accessible and transparent portal for the management of the data and for dissemination to investors and researchers. The old analogue regional geophysical data shall be digitized and made accessible to investors. The specific elements of the strategy are:

- The old regional geophysical data of 1975-78 and the new high-resolution data including all data types shall be part of the data archive for dissemination.
- The data shall be distributed to interested parties upon completing a data requisition form (Annex 1) and payment of a nominal reproduction cost reflected in the price list in Annex 2.
- The access to the data is by all members of the public and the right to acquisition of data shall not be dependent on the acquisition of a mineral title
- A Data Confidentiality Agreement shall be entered upon between the individuals/company/organization, who takes the data and the Nigerian Geological Survey Agency. The Data Confidentiality Agreement shall be adhered to by all those taking the data.

D. TECHNICAL DETAILS OF THE SURVEY;

I. PILOT SCHEME; Ogun State

The project was executed by Fugro Airborne Services Ltd, Johannesburg

Flight Parameters;	The survey was carried out by fixed wing aircraft
Total line kilometres	36,500 line km
Flight lines spacing	500 metres
Terrain clearance	100 metres
Flight direction	NW -SE
Tie lines spacing	2,000 metres
Tie lines direction	NE -SW
Measured parameters	Magnetic gradient and multi-channel radiometric

II. PHASE 1 Airborne magnetic gradient and multi channel radiometric survey

Coverage; 44% of the Country. The Country was divided into four geological blocks.

Blocks A 1	241,000 line kilometres
Block A2	104,000 line kilometres
Block B	235,000 line kilometres
Block C	246,000 line kilometres

Electromagnetic survey	24,000 line kilometres
Flight spacing	200 metres

Flight parameters;	
Total line kilometres	736,275
Flight line spacing	500 metres
Terrain clearance	80 metres
Flight direction	NW -SE
Tie line spacing	2,000 metres
Tie lines direction	NE -SW

III. PHASE 11 AIRBORNE GEOPHYSICAL SURVEY OF NIGERIA covered 56% of the Country. The Country was divided into five geologic blocks.

Blocks D1	323,801 line kilometres
D2	263,675 line kilometres
D3	128,180 line kilometres
D5	388,518 line kilometres
Total	1,104,174 line kilometres

Flight Parameters.

Total lines km	1,104,174 line km
Flight lines spacing	500 metres
Terrain clearance	80 metres
Flight lines direction	NW- SE
Tie line spacing	2 km
Tie lines direction	NE- SW

The survey includes the following geophysical methods;

- Magnetic total field
- Gamma ray spectrometry
- Horizontal magnetic gradient enhanced.

The data collection and processing were carried out by Fugro Airborne Survey Services.

The interpretation was carried out by Patterson Grant and Watson (PGW) of Canada

- IV. PRODUCTS:** The final products of the survey were;
- Data on CD ROM and DVD containing line data, grid data and digital plot files.
 - Colour maps on 1: 250,000 and 1 : 500,000 scales
 - Radioelement; - Ternary Radioelement
 - Potassium %
 - Equivalent Uranium (ppm)
 - Equivalent Thorium (ppm)
 - Equivalent Uranium/Equivalent Thorium
 - Equivalent Uranium/Potassium
 - Equivalent Thorium/Potassium

Magnetics; -Magnetic Total field, shaded relief (nT)

- (Horizontal gradient enhanced and IGRF removed),
- Reduced to Pole magnetic shaded relief image (nT)
- (horizontal gradient enhanced and IGRF removed)
- Magnetic vertical gradient (nT/m) (calculated)
- Magnetic horizontal gradient (nT/m) (measured)
- Analytical signal (nT) (calculated)

The large volume of data and the increasing number of requests by mineral investors and other interested parties for the data from different areas has necessitated the development of a data dissemination guideline. The data collection will eventually be transformed into a dedicated online data storage and management system including a customized viewing, handling and archiving system.

The airborne geophysical management system will store all grid and line archives in a consistent format that guarantees data integrity and facilitates data distribution. Where areas of interest encompass more than one survey, the grid data are supplied as individual survey grids and as windowed supergrids. Supergrids are compilations from all available high resolution and regional data and are upgraded regularly as new survey data become available.

ANNEX 1
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
DIGITAL AIRBORNE GEOPHYSICAL DATA REQUISITION AND DELIVERY
FORM



The Federal Republic of Nigeria

MINISTRY OF MINES AND STEEL DEVELOPMENT

NIGERIAN GEOLOGICAL SURVEY AGENCY						
DIGITAL AIRBORNE GEOPHYSICAL DATA REQUISITION AND DELIVERY FORM						
Requested By					Date:	
Company Name:					Time:	
Company Address:						
Telephone:						
E-mail:						
Purpose:	Minerals	Geotechnical	Groundwater	Other		
Mode of request:	In Person	Fax	E-mail	Phone		
Data Set Name and Format (Grid or Line)	Size of Dataset and area of coverage	Storage Media CD/HD/Tape	Date of Request	Date of Receipt	Name and Signature of NGSA' Staff	Name and Signature of Company's Receiving Officer(also to sign confidentiality agreement)
Comments per data set (if any)						

ANNEX 2
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
AIRBORNE GEOPHYSICAL DIGITAL DATA-PRICING SCHEDULE



THE FEDERAL REPUBLIC OF NIGERIA
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
Airborne Geophysical Digital Data Sales-Pricing Schedule
Data Format

Grid data are delivered in Oasis Montaj Geosoft grid file format.

Line data are delivered in Oasis Montaj Geosoft format and ASCII file format and a format description file accompanies each data file:

Data Windowing

Data shall generally be sold on the basis of standard topographical map sheets. However, data can also be windowed to any boundary on request.

Payments

All processes stated below are exclusive of shipping charges.

PROCEDURES FOR ACQUISITION OF AIRBORNE GEOPHYSICAL DATA

1. The client should obtain and read a copy of the Airborne Geophysical Data Dissemination Guideline.
2. The client should fill the data requisition form specifying the data is required.
3. NGS Staff will calculate the total line km and the amount to be paid.
4. NGS Staff will fill the Pro forma Invoice indicating the amount to be paid.
5. The client should obtain Bank Advice Forms (BAF's) from the NGS Accounts Section.
6. The filled Bank Advice Forms (BAF's) are then taken to bank for payment
7. The URA Bank Payment receipt and the stamped copy of the BAF are to be presented to the NGS Accounts Section and a copy to Customer Services Unit.
8. The receipt is entered in the Hard cover book in Accounts Section.
9. The Customer then signs a Confidentiality and Copyright Agreement.
10. Finally, the hard or digital copy of the requested data is handed over to the customer with any guidance that may be required from the staff.
11. NGS shall not be liable to any data obtained taken without permission..

PRICE SCHEDULE Magnetics and Radiometrics

Complete digital magnetic and radiometric data (MAP data) are sold for US\$100 per sheet and US\$200 per sheet respectively. Grid data are sold @ \$200/sheet (magnetic) and \$400/sheet (Radiometric). The sheet is reference is 1:100,000 (1/4 degree sheet). Payment can also be made in Nigeria currency (Naira) at the prevailing exchange rate.

Electromagnetics

The electromagnetic data is sold for US\$500 per sheet.

SALES CONTACT

Customer Services Unit, Nigerian Geological Survey Agency, 31 Shettima Monguno Street, behind Julius Berger Offices, PMB 616 Garki Post Office, Abuja. Tel: **+234 (0)8053000183, +234 (0)8053000184, +234 (0)8065901938, +234 (0)8020393920. Email: customerenquiries@ngsa-ng.org, contactus@ngsa-ng.org**

* A shipping charge shall be included in the cost of data, especially for overseas orders. The prices given above are guaranteed only for a period of 1 year following the date of release. Prices are subject to change without notice.

SURVEY BLOCK	LINE SPACING	TERRAIN CLEARANCE	AREA (sq Km (approx.))	LINE KM (approx.)	Date of Release of Preliminary Data	Date of Release of Final data
Block 1						
Block 2						
Block 3						
Block 4						
Block 5						
Block 6						
Block 7						

ANNEX 3
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
CONFIDENTIALITY AND COPYRIGHT AGREEMENT
FOR THE PURCHASE OF AIRBORNE GEOPHYSICAL DIGITAL DATA OF
NIGERIA



The Federal Republic of Nigeria
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
CONFIDENTIALITY AND COPYRIGHT AGREEMENT
FOR THE PURCHASE OF AIRBORNE GEOPHYSICAL DIGITAL DATA OF NIGERIA

On behalf of the company /organization/ myself I hereby called (Name and Address) -----

-----I agree
to the following conditions with respect to use of digital data shown below and acquired from the
Nigerian Geological Survey Agency, 31 Shettima A. Munguno Street, Utako District, P.M.B 616, Abuja,
Nigeria.

Nature of Data (name of data and area coverage): -----

Terms, conditions and covenants agreed to are as follows:

- i. All digital data delivered by Nigerian Geological Survey Agency (NGSA) shall be for the internal use of data receiver. Data products may be shown but not sold, traded, disposed of, transmitted to or otherwise made available to any individual(s), joint-venture(s) or partner company or companies excepting its parent company, any wholly-owned subsidiary, or affiliate. If any outside consultants are engaged to work on this data, they must be aware of this agreement and requested to initial one copy.
- ii. Data obtained, whether in digital format, by scanning of hard copy maps or any other reproduction processes, are licensed for use only for the purpose it was acquired.
- iii. Any derivative maps, interpretation and/or reports made from the original data will be only for internal use of DATA RECEIVER or its affiliates. These second generation products may not, except as detailed under point iv, be sold, traded, disposed of, transmitted to or otherwise made available to third parties who have not acquired the original data from NGSA.

- iv. Keep NGSA informed on any reprocessing of digital data and agrees to provide NGSA with one copy of any reports, maps and enhancements of these data within one year of completion. Such copies will be for the sole use of NGSA, or de facto staff of NGSA, and will not be made available to third parties without the written consent of the DATA RECEIVER for a period of two years from the date of receipt of said copies.
- v. Publication of these data or interpretations derived therefrom must be presented to NGSA for technical review. Only then may permission to publish be granted the Director-General NGSA.
- vi. Distribution and/or selling of standard or enhanced digital products by the DATA RECEIVER may only be undertaken with the written permission of the NGSA.
- vii. NGSA retains all copyrights to acquired survey data and maps. Presentation of these data and maps/images at conferences, websites or in research publications must ensure that NGSA is credited.
- Viii. NGSA shall not be liable for any post-processing performed on the DATA RECEIVER.
- ix. Failure to adhere to the above conditions may lead to prosecution under international copyright laws.

IN WITNESS WHEREOF, this agreement is executed as of the dates set forth below:

Name of the Company/Organisation representative: -----

Position: -----

Signed: ----- Date: -----

On Behalf of (Name of Company/Organisation):-----

Name of Director-General Nigerian Geological Survey Agency: -----

Signed: ----- Date: -----

ANNEX 4
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
PURCHASE OF AIRBORNE GEOPHYSICAL DIGITAL DATA
PROFORMA INVOICE



The Federal Republic of Nigeria
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
PURCHASE OF AIRBORNE GEOPHYSICAL DIGITAL DATA OF NIGERIA
PROFORMA INVOICE

Date:

Attention:

(Name of Company/Organisation)

Airborne Geophysical Data for *(Area of coverage):*

Type of Geophysical Data:

	Quantity	Cost each (Naira)	Total (Naira)
Line Data			
Gridded Data(QDS or km ²)			
Others <i>(Specify)</i>			
Total Cost			

ANNEX 5
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
AIRBORNE MAGNETIC AND RADIOMETRIC SURVEYS
DATA FORMATS



The Federal Republic of Nigeria
MINISTRY OF MINES AND STEEL DEVELOPMENT
NIGERIAN GEOLOGICAL SURVEY AGENCY
AIRBORNE MAGNETIC AND RADIOMETRIC SURVEYS
DATA FORMATS

Grid Data

All grid data are delivered in Oasis Montaj Geosoft raster file format.

Line Data

All data are stored in the Geosoft database format. Line data are also delivered as ASCII files to be imported into any software able to handle large spreadsheet-type data sets.

FORMAT OF GEOSOF MAGNETIC DATABASE

X (WGS84, UTM ZONE 36S)
Y (WGS84, UTM ZONE 36S)
X_ARC1960 (ARC1960, UTM ZONE 36S)
Y_ARC1960 (ARC1960, UTM ZONE 36S)
LATITUDE (WGS84 WORLD) (DDD.MM.SS.SS)
LONGITUDE (WGS84 WORLD) (DDD.MM.SS.SS)
FID Fiducial
LINE
DATE (YYYY/MM/DD)
FLIGHT
GPS_TIME (seconds)
RADAR_ALTIMETER (m)
GPS_HEIGHT (m)
BATO_ALTIMETER (m)
FluxgateX
FluxgateY
FluxgateZ
FluxgateTF
RAW_LEFT_SENSOR (nT)
RAW_RIGHT_SENSOR (nT)
RAW_TAIL_SENSOR (nT)
RAW_HORIZONTAL_GRADIENT (nT)
LEVELLED_MAGNETICS (nT)
PROCESSED_HORIZONTAL_GRADIENT (nT/m)
TERRAIN (m)
Diurnal (nT)

FORMAT OF GEOSOFT RADIOMETRIC DATABASE

X (WGS84, UTM ZONE 36S)
Y (WGS84, UTM ZONE 36S)
X_ARC1960 (ARC 1960, UTM ZONE 36S)
Y_ARC1960 (ARC 1960, UTM ZONE 36S)
LATITUDE (WGS84 WORLD) (DDD.MM.SS.SS)
LONGITUDE (WGS84 WORLD) (DDD.MM.SS.SS)
FID Fiducial
LINE
DATE (YYYY/MM/DD)
FLIGHT
GPS_TIME (seconds)
RADAR ALTIMETER (m)
GPS_HEIGHT (m)
PRESSURE (mb)
TEMPERATURE (degree C)
COSMIC (counts)
URANIUM_UP (counts)
STIME Sample Time
LTIME Live Time
RAW-TOTALCOUNT_NASVD (counts)
RAW_POTASSIUM_NASVD (counts)
RAW_URANIUM_NASVD (counts)
RAW_THORIUM_NASVD (counts)
PROCESSED_TOTALCOUNT_NASVD (cps)
PROCESSED_POTASSIUM_NASVD (%)
PROCESSED_URANIUM_NASVD (ppm)
PROCESSED_THORIUM_NASVD (ppm)
DOSE_RATE (nGy/h)

FORMAT OF GEOSOFT MAGNETIC ARCHIVE (XYZ)

X (WGS84, UTM ZONE 36S)
Y (WGA84, UTM ZONE 36S)
Z1 X_ARC1960 (ARC1960, UTM ZONE 36S)
Z2 Y_ARC1960 (ARC1960, UTM ZONE 36S)
Z3 LATITUDE (WGA84 WORLD) (DDD.MM.SS.SS)
Z4 LONGITUDE (WGS84 WORLD) (DD.MM.SS.SS)
Z5 FID Fiducial
Z6 LINE
Z7 DATE (YYYY/MM/DD)
Z8 FLIGHT
Z9 GPS_TIME (seconds)
Z10 RADAR ALTIMETER (m)
Z11 GPS_HEIGHT (m)
Z12 BARO_ALTIMETER (m)

Z13 FluxgateX
Z14 FluxgateY
Z15 FluxgateZ
Z16 FluxgateTF
Z17 RAW_LEFT_SENSOR (nT)
Z18 RAW_RIGHT_SENSOR (nT)
Z19 RAW_TAIL_SENSOR (nT)
Z20 RAW_HORIZONTAL_GRADIENT (nT/m)
Z21 LEVELLED_MAGNETICS (nT)
Z22 PROCESSED_HORIZONTAL_GRADIENT (nT/m)
Z23 TERRAIN (m)
Z24 DIURNAL (nT)

FORMAT OF GEOSOFT RADIOMETRIC ARCHIVE

X (WGS84, UTM ZONE 36S)
Y (WGS84, UTM ZONE 36S)
Z1 X_ARC1960 (ARC 1960, UTM ZONE 36S)
Z2 Y_ARC1960 (ARC 1960, UTM ZONE 36S)
Z3 LATITUDE (WGS84 WORLD) (DDD.MM.SS.SS)
Z4 LONGITUDE (WGS84 WORLD) (DDD.MM.SS.SS)
Z5 FID Fiducial
Z6 LINE
Z7 DATE (YYY/MM/DD)
Z8 FLIGHT
Z9 GPS-TIME (seconds)
Z10 RADAR ALTIMETER (m)
Z11 GPS_HEIGHT (m)
Z12 PRESSURE (mb)
Z13 TEMPERATURE (degrees C)
Z14 COSMIC (counts)
Z15 URANIUM_UP (counts)
Z16 STIME Sample Time
Z17 LTIME Live Time
Z18 RAW_TOTTALCOUNT_NASVD (counts)
Z19 RAW_POTASSIUM_NASVD (counts)
Z20 RAW_URANIUM_NASVD (counts)
Z21 RAW_THORIUM_NASVD (counts)
Z22 PROCESSED-TOTALCOUNT_NASVD (counts)
Z23 PROCESSED_POTASSIUM_NASVD (counts)
Z24 PROCESSED_URANIUM_NASVD (counts)
Z25 PROCESSED_THORIUM_NASVD (counts)
Z25 DOSE_RATE (nGy/h)

GEOSOFT GRIDS (Arc 1960 and WGS84)

Magnetic Horizontal Gradient Enhanced_IGRF_corrected.grd (nT)
Potassium_NASVD.grd (%)
Terrain.grd (m)
Thorium_NASVD.grd (cps)
TotalCount_NASVD.grd (ppm)

SURVEY SPECIFICATIONS

Magnetic Data Recording Interval	0.1 seconds
Radiometric Data Recording Interval	1 second
Sensor Mean Terrain Clearance	80 meter (for Blocks 1, 2, 3, 4, 5 and 7) 100 metres (for Blocks 6)
Flight Line Spacing	200 metres (for Blocks 1, 2, 3, 4, 5 and 7) 500 metres (for Block 6)
Tie Line Spacing	2000 metres (for Blocks 1, 2, 3, 4, 5 and 7) 5000 metres (for Block 6)
Flight Line Trend	035 degrees
Tie Line Trend	125 degrees

EQUIPMENT SPECIFICATIONS

Magnetometers	3 x Scintrex CS3 Cesium Vapour
Data Acquisition System	FASDAS
Magnetic Counter	FASDAS
Radar Altimeter	KING KR405/KING KR405B
Barometric Altimeter	ENVIRO BARO/DIGIQUARTZ
Radiometric Crystal Volume-Down	32litres
Radiometric Crystal Volume-Up	8litres
Radiometric Crystals	GPX 1024/256
Radiometric Data Acquisition	GR-820-3

NAVIGATION SPECIFICATIONS

Flight Path Tracking	Digital
Flight Path Navigation	Novatel 3151R/Omnistar RTDGPS
Flight Path Recovery	Digital
Flight Path Processing	Real Time Differential GPS
Aircraft Supplied By	Fugro Airborne Surveys
Aircraft	Cessna Caravan 208B ZS-FSA
Aircraft	Cessna Caravan 208 ZS-MSJ
Aircraft	Cessna 406 ZS-SSC

PLOTTING SPECIFICATIONS

Projection	Universal Transverse Mercator
Spheroid	Clarke 1880 (Modified)
Central Meridian	33 Degrees East
Central Scaling Factor	0.9996
Datum	Arc 1960
X Bias	500 000 metres
Y Bias	0 metres
Grid Mesh Size	50 metres
Survey Date	07/12/06 - 31/05/07
Data Acquisition By	Fugro Airborne Surveys

For Further Enquiries, Please Contact:

Director General
NIGERIAN GEOLOGICAL SURVEY AGENCY
31 Shettima Monguno Crescent
Behind Julius berger Office, Utako District
P.M..B 616, Abuja, Nigeria.
Email dgoffice@ngsa-ng.org

CUSTOMERS SERVICE CENTRE
NIGERIAN GEOLOGICAL SURVEY AGENCY
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E-mail: customer-enquiries@ngsa-ng.org
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