USERS' GUIDE TO THE NGMA FIELD DATABASE

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ABSTRACT

The NGMA Field Database standardises the recording of AGSO geological field information - such as ground sites, outcrops, lithologies, rock samples, and structural observations. It lies at the centre of a number of AGSO laboratory databases on petrography, whole-rock geochemistry, isotopic age determinations, geophysical rock properties and stream-sediment geochemistry. Other databases, like the OZMIN mineral deposits database and the RTMAP regolith-terrain database, make use of the sites component of the field database.

Wherever possible, data standards are controlled by the means of authority tables to facilitate the presentation of data with geographic information systems and other computer applications. For example, all geological time terms are checked against a geological time scale, and all mineral names are validated by an AGSO list of mineral names and abbreviations. Without such rigorous validation of input data it becomes difficult to make use the database for automated data analysis and presentation.

This users guide presents an overview of the database, and describes in detail the menus and screen forms used to input and view the data. In particular, the definitions of most fields in the database are given in some depth under descriptions of the screen forms - providing, in effect, a comprehensive data dictionary of the database. The database schema, with all definitions of tables, views and indexes is contained in an appendix to the guide.

1 - INTRODUCTION

The NGMA Field Database forms the nucleus of the NGMA Database System (Figure 1) - a group of interconnected field and laboratory databases designed primarily for data generated by the National Geoscience Mapping Accord (Jaques, 1992). The system has been set up by the Minerals and Land Use Program in collaboration with Information Systems Branch, using Oracle 6.0 relational database management system (RDBMS) on AGSO's corporate database server - a DG AViiON 6240 computer running UNIX System 5, Version 4.

The Field Database records what a geologist normally writes in a field notebook, but in a structured way that lends itself to automated methods of data manipulation and presentation (Blewett & Ryburn, 1992). In particular, the database has been designed to mesh with geographic information systems (GIS) - such as AGSO's Arc/Info system (Chopra & Ryburn, 1993). Earlier laboratory databases, such as the ROCKCHEM (formerly PetChem) database of whole-rock chemistry (Ryburn, 1991) and the OZCHRON database of Australian geochronology (Ryburn, Page & Richards, in prep), now make use of the Field Database for their geographic location and sample information. Other databases, such as the OZMIN database of Australian mineral deposits (Ewers & Ryburn, 1993) and the RTMAP Regolith-Landform Database (Lenz, 1991), tap into the location information. The former structural geology database (STRUCTURE) is now an integral part of the NGMA Field Database.

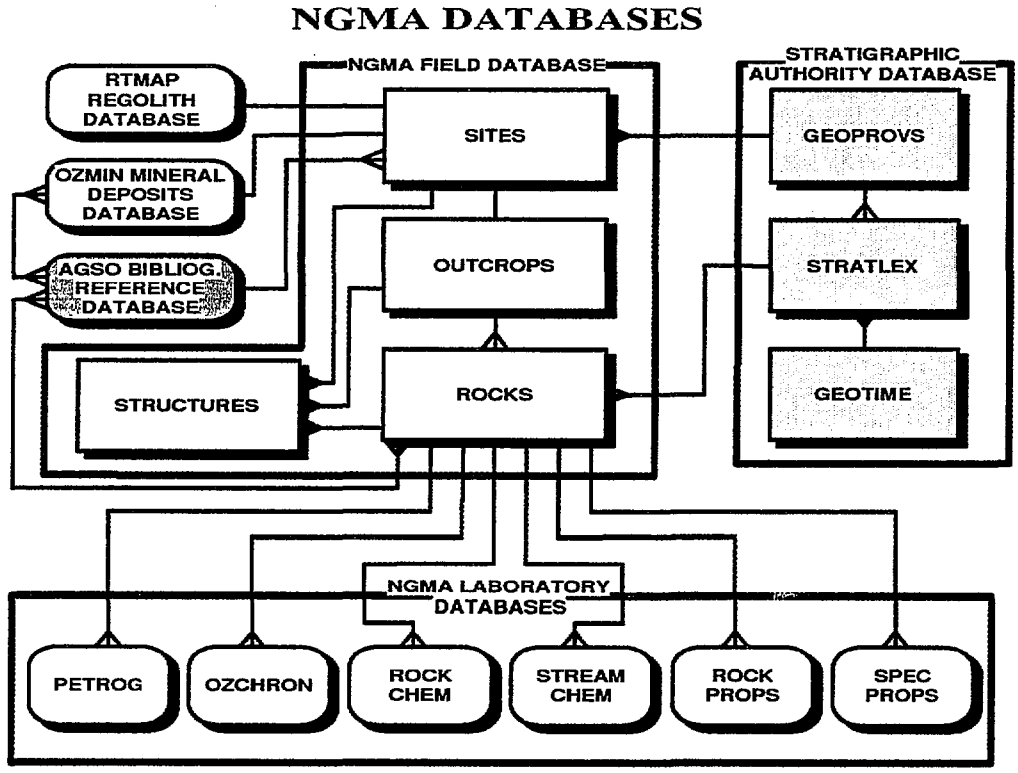

Figure 1. Simplified Structure of AGSO's Field & Laboratory Database System

The NGMA Field Database owes a lot to the Geological Survey of Queensland's REGMAP system (Withnall et al., 1992), which also has a SITES table for all geographic location information. Initially, the REGMAP model was seriously considered for AGSO's field database, but the need to accommodate continent-wide data in a variety of disciplines, and the need for tight validation of input data, precluded REGMAP being followed in detail. The NGMA Field Database provides for data from anywhere in the world.

This guide is a description of the infrastructure of the NGMA Field Database as it now exists. In time the database may change significantly in response to changing technology and user requirements. For information on the current AViiON server, AGSO's Oracle environments and the use of SQL*Plus, SQL*Forms, etc., the reader is referred to the 'Users' Guide to AGSO's Oracle Database System' (Lenz, Ryburn & Kucka, 1993).

2- STRUCTURE OF THE NGMA FIELD DATABASE

The NGMA Field Database has five main data tables - SITES, OUTCROPS, ROCKS, LITHDATA and STRUCTURES. All other tables indicated in Figure 2 below are lookup or authority tables used to validate the classifications and nomenclature used in the main tables.

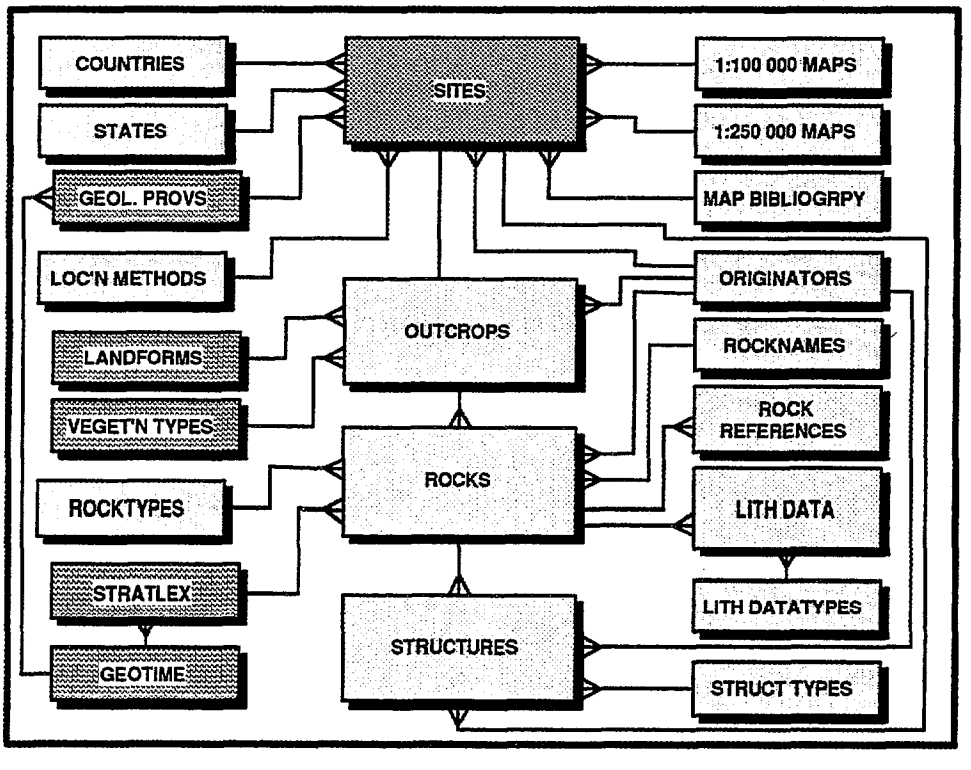

Figure 2. The structure of the NGMA Field Database showing relationships between tables with 'crows' feet' at the 'many' end of many-to-one links. The authority table labels emphasise function and are not necessarily actual table names (see below).

The focus of the Field Database is the **SITES** table, which standardises the way point location data are recorded and ensures that the accuracy and lineage of coordinates are noted. This is logically linked to the **OUTCROPS** and **ROCKS** tables via the **Originator Number** and **Site ID** (see Section 3 below). The OUTCROPS table stores data at the outcrop level, including drill-hole data, while the ROCKS and LITHDATA tables record lithologies and samples taken. LITHDATA is the expandable attributes table for ROCKS - linked via an automatically generated key known as **Rockno**. Validation of geological provinces (and subprovinces and domains) and stratigraphic units is accomplished by links to the **GEOPROVS** and **STRATLEX** tables, which, together with the **GEOTIME** geological time scale table, make up the Stratigraphic Authority Database (Ryburn, in prep.) indicated in Figure 1 - brief descriptions of these tables are included in this manual.

The main data tables in the NGMA Field Database are owned by the Oracle user called 'NGMA'. The ownership of all tables is indicated in full table names by a prefix occurring before the decimal point. The main NGMA data tables are as follows -

TABLE NAME	CONTENTS
NGMA.SITES	ground sites location data, accuracy & lineage
NGMA.OUTCROPS	outcrop-related data, including drill holes
NGMA.ROCKS	rock samples and lithological data
NGMA.LITHDATA	extendable attributes for ROCKS table
NGMA.STRUCTURES	mesoscopic structures at a site or outcrop
NGMA.ROCKREFS	bibliographic reference *versus* rock samples

There are also views of these tables that allow ordinary users (as opposed to owners or custodians) to add, update and delete their own data. These views, called **NGMA.USITES, NGMA.UOUTCROPS, NGMA.UROCKS, NGMA.ULITHDATA NGMA.USTRUCTURES** and **NGMA.UROCKREFS,** are described more fully in section 4 - 'Security and Access'. In addition to the above main data tables there are a number of authority tables and one view, not all of which belong to NGMA -

TABLE NAME	CONTENTS	CUSTODIAN
NGMA.ORIGINATORS	contributors of data	Murray Hazell
NGMA.AGSOCOUNTRIES	list of valid countries	Rod Ryburn
NGMA.AGSOSTATES	list of valid Australian States	Rod Ryburn
NGMA.QMAPS	Australian 1:250 000 map sheets	Murray Hazell
NGMA.HMAPS	Australian 1:100 000 map sheets	Murray Hazell
NGMA.LOCMETHODS	spatial location methods	Richard Blewett
NGMA.STRUCTYPES	extendable stucture attributes	Richard Blewett

NGMA.ROCKTYPES	basic classification of rocktypes	Lesley Wyborn
NGMA.LITHNAMES	lithological names	Jan Knutson
NGMA.LITHDATATYPES	extendable lithological attributes	P. Stuart-Smith
NGMA.AGSOMINERALS	mineral names	Morrie Duggan
NGMA.ROCKDATATYPES	view of lithdatatypes/agsominerals union	
STRATA.GEOPROVS	Australian geological provinces	David Palfreyman
STRATA.STRATLEX	Australian stratigraphic names	Cathy Brown
STRATA.GEOTIME	geological time scale	John Laurie
RTMAP.LANDF	Australian landform classification	Colin Pain
QUATDB.VEGET	Australian vegetation classification	Geoff Hunt

As a general rule, only the designated custodians are permitted to change the data in these tables. Full definitions of all tables, indexes and views used by the NGMA Field Database are given in Appendix A.

3 - SITE AND SAMPLE NUMBERING

With the help of an **Originator Number** (origno) most NGMA data tables maintain original site and sample 'numbers'. In most cases the sample number will be the same as the site number, perhaps with one or two appended letters to distinguish several samples at the one site, but ***sample numbers can be unrelated to site numbers.*** If all sites and samples were from AGSO, and had unique registered numbers, then the site and sample numbers would be sufficient on their own. However, the SITES and ROCKS tables are also intended for data provided by universities, State geological surveys, companies and private individuals, all of whom use their own numbering systems. The Originator Number is required to maintain uniqueness amongst diverse numbering systems. Originator numbers are recorded against names in the **ORIGINATORS** authority table. An Originator Number of 93, for example, corresponds to SADME - the South Australian Department of Mines and Energy.

A site in the SITES table is fully identified by a unique combination of Originator Number and **Site ID** (siteid), the latter being any sequence of numbers and letters up to 16 characters long. The uniqueness of an Originator Number and Site ID combination is enforced by a unique index covering these fields. Similarly, a sample in the ROCKS table is fully identified by a unique combination of Originator Number and **Sample ID** (sampleid), which is protected by a trigger in the ROCKS form - it is not possible to enter a combination already in the ROCKS table (except where no sample has been taken, indicated by a null Sample ID). All analytical tables in laboratory databases record both the Originator Number and Sample ID. Although a sample number on its own is usually sufficient to retrieve the required sample, do not forget that ***sample numbers on their own are not unique.***

The originator of a site or sample is the person or organisation primarily responsible for the data. This could be the person who observed the site or collected the sample, a laboratory worker, or an author of published results - someone who might reasonably be expected to know about the sample and perhaps be able to supply further information. Note that the name of the Originator is recorded only once in the database. All other references to the Originator use the Originator Number, which is listed against the name in the NGMA. ORIGINATORS table.

4 - SECURITY AND ACCESS

Select-Only Database Access

The Oracle production environment allows all internal AGSO users select-only access to the main data tables in the NGMA Field Database. The menu system provides 'read-only' versions of the forms that allow users to retrieve most of the data in the databases, but not to insert, update or delete data. Users also have select-only access to all validation tables. When in SQL*Plus, all users may select data from any of these tables provided they include the owner's name plus a full stop in the full name of the table or view, e.g. -

SELECT SITEID FROM NGMA.OUTCROPS WHERE ORIGNO = 56;

Remember that not all tables are owned by NGMA. Tables from the Stratigraphic Authority Database are owned by STRATA, while RTMAP owns the Landforms Table, and QUATDB owns the Vegetation Table.

Insert, Update and Delete Oracle Access

All internal Oracle users on the production environment can add, change or delete their own data. This is accomplished via the following named views and their respective base tables -

BASE TABLE	INSERT/UPDATE VIEW
NGMA.SITES	NGMA.USITES
NGMA.OUTCROPS	NGMA.UOUTCROPS
NGMA.STRUCTURES	NGMA.USTRUCTURES
NGMA.ROCKS	NGMA.UROCKS
NGMA.LITHDATA	NGMA.ULITHDATA
NGMA.ROCKREFS	NGMA.UROCKREFS

In SQL*Forms all 'Insert/Update' forms cover the above views. The restrictions applying to the above views are the same in each case. For example, the view USITES of the SITES tables is defined as -

```
CREATE VIEW USITES AS
    SELECT * FROM SITES WHERE ENTEREDBY = USER;
```

The word ***USER*** in the above statement is an Oracle function that returns the current username. Each of the above tables has the mandatory field ENTEREDBY for the username of the person entering the data. This scheme guarantees that the users see only their own records, and only they or the data custodians can alter or delete them.

Users wishing to use SQL*Plus to insert, update or delete records in the above main tables (or SQL*Loader to load records from an ASCII file) must use the above views.

Custodians' Access Privileges

All custodians have been given appropriate access privileges to the data or authority tables that they administer. They may select, insert, update and delete all data in these tables via screen forms or from SQL*Plus. They cannot drop tables or alter the structure of tables. Note that custodians use the 'read-only' forms to insert, update and delete rows in the main data tables. This is because their access privileges apply to the base tables, not to views of the tables. The 'insert-update' forms do not allow them to retrieve records they do not own.

Owner's Access Rights

NGMA has complete privileges on all the tables it owns in the NGMA Field Database, as does STRATA in the Stratigraphic Authority Database and RTMAP and QUATDB on all tables in their databases.

5 - THE NGMA DATABASE MENU SYSTEM

Access to NGMA databases is via a tree-structured menu system used to branch to the NGMA Field Database and other NGMA databases. The menu system provides access to SQL*Plus, some reporting programs and nearly all screen forms associated with the NGMA databases. More reporting programs will probably be added in the future. Most ad-hoc queries, data inserts and updates are done via screen forms, although you should also know that batch retrievals and updates are often done via SQL*Plus (see Lenz, Ryburn & Kucka, 1993). To run the NGMA Database Menu System just type -

ngma <ENTER>

- after logging into the AViiON UNIX environment and specifying your terminal type. This automatically puts you into the Oracle production environment and brings up the SQL*Menu login screen, and after entering your Oracle user name and password, the first menu screen is displayed. This currently appears as follows -

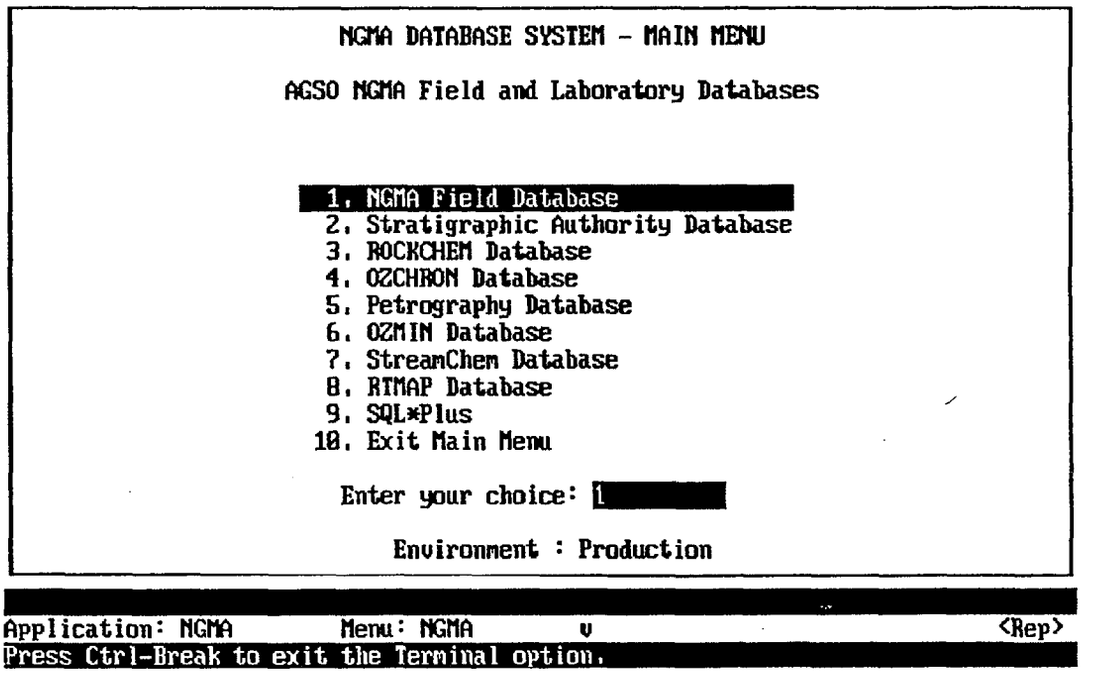

Figure 3. The Main Menu of the NGMA Database Menu System. This menu gives access to nearly all areas of the NGMA Database System.

Selecting item **10** in the menu, or pressing the **EXIT** function key, takes you back to UNIX. Item **9** puts you into the SQL*Plus command-line environment without having to log into Oracle again. Otherwise, just enter 1 (the default) to engage the following submenu -

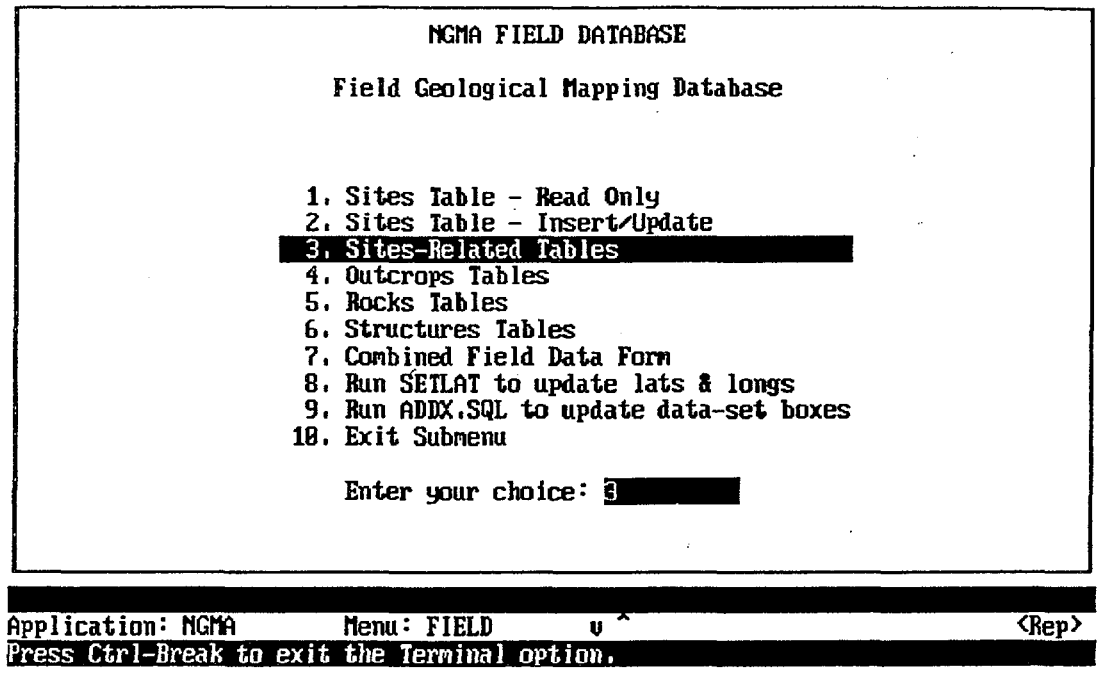

Figure 4. The NGMA Field Database Menu.

Selecting item **10** returns you to the Main Menu. This menu allows you to run the SITES form, or to enter further menus covering other forms used in the NGMA Field database. For example, if you select item 3, 'Sites-Related Tables', the following submenu appears -

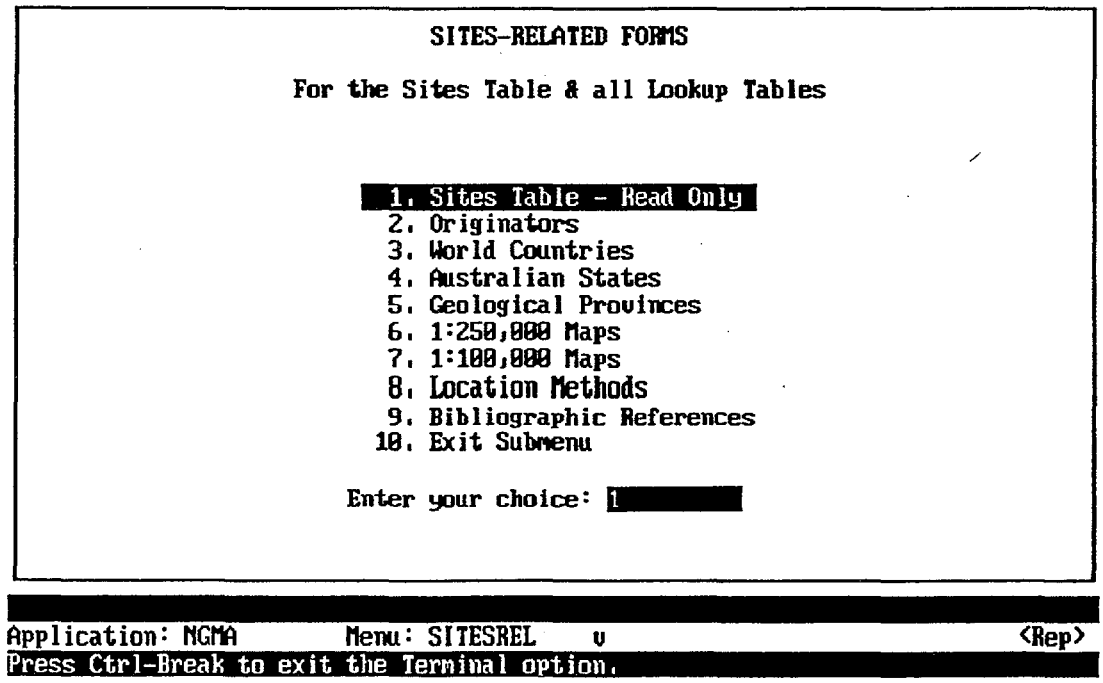

Figure 5. The Submenu for Sites-Related Forms.

This submenu repeats the read-only version of the SITES form and includes all screen forms covering authority tables used for validation of data in the SITES table. Selecting item **10**, or pressing the **EXIT** function key, takes you back to the previous menu. Other submenus give access to forms and reporting programs in the OUTCROPS, STRUCTURES and ROCKS groups. All areas of the NGMA Database System may be accessed from the NGMA Database Menu System.

In what follows each of the main screen forms of the NGMA Field Database is described in detaill. The purpose and definitions of all displayed fields are described - where necessary, in some detail. In addition, some of the more important or complex forms covering authority tables are also described, including the Stratigraphic Lexicon and Geological Provinces Forms from the the Stratigraphic Authority Database. Forms covering simple lookup tables, the ORIGINATORS form for example, are not described individually as they are basically similar to one another, and the 1:100 000 Maps Form is a good example of how they all function. In most cases the relevant fields in these lookup tables are well covered in the descriptions of the equivalent fields in the main tables.

6 - THE SITES FORM

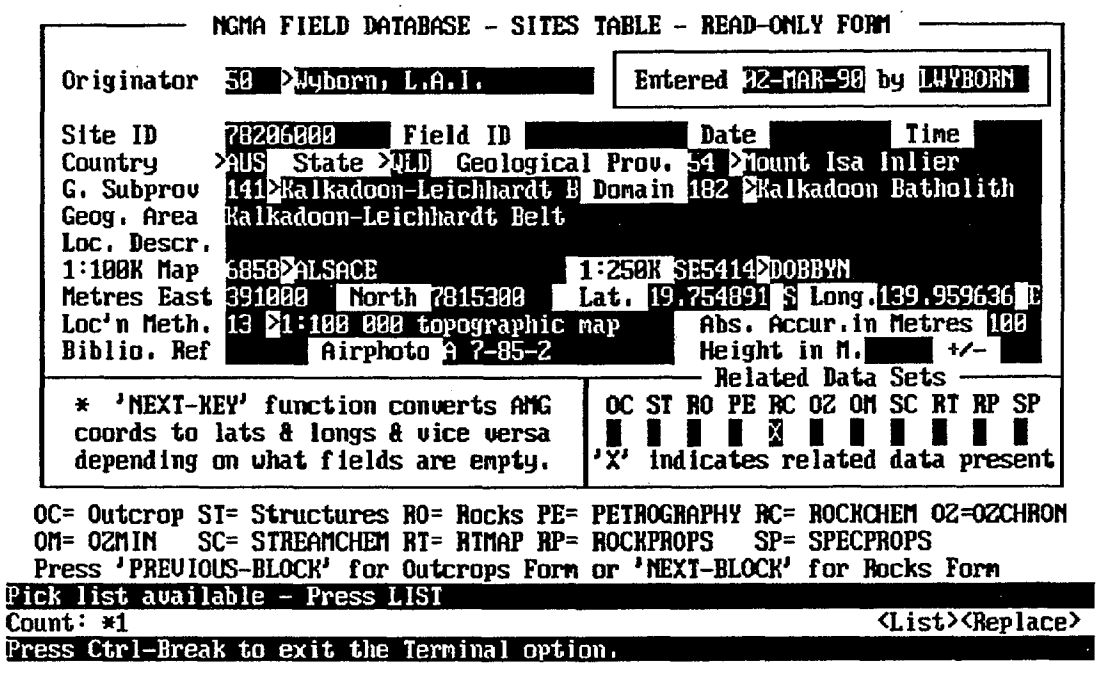

Figure 6. The Sites Form.

The Sites Form standardises the way geographic point location data are recorded in NGMA databases. The form attaches to the SITES table, but also draws on standard terms from associated look-up or authority tables. The form is primarily for surface location data relating to field geological, geochemical and geophysical observations. For example, an entry in the SITES table may be for observations at an outcrop, sample data, a scintillometer reading, or all three. You may move directly from the Sites Form to the Outcrops or Rocks Forms by pressing ***PREVIOUS BLOCK*** or ***NEXT BLOCK***. The current Originator Number and Site ID are automatically carried through to the destination form.

Geographic coordinates, either as decimal latitudes and longitudes or as AMG eastings and northings, are mandatory but the form includes a key trigger (press ***NEXT PRIMARY KEY***) that converts AMG coordinates to latitudes and longitudes, and *vice versa*. The direction of conversion is determined by which fields are full and empty. Of considerable importance are the data relating to the accuracy of the coordinates and their provenance - i.e., how they were obtained. Although the form insists on an absolute accuracy estimate in metres on the ground this is often an order-of-magnitude estimate only. Location data accurate to ±100 metres are generally acceptable when plotted at 1:250 000 scale, but may be too inaccurate for use at 1:50 000 scale. Similary, the method used to obtain the location coordinates is essential information. If a map was used, a pointer to a bibliographic reference (in AGSO's Biliographic Reference Database) to the exact map may also be included.

The Sites Form has fields for Country, State, Geological Province, Subprovince, Domain, 1:250 000 and 1:100 000 map sheet areas, and Airphoto. Some of these fields could be eliminated by using SQL joins between geographic coordinates in the SITES and other tables, but the procedures are cumbersome and slow in practice, and the inclusion of these attributes in the SITES table is in the interests of speed and simplicity. The need for a country field should be clear from the prior existence in the ROCKCHEM database, for one, of data from Antarctica, New Zealand, Papua New Guinea and the Solomon Islands.

In the following field definitions (and those of subsequent forms), the true name of each field is given in round brackets following the name used in the form. In the interests of saving screen space the field names are often abbreviated in the forms.

Originator - (ORIGNO) Mandatory integer of up to 5 digits that automatically displays the corresponding originator's name. Only the number of an originator already in the NGMA.ORIGINATORS table may be entered. A pop-up list of originators and their numbers may be viewed by pressing the LIST key - from which an originator may be selected with the ACCEPT or ENTER key. The originator is usually the person or organisation that collected the data at the site, and is also an indication of where to go for more information. The main purpose of this field is to allow the retention of any original site numbering systems.

Entered - (ENTRYDATE) Mandatory date field for the date the current record was entered into the SITES table. This field is is automatically inserted by a trigger when a new record is committed. The cursor can be moved into this field only when the form is in query mode.

By - (ENTEREDBY) Mandatory field for the Oracle Owner (username) of the current record. This field is is automatically inserted by a trigger when the record is first committed. The cursor can be moved into this field only when the form is in query mode.

Site ID - (SITEID) Mandatory field of up to 16 characters for a user-supplied number or ID for the site. AGSO field parties should use the AGSO registered number system. Otherwise, any combination of numbers and letters may be used but the Site ID must be unique to the originator. This is enforced by a validation trigger on the field as well as a unique index on ORIGNO plus SITEID. Even in SQL*Plus, attempts to insert records with duplicate Site IDs for the same Originator will result in the Oracle error 'duplicate value in index'.

Observation Date - (OBSDATE) The date that the field site was visited or observed - in the standard Oracle date format of DD-MMM-YY - e.g. '23-JUL-92'. This is not always known for old sites, but should always be supplied with new site data.

Observation Time - (OBSTIME) The time that the field site was observed - in Oracle's 24-hour format of HH:MM - e.g. '14:47'. Although often not recorded, this field is essential for gravity and ground spectral measurements.

Field ID - (FIELDID) An optional field of up to 16 characters for an alternative site number or ID. In the past, some AGSO field parties used field numbering systems that were later translated in the office to AGSO registered numbers. The field numbers were marked on the back of airphotos. This field is not indexed and field numbers need not be unique.

Country - (COUNTRYID) Mandatory 3 capital characters indicating the country or continent. Defaults to 'AUS' for Australia. Valid capital letters are those in the NGMA.AGSOCOUNTRIES table, which can be viewed as a pop-up list. With a few minor additions, the countries and abbreviations used in this table are taken from Australian Standard 2632-1983 (Standards Association of Australia, 1983). Note that the abbreviation for Antarctica is now 'ATA', not 'ANT' as before, and that INT may be used for international waters.

State - (STATE) Two or three capital letters indicating the Australian state in which the site lies. A validation trigger makes this field mandatory if Country is 'AUS', or NULL if some other country is given. A pop-up list of valid states is available. Valid States are those in the NGMA.AGSOSTATES table, which currently has the following values -

Letters	State
ACT	Australian Capital Territory
NSW	New South Wales
NT	Northern Territory
QLD	Queensland
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia

Geological Province - (GEOPROVNO) An integer of up to 5 digits pointing to the Geological Province in the STRATA.GEOPROVS authority table. Only geological provinces proper (i.e., those with a rank of 1) may be accessed. A pop-up list of valid geological provinces is available. This field must be entered if the Country is Australia.

Subprovince - (SUBPROVNO) As for Geological Province but optional. A validation trigger ensures that the value entered here must point to a subprovince (with a rank of 2) of the geological province already entered in the previous field. A pop-up list of geological subprovinces of the entered province is available.

Domain - (DOMAINNO) Optional. As for Subprovince, but must point to a Domain already entered into the GEOPROVS table. Unlike Provinces and Subprovinces, Domains are currently regarded as informal only. However, all batholiths are now included with Domains, as conventional wisdom holds that batholith names do not belong in stratigraphic nomenclature. A pop-up list may be viewed of all domains in the given Province or Subprovince. A validation trigger checks to see if the Domain is correctly attributed to the Province and/or Subprovince.

Geographic Area - (GEOGAREA) An optional descriptive field of 64 characters for the geographic area (e.g. - valley, plain, mountain range) the site is in. Examples include 'Hay Plain', 'Tuggeranong Valley' and 'Selwyn Range'. This field is inherited from the old samples table in the PetChem Database (Ryburn, 1990) and is not controlled by any authority table. It should not be used for the names of geological provinces or features - as has often happened in the past.

Location Description - (LOCDESC) An optional descriptive field of 64 characters for additional information relating to to the site's location - e.g., '5 Km SE of Brown's Bore'. This kind of information is an aid to relocating a site in the field.

1:100 000 Map - (HMAPNO) A 4-digit integer identifying the 1:100 000 map sheet-area on which the site falls. Mandatory if country is Australia, optional if PNG. The name is automatically displayed from the NGMA.HMAPS table, which has over 3000 Australian 1:100 000 maps. A pop-up list is available. A valid entry will automatically insert the correct 1:250 000 Map ID. A validation trigger ensures that the sheet number entered lies wholly or partly in the given state.

1:250 000 Map - (QMAPID) The 6-character ID of the 1:250 000 map sheet-area on which the site falls - e.g., 'SF5402'. Mandatory if the country is Australia, otherwise it is unenterable. This field is automatically filled in when a valid 1:100 000 map is entered. The name is displayed from the NGMA.QMAPS authority table, and a pop-up list is available. Note that the first four characters identify the 1:1 000 000 map, and the first two letters in the ID record the 6° UTM (AMG) zone on which the map falls - essential for AMG coordinates.

Decimal Latitude - (DLAT) A positive numeric field with up to 2 digits in front of the decimal point, and up to 6 digits after the decimal point. All latitudes and longitudes must be entered in decimal degrees and must not be negative. Mandatory if an AMG northing is not entered. A validation trigger ensures that the lattitude given must lie within the given 100 000 map sheet area.

N/S - (NS) A single character field that can only take the values 'N' or 'S'. It defaults to 'S'. This field is needed because the SITES table has provision for locations in the northern hemisphere.

Decimal Longitude - (DLONG) A positive numeric field with up to 3 digits in front of the decimal point and up to 6 digits after the decimal point. Mandatory if an AMG easting is not entered. A validation trigger ensures that the longitude given must lie within the given 100 000 map sheet area.

E/W - (EW) A single character field that can only take the values 'E' or 'W'. Defaults to 'E'. There are no sites yet from the western hemisphere in the SITES table.

Metres East - (EASTING) Normally a 6-digit positive integer for the full AMG easting of the site in metres, but up to two decimal places may also be entered (a precision of ±1.0 cm on the ground). Mandatory if the country is 'AUS' and a longitude is not entered. A validation trigger checks that the easting lies (approximately) within the given 1:100 000 map sheet area.

Metres North - (NORTHING) Normally a 7-digit positive integer for the full AMG northing of the site in metres, but up to two decimal places may also be entered (a precision of ±1.0 cm on the ground). Mandatory if the country is 'AUS' and a latitude is not entered. A validation trigger checks that the northing lies (approximately) within the given 1:100 000 map sheet area.

Location Method - (METHOD) A mandatory integer of up to 3 digits pointing to a record in the NGMA.LOCMETHODS table showing the method used to obtain the geographic coordinates of the site. In most cases an entry in this field will automatically insert a default estimate in the Absolute Accuracy field. If a standard series map is indicated it is assumed that the map used was the most up-to-date edition at the time the observation was made. Current standard-series maps use the AMG-66 speroid. If this is not the case then a specific map, report or publication can be referenced via the Bibliographic Reference field. The LOCMETHODS table currently has the following entries -

Number	Description	Default Accuracy (±m)
0	unknown	
1	GPS observation (WGS-84)	50
2	GPS observation (AMG-66)	50
3	GPS observation (AMG-84)	50
4	GPS observation (GDA-92)	50
5	astronomical observation	
6	surveyed from ground control	
7	published report	
8	unpublished report	
10	non-standard topographic map	
11	1:25 000 topographic map	25
12	1:50 000 topographic map	50
13	1:100 000 topographic map	100
14	1:250 000 topographic map	250
15	1:500 000 topographic map	500
16	1:1 000 000 topographic map	1000
20	non-standard geological map	
21	1:25 000 geological map	25
22	1:50 000 geological map	50
23	1:100 000 geological map	100
24	1:250 000 geological map	250
25	1:500 000 geological map	500
26	1:1 000 000 geological map	1000

Bibliographic Reference - (BIBREF) A 9-character field for the ID of a bibliographic reference in AGSO's Corporate Reference Database that locates or refers to the site. The reference could be to a locality diagram in a publication, a non-standard published map or a map from a PhD thesis or company report. This field is provided principally as a means of recording the lineage or provenance

of data that has come from another source. Note that almost any map can be treated as a bibliographic reference using the standard 'Harvard-style' of refererence notation. The GEODX IDs in AGSO's Reference Database are various - e.g. '79/20055', 'R156' 'GOLD239'. IDs of user-entered references are always a number with a '*' prefix - e.g. '*2156'.

Absolute Accuracy in Metres - (ACCURACY) Mandatory. A positive integer of up to 4 digits for the absolute accuracy of the given coordinates in metres on the ground. If a site cannot be located to better than ±10 000 meters then it should not be entered in the database! For many pre-existing sites the locational accuracy is just an order of magnitude figure, but this is still better than no estimate. For example, points measured on a map at 1:250 000 scale are generally accurate to ±1 mm on the face of the map or ±250 metres on the ground. Estimates like this are automatically supplied by the trigger in the Location Method field but these may need to be refined, depending on the particular circumstances. This field is important for assessing whether a point in the SITES table can be plotted at particular scales - it provides the table with a degree of scale independence.

The accuracy estimate should not be just the reproducibility of measurement on a map, as this is of little value in comparing results obtained by different methods. It is usually assumed that the field worker has located the point on the map as accurately as possible with respect to surrounding topographic details. Non-statistical errors, such as a point located in the wrong drainage, can only be detected - if at all - by tedious manual inspection. However, GPS measurements are increasingly being used to obtain geographic coordinates in the field and these always include precise accuracy estimates, but the map spheroid should always be specified via the location method field.

The data in the SITES table that have come from the older SAMPLES table associated with the ROCKCHEM and OZCHRON databases did not include accuracy estimates. The following assumptions have been made in translating these results to the SITES table.

1 - Unless otherwise known, it is assumed that all geographic coordinates were obtained from 1:100 000-scale maps, and were therefore accurate to about ±100 metres.

2 - Results known to have been measured only from 1:250 000-scale maps are assumed accurate to ±250 metres.

3 - Other known circumstances have had their accuracies appropriately estimated - e.g. Antarctica.

Although most 1:100 000 geological maps have been compiled at 1:50 000 scale, points located on the compilation sheets are no more accurate than they would be at 1:100 000 scale, as in most cases the topographic control on the compilation sheets was enlarged from original 1:100 000 bases.

Airphoto - (AIRPHOTO) An optional field of 36 characters to identify the airphoto on which the site is located and/or was plotted. The field is for the name of the airphoto series, the run number and the photo number - e.g. 'Cloncurry 8/2134'. It is not intended to be a comprehensive reference to a major national airphoto database, as this is beyond any reasonable AGSO role at present. AGSO geologists often wish to re-locate and re-inspect airphotos on which sites occur.

Height in Metres - (HEIGHT) An integer of up to 5 digits for the height of the site in metres above mean sea level. Can be negative. This information is not generally recorded, but it is essential for some purposes - e.g., gravity readings. The field is also needed for subsurface mine information and for cliff sections through subhorizontal strata.

± Metres - (HEIGHTACC) A positive integer of up to 3 digits for the absolute error in metres of the height entered in the previous field.

Related Data Sets - (OC, RO, ST, TS, RC, OZ, OM, SC, RT, RP, SP) Eleven single character fields that show what data sets join to the site. Only two values are allowed, null or capital 'X' - the 'X ' indicating that the related data set exists.

ID	Related Data Set
OC	OUTCROPS TABLE - Outcrop Information
RO	ROCKS TABLE - Lithology & Sample Information
ST	STRUCTURE - Structural Geology Observations
PE	PETROGRAPHY Thin Section Database
RC	ROCKCHEM Whole-Rock Chemistry Database
OZ	OZCHRON Geochronolgy Database
OM	OZMIN Mineral Deposits Database
SC	STREAMCHEM Geochemical Database
RT	RTMAP Regolith-Landform Database
RP	ROCKPROPS Geophysical Properties Database
SP	SPECPROPS Spectral Properties Database

Although SQL can be used to determine what sites relate to what data sets, the exercise is complicated and slow, and these fields are needed for the immediate identification of related data. However, SQL*Plus can be used to update these fields via joins to the appropriate tables. In the case of the OZCHRON Geochronolgy Database, though, 6 tables need to be searched. These fields can be brought entirely up to date with the help of a SQL*Plus script called 'ADDX.SQL'. This may be run from item 5 in the SITES submenu. It takes some time to run to completion.

7 - THE OUTCROPS FORM

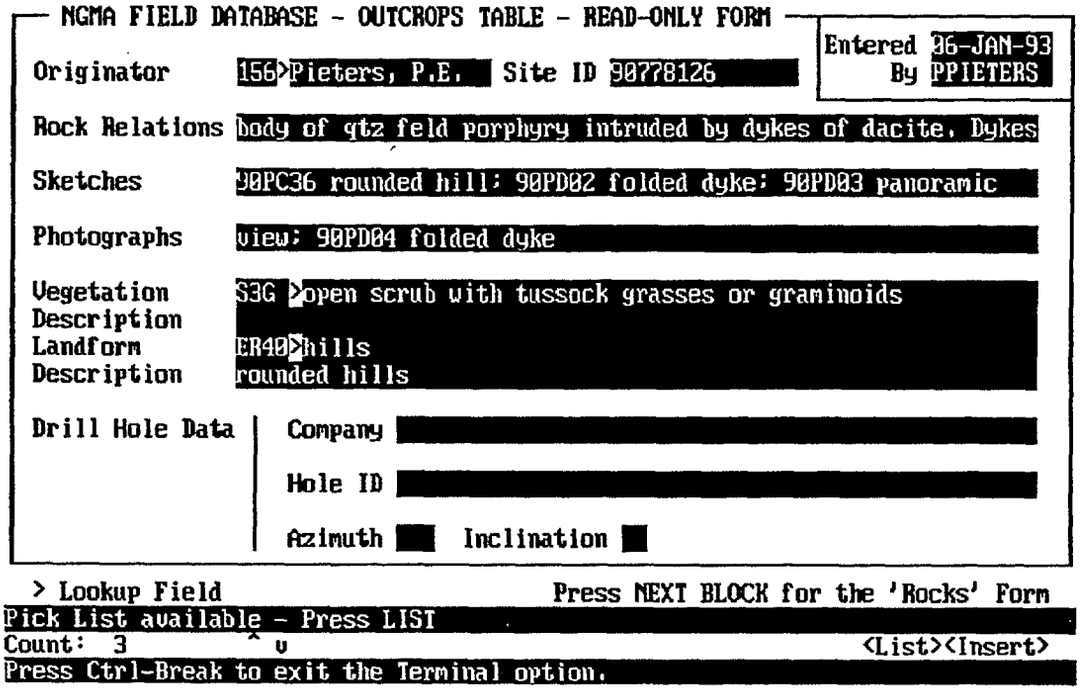

Figure 7. The Outcrops Form.

The Outcrops Form covers the OUTCROPS table and is designed for descriptions of the outcrop as a whole and relationships between lithologies and structures in the outcrop. Information on individual lithologies, samples and structures belong in the ROCKS and STRUCTURES tables - both of which have a many-to-one relationship with OUTCROPS. The OUTCROPS table has a one-to-one relationship with the SITES table, and uses the same concatenated key covering the Originator and Site Id. The reason for the separation into two tables is that tables other than OUTCROPS - such as the DEPOSITS table in the OZMIN database - need to link in with the location information in SITES. A record must exist in SITES before the corresponding record can be entered into the OUTCROPS table. No two OUTCROPS records can have the same Originator and Site ID.

For two reasons the Outcrops Form is less satisfactory than the Sites or Rocks Forms and is likely to receive less patronage as a consequence. The first reason is that the included data are mostly descriptive and not easily used by other software applications. Unfortunately the data are not easily systematised without undue complications. For example, do we want to systematise the complexity of rock relationships, and if so, to what purpose? The second reason is the compromise of including exploration drill-hole data - which may have to be split off into separate tables in the future. The drill-hole samples and their depths are catered for in the ROCKS table. In the meantime OUTCROPS provides a compromise that is appropriately simple. It exists largely for those who wish to enter their field notes.

Originator - (ORIGNO) As for the Sites Form.

Site ID - (SITEID) As for the Sites Form. A trigger ensures that only Originator-Site ID combinations that are already in the SITES table can be entered.

Entered - (ENTRYDATE) As for the Sites Form.

By - (ENTEREDBY) As for the Sites Form.

Rock Relations - (ROCKRELS) An optional field of 128 characters for a description of the rock relations in the outcrop.

Sketches - (SKETCH) An optional field of 64 characters noting any sketches made at the outcrop.

Photographs - (PHOTO) An optional field of 64 characters noting any photos taken at the outcrop.

Vegetation -

Code - (VEGCODE) An optional field of up to 4-characters for the vegetation type in the QUATDB.VEGET table. This is part of the Quaternary Climates Database (custodian - Geoff Hunt) and is based on AUSLIG's vegetation map of Australia. The name of the vegetation type is automatically displayed. For example, the code 'M2S' displays the text 'Woodland with tall shrubs'. With the cursor in this field press ***LIST*** to view a po-up list of vegetation types.

Description - (VEGETATION) An optional 64 character field for a text description of the vegetation at the site of the outcrop. Important for remote sensing.

Landform -

Code - (LANDCODE) An optional field of up to 4 characters for the landform in the RTMAP.LANDF table. This is part of the Regolith Landforms Database (custodian - Colin Pain). The landform's name is automatically displayed. For example, the code 'ME00' displays the text 'meteor crater'. When the cursor is in this field press ***LIST*** to view a pop-up list of valid landforms from the LANDF table.

Description - (LANDFORM) An optional 64 character field for a text description of the landform at the site of the outcrop.

Drill Hole Data -

Company - (DHCOMPNY) An optional 48 character field for the name of the company that drilled the hole.

Hole ID - (DRILLHOLEID) An optional 48 character field for the name or other ID of the hole.

Azimuth - (DHAZIMUTH) An optional 3 digit integer for the azimuth of an inclined hole in degrees east of true north. The value entered must lie between 0 and 360 degrees.

Inclination - (DHINCLIN) An optional 2 digit integer for the inclination below the horizontal of the drill hole. For vertical holes this is 90 degrees. The value entered must lie between 0 and 90 degrees.

8 - THE ROCKS AND STRUCTURES FORM

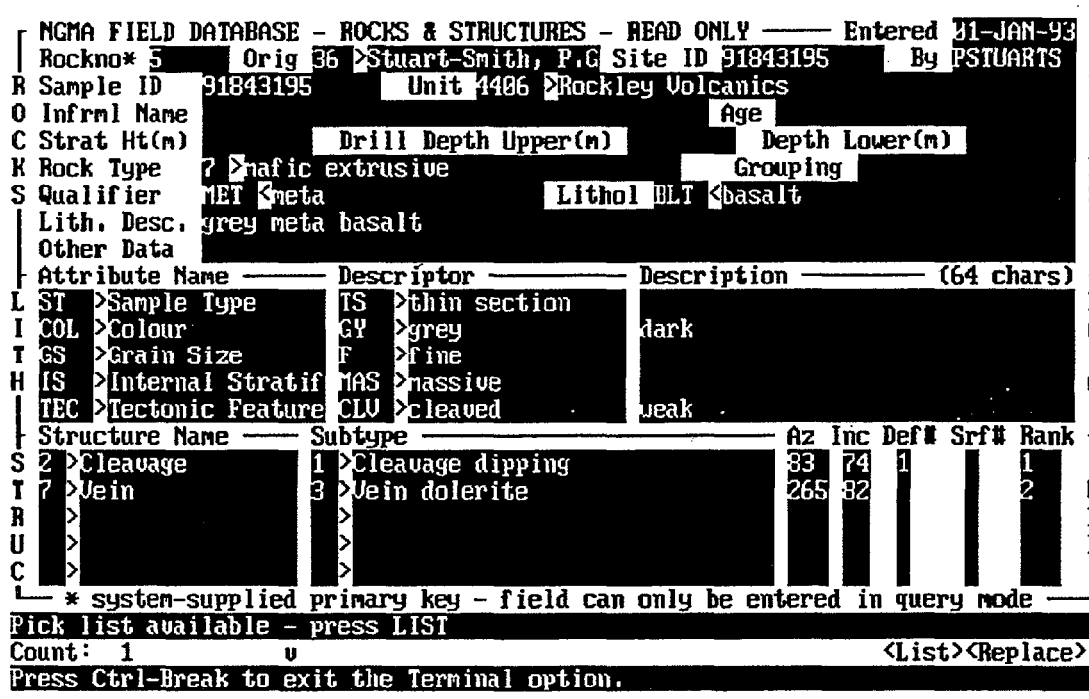

Figure 8. The Rocks and Structures Form.

The Rocks and Structures Form is for data on lithologies, rock samples and mesoscopic geological structures that occur at a site or outcrop. It is a three-block form covering the ROCKS, LITHDATA and STRUCTURES tables. The ROCKS table has a many-to-one relationship with the SITES table, and also with the OUTCROPS table if there are outcrop-related data at the site. This is a natural relationship, as different lithologies and/or samples are commonly associated with the one site or outcrop. The LITHDATA table, which has a many-to-one relationship with the ROCKS table, functions as an extendable attributes table for the ROCKS table. As many records as may be needed can be entered here. The STRUCTURES table also has a many-to-one relationship with ROCKS, since many structural observations may be made in one lithology or rock unit at one outcrop. There is no limit to the number of structural observations that may be entered against one record in the ROCKS table. The system-generated 'Rockno' key ties all three blocks together.

If a sample exists a Sample Number must be supplied, otherwise the record is regarded as a lithology observation without a sample having been taken. The sample number can be the site number, or can be different, but it must be unique to the originator. If the site number is used and several samples were taken, then the site number is typically modified by adding letters to represent each sample. This is the recommended system, as the connection between samples and sites is made clear. However, tha data come from many sources, and as far as possible the numbering system used by the originator should be preserved. The definitions and purposes of the fields displayed on the form are as follows -

Rockno - (ROCKNO) A mandatory positive integer of up to 6 digits which is the primary key for the ROCKS table, and is what links ROCKS to LITHDATA and STRUCTURES. The number is automatically inserted when a new ROCKS record is committed. This field may be entered by the user only in query mode.

Originator - (ORIGNO) As for the Sites and Outcrops Form.

Site ID - (SITEID) As for the Sites and Outcrops Form. A validation trigger ensures that Originator and Site ID must already exist in the SITES table. When a new record is entered the Site ID is automatically copied to the Sample ID field.

Entered - (ENTRYDATE) As for the Sites and Outcrops Form.

By - (ENTEREDBY) As for the Sites and Outcrops Form.

Sample ID - (SAMPLEID) An optional field of 16 characters for the ID of a sample. It must be entered if a sample exists, otherwise it is assumed that no sample was taken. The Sample ID must be unique to the Originator, but it need bear no relationship to the Site ID. However, the usual situation is that only a letter need be added to the Site ID that is automatically copied from the Site ID field. AGSO originators should use an AGSO registered number with one appended letter, or two letters if more than 26 samples were taken from a site. Although not relevant to the ROCKS table, splits of rocks samples take on an additional number following the letter (splits data belong in NGMA laboratory databases).

Stratigraphic Unit - (STRATNO) An optional integer of up to 5 digits that identifies the unit in AGSO's Stratigraphic Lexicon. If a valid number is entered the name is automatically inserted, otherwise an error message appears. Alternatively, move the cursor to the name field, enter the first two or three letters of the required unit's name in either lower or upper case and then press ***LIST***. All units starting with the supplied letters will then be displayed in the resulting pop-up list. Position the highlighted bar on the correct unit and press ***ACCEPT*** to insert the name and number in the form This is much quicker than an open list (no letters supplied), which is quite slow due to the size of the Stratigraphic Lexicon.

Informal Stratigraphic Name - (INFORMAL) Up to 64 characters for an informal statigraphic name - in the absence of a registered name from the Stratigraphic Lexicon. This field may be used for new units, not yet in the Lexicon, or for geological mapping units that will always be informal units. A validation trigger checks to see if the name is already in the lexicon. If it is, the field is cleared and the correct number and name placed in the previous two fields.

Age - (AGE) Up to 54 characters for an entered geological age. The minimum and maximum ages of a stratigraphic unit can be obtained from the Stratigraphic Lexicon, but this field allows the age of a rock to be stated independently, either as an absolute age or as a Period, Stage etc. All non-numeric entries are validated against the STRATA.GEOTIME table in the Stratigraphic Authority Database. A pop-up list of valid time terms from this table may be viewed by pressing ***LIST***. This rather long list may be shortened by first entering a letter or two in the age field before pressing ***LIST***.

Stratigraphic Height - (STRATHEIGHT) A positive integer of up to eight digits indicating the height of the observation or sample above the base of the stratigraphic unit or some arbitrary stratigraphic datum. This field is typically used where a sample or observation comes from a measured section or drill hole.

Drill Depth Upper - (HOLEDEPTH) A positive integer of up to 8 digits giving the depth in meters from ground level to the top of a sample or observation interval in a drill hole. If a 'Drill Depth Lower' is not entered, 'Drill Depth Upper' refers to the centroid of the sample or observation interval.

Drill Depth Lower - (HOLEDEPTH2) A positive integer of up to 8 digits giving the depth in meters from ground level to the bottom of a sample or observation interval in a drill hole.

Rock Type - (ROCKTYPE) A positive integer of up to two digits that identifies the basic rock type from a look-up list of 17 possibilities. This field is designed for a first-pass coarse classification of rock types. It currently looks like this -

Number	Rock Type
1	unknown
2	felsic intrusive
3	intermediate intrusive
4	mafic intrusive
5	felsic extrusive
6	intermediate extrusive
7	mafic extrusive
8	ultramafite
9	alkaline igneous
10	clastic sediment
11	chemical sediment
12	metabasite
13	felsic gneiss
14	metasediment
15	metasomatite
16	ore
17	regolith

Grouping - (GROUPING) A 50-character optional field for a user-defined classification. This uncontrolled field is inherited from the Samples Form in the old version of the ROCKCHEM Database, and is used to classify suites of rocks from particular regions into classes other than those used by other fields on the form. The values entered here are up to the user and have no global significance. They are often used to indicate geochemically coherent granitoid or mafic dyke suites.

Lithology Qualifier - (QUALIFIER) A 20-character optional field for the qualifying term, if any, before the Lithology Name field that follows. An abbreviation may be entered in the associated short field that automatically retrieves the full term.

The full term is what is stored in the ROCKS table. The qualifying term must be in the NGMA.LITHNAMES authority table and classified as Type 'Q' for qualifier. An example of a Qualifier is 'pelitic' (abbreviation 'PEL"), as in 'pelitic schist'. Valid lithology qualifiers may be selected from a pop-up list obtained by pressing ***LIST***.

Lithology Name - (LITHNAME) A 32-character optional field for a lithology name. An abbreviation may be entered in the associated short field to fetch the full term, but the full term is what is stored in the ROCKS table. Only names already in the NGMA.LITHNAMES authority table, and classified as Type of 'I', 'M' or 'S' (igneous, metamorphic, sedimentary), may be entered. Valid lithology names may be selected from a pop-up list obtained by pressing ***LIST***.

Description - (DESCRIPTION) A 64-character optional field for a description of the lithology. If lithology is insufficiently characterised by the previous controlled fields then this field should be used for additional information on lithology.

Other Data - (OTHERINFO) A 64-character optional field that may be used for any data the user feels are relevant that are not covered by the above fields.

THE LITHDATA BLOCK

The Lithdata Block allows a variety of other attributes to be added, as needed, to the description of a lithology or rock sample - for example, sample type, component minerals, colour, alteration and metamorphic grade. The attributes and descriptors (values) entered here are controlled by lookup data in the ROCKDATATYPES view, which is a union of the LITHDATATYPE and AGSOMINERALS tables (see Appendix A). If users feel the need for further attributes and descriptors, they are easily added to the LITHDATATYPES table by the custodian (Peter Stuart-Smith). Although not displayed in the block, all LITHDATA records automatic-ally receive the Rockno shown at the top of the form.

Attribute - (DATATYPE) A mandatory field for an abbreviation of up to 4 capital letters pointing to an attribute ('Datatype') in the ROCKDATATYPES view. The attribute's name is automatically displayed in the next field. Only attributes already in the ROCKDATATYPES view may be entered, but the same attribute can be used more than once (e.g. - a sample may exhibit two types of alteration). A pop-up list of available attributes can be viewed by pressing ***LIST***. The ROCKDATATYPES view currently has the following attributes -

Abbreviation	Attribute Name
ALT	Alteration
BED	Bedding thickness
CM	Common Mineral
COH	Coherence
COL	Colour
FOS	Fossil

GS	Grain Size
IS	Igneous Stratification
ITX	Igneous Texture
MAG	Magnetic suscept. (SI Units x 10^{-5})
MET	Metamorphic grade
MI	Mineral
MTX	Metamorphic Texture
RAD	Gamma Ray Spectometry (cps)
SEQ	Sequence types
SOR	Sorting
SP	Sample Provenance
SPH	Sphericity
SS	Sedimentary Structure
ST	Sample Type
STX	Sedimentary Texture
TEC	Tectonic features
WEA	Weathering

Descriptor - (SUBTYPE) A mandatory field for an abbreviation of up to 4 capital letters referring to a descriptor (value) of an attribute in the ROCKDATATYPES view. If the subtype exists, its description is automatically displayed in the next field, otherwise an error message appears at the bottom of the form. A pop-up list of the descriptors for the attribute already entered in the current record may be displayed by pressing ***LIST***. For example, the 'COH' or Coherence attribute presently has the following descriptors or values -

Abbreviation	**Subtype Name**
PO	porous
CP	compact
CON	consolidated
FI	fissile
FR	friable
HD	hard
IN	indurated
UN	unconsolidated

This system allows new attribute names and values to be added to the LITHDATATYPES by the custodian, as and when required. (Note, however, that the custodian is not free to delete or alter existing attributes and values without first attending to any potential referential integrity problems. The LITHDATA table currently depends on the LITHDATATYPES table, and there may also be other dependent tables in the future).

Description - (DESCRIPTION) An optional field of 64 characters for any additional descriptive information relating to the Data Type/Subtype record. For example, one may wish to comment on the mode of occurrence of a mineral in a sample.

THE STRUCTURES BLOCK

The Structures Block allows observations of mesoscopic/macroscopic geological structures to be related to the lithologies and statigraphic units in which they are found. This is done via the Rockno (shown only at the beginning of the Rocks Block) which is automatically inserted into every record in the STRUCTURES table that is entered via the Rocks and Structures Form. Users should be aware that some entries in the STRUCTURES table do not yet possess a Rockno, and cannot therefore be displayed in this form - the Structures Form must be used for this purpose. As a general rule, the Rocks and Structures Form should now be used for the entry of all new structural observations - so that they become automatically tied to a record in the ROCKS table via the Rockno key.

Structure Name - (TYPE) A mandatory positive integer of up to 2 digits pointing to the structure name (type) in the STRUCTURETYPES authority table (may be changed to a mnemonic abbreviation in the near future). The description of the structure type is automatically displayed in the following field - for example, '1' is for 'Bedding'. A pop-up list of all Structure Types may be obtained by pressing the ***LIST*** when the cursor is in the field.

Subtype - (SUBTYPE) A positive integer of up to 2 digits pointing to the stucture subtype in the STRUCTURETYPES table. The description of the subtype is automatically displayed in the following field - for example, if the Structure Type is '1' for 'Bedding', then a subtype of 14 specifies 'overturned bedding'. A pop-up list of all Subtypes belonging to the Structure Type entered in the first column may be obtained by pressing the LIST key when the cursor is in this field.

Azimuth - (AZIMUTH) A positive integer of up to 3 digits for the azimuth of the structural obsevation in degrees between 0 and 360. For planar observations the azimuth is always the direction of dip (90o to the strike). The azimuth of horizontal planar structures should always bee given as zero (north-south).

Inclination - (INCLINATION) A positive integer of up to 2 digits - between 0 and 90 - for the vertical inclination of the structural vector below the horizontal. For planar observations this represents the dip, for linear observations the plunge.

Deformation Number - (DEFNO) A positive single-digit integer for the number of the deformation that produced the structure being measured. For bedding this is 0, for first deformation structures 1, etc.

Deformed Surface Number - (DEFSURFNO) A positive single-digit integer for the deformation that produced the deformed surface being measured. For example, 2 indicates a surface produced during the second deformation that is folded by a fold of the 3rd deformation - or later.

Plot Rank - (PLOTRANK) A positive integer of up to 3 digits indicating the order of importance in plotting the structure on a map. Where a number of structures have been measured at the one locality, plot rank determines which structures will be plotted first. On maps plotted by computer, only one structure can generally be plotted at any one point on a map.

9 - THE STRUCTURES FORM

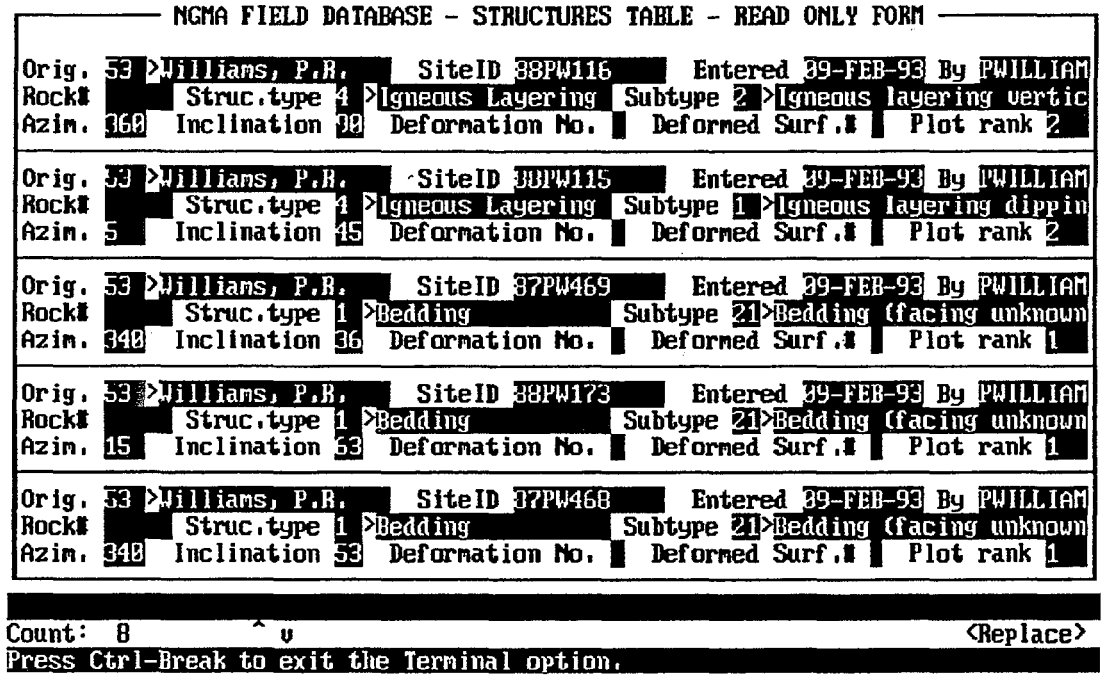

Figure 9. The Structures Form.

This form provides an alternative to the Rocks and Structures Form for querying and updating quantitative geological structural data of the mesocopic to macroscopic variety. This form must be used for manipulating structural records that do not yet have a 'Rockno', as these records cannot be viewed with the Rocks and Structures Form. The data entered into this form is controlled by the NGMA.STRUCTURETYPES authority table.

Originator - (ORIGNO) As for the Sites Form.

Site ID - (SITEID) As for the Sites Form.

Entered - (ENTRYDATE) As for the Sites Form.

By - (ENTEREDBY) As for the Sites Form.

Rockno - (ROCKNO) An optional field of up to 6 digits pointing to the primary key of a record in the ROCKS table. In other words, Rockno is a foreign key linking STRUCTURES to the ROCKS table.

Structure Type -- Plot Rank - These fields are described in the subsection on the Structures Block of the Rocks and Structures Form.

10 - THE COMBINED FIELD DATA FORM

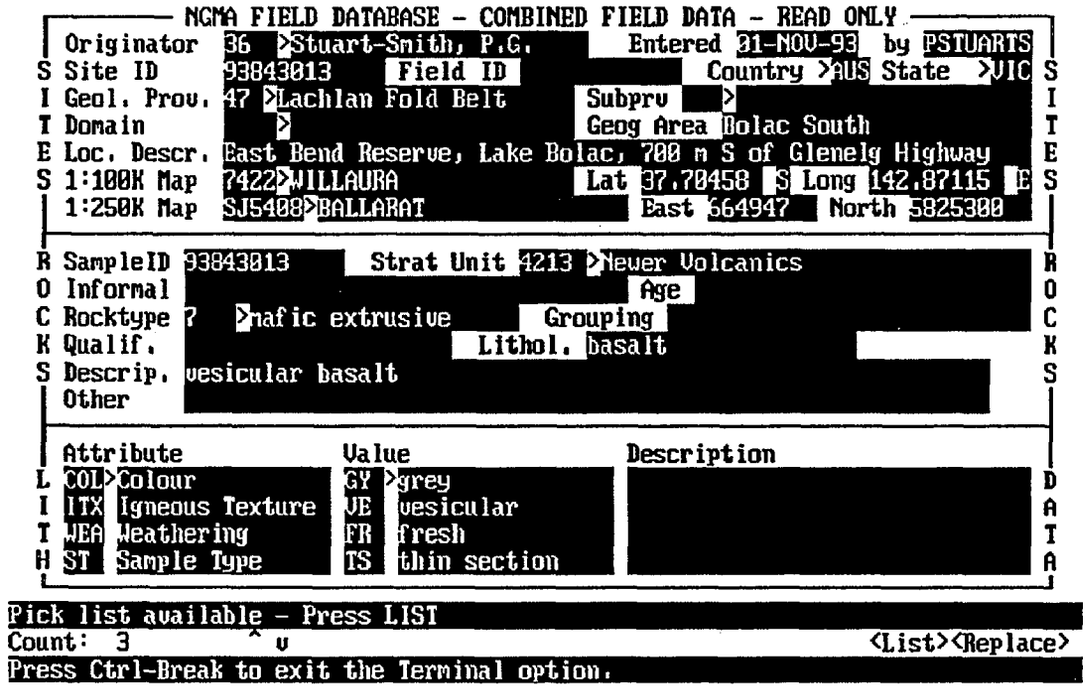

Figure 10. The Combined Field Data Form.

The Combined Field Data Form is selected at item 7 in the Main NGMA Field Database Menu. It is a read-only form that includes the majority of fields from the SITES, ROCKS and LITHDATA forms. The main use for this form is for viewing field data with the site information coupled to sample and lithological data. The form is designed mainly for queries based on the Sites Block - for example, site ID, map sheet area or geological province. Refer to the accounts of the Sites and Rocks-and-Sructures Forms for descriptions of the fields in the Combined Field Data Form.

11 - THE ROCK REFERENCES FORM

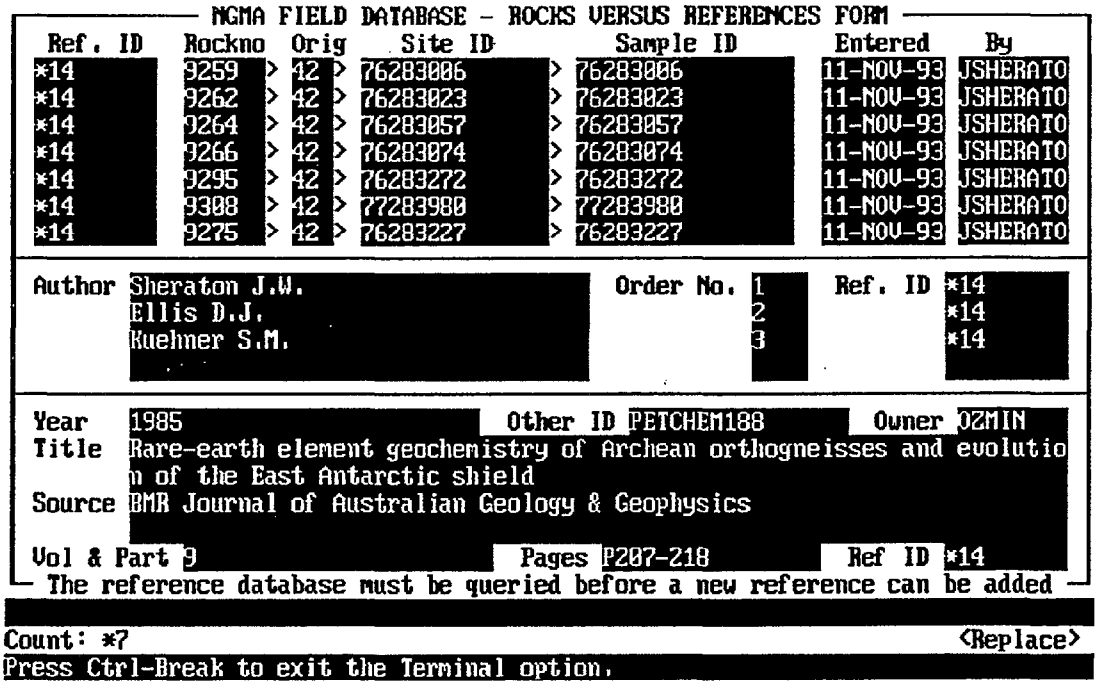

Figure 11. The Rock References Form.

Via the Rockno and Ref. ID fields, the top block of this form links the ROCKS table to AGSO's Bibliographic Reference Database in a many-to-many relationship. It points to any published information on lithologies and rock samples. For any given rock sample there could be several references, and any one reference may refer to many rock samples. The top block shows all the Reference IDs for a particular Rockno, or all Rocknos for a particular Reference ID. Although only 7 records are displayed on the screen, these may be scrolled vertically, there being no limit to the number of references that can be attached to any given sample or samples that can be attached to a reference. The bottom two blocks, which display a reference at a time, correspond to the GEOREF.AGSOAUTHS and GEOREF.AGSOREFS views of the Reference Database. These encompass a union with the GEODX bibliography, which has over 22 000 references on Australian geology. As the cursor is moved from record to record in the top block, the corresponding reference is displayed in the bottom two blocks.

To query AGSO's Reference Database by authors, year, title, etc., press ***NEXT BLOCK*** to position the cursor in the Authors (or Reference) Block, then press ***ENTER QUERY*** to obtain a pop-up query form. Enter your query information in this form then press ***EXECUTE QUERY*** to retrieve one or more reference to the underlying form. Use ***NEXT RECORD*** to scroll through more than one references and ***NEXT KEY*** to transfer the Reference ID of the currently displayed reference to the top block - to which a Rockno must be added. In this way, pre-existing references in the References Database may be attached to rock samples.

To prevent the entry of duplicate references the form insists that you query the Reference Database before you can enter a new reference or update an existing one. Having done so, though, you are free to enter or update more than one reference. The onus is on the user to try to prevent the duplication of references in the shared database (a percentage of duplicated records is inevitable). To engage the Reference Insert/Update Form place press ***INSERT RECORD*** (do not use NEXT FIELD) when the cursor is in the top block. Enter and commit the required reference. The same procedure may be used to update existing references, but only those references belonging to you (the entry form will only display references with your Oracle user name attached to them). You should not update a reference to the extent that it becomes another reference, as other people may have set pointers to the reference from other databases. Use updates only to correct errors in existing references. All new references go into the GEOREF.AUTHORS and GEOREF.REFERENCES tables.

This form can also be used to inspect and insert the references pointed to by the Bibliographic Reference field in the SITES table. A more complete description of AGSO's Reference Database will be be published in the users' guide to that database, but the information presented here is adequate for the purposes of attaching references to the NGMA Field Database.

TOP BLOCK

The Top Block, which covers the NGMA.ROCKREFS table, is the only block in the form that actually belongs to the NGMA Field Database. The Originator, Site ID and Sample ID fields are displayed from the ROCKS table. To enter new records into ROCKREFS just add them to the bottom of the displayed records with ***NEXT FIELD***. As already mentioned, the INSERT RECORD key takes you into a form for entering new references.

Reference ID - (REFID) A 9-character field (foreign key) for the ID of a bibliographic reference in AGSO's Reference Database. The GEODX IDs in the database are various - e.g. '79/20055', 'R156' 'GOLD239'. The IDs of non-GEODX references are always a number starting with an asterisk - e.g. '*2156'.

Rockno - (ROCKNO) As in the Rocks & Structures Form (foreign key).

Originator - (ORIGNO) As in the Rocks & Structures Form. Display field only.

Site ID - (SITEID) As in the Rocks & Structures Form. Display field only.

Sample ID - (SAMPLEID) As in the Rocks & Structures Form. Display field only.

Entered - (ENTRYDATE) As in the Rocks & Structures Form.

By - (ENTEREDBY) As in the Rocks & Structures Form.

AUTHOR'S BLOCK

The Authors Block provides access to the GEOREF.AGSOAUTHS view (read only).

Authors - (AUTHNAME) A mandatory character field of up to 32 characters for the surname of an author in lower case (except for the first letter) followed by a space and the author's initials with full stops and no spaces between the initials. Capital letters can also occur inside a surname (e.g., d'Albertis, McDonald).

Order Number - (ORDERNO) A positive integer of up to two digits indicating the order of the author in the authors list of the reference. This field must be entered. Must start with one and must increment by one.

Reference ID - (REFID) As in the Top Block. The foreign key to the reference record.

REFERENCE BLOCK

The References Block corresponds to the GEOREF.AGSOREFS view (read only).

Year - (YEAR) A mandatory character field of up to 32 characters for the year of publication of the reference.

Other ID - (OTHERID) An optional 32 character field for any alternative user-supplied reference number or ID - e.g., reference IDs from the former PALREFS database.

Owner - (ENTEREDBY) A mandatory 8-character field for the Oracle user name of the person or database owner who entered the reference in the AGSO Reference Database system.

Title - (TITLE) A mandatory field of up to 255 characters for the title of the reference. Use lower case except for the first letter of the first word and all proper names. Use a full stop at the end of the title. In symposium-style references the title of the symposium or collected works should also be entered, following the word 'In' and the names and initials of the editors plus (Ed) or (Eds).

Source - (SOURCE) A mandatory field of up to 255 characters for the journal name or publication of the reference. Use mostly lower case - as in the title field. Do not include volume, part, or page numbers. A pick list is available from GEODX.

Volume and Part - (VOLPART) Up to 32 characters for the volume and/or part number of the publication containing the reference. A single number indicates a volume number. If a part or issue number is also included place it in round brackets. Special volumes may require text entry - e.g. 'The Sam Carey Special Volume'.

Page Numbers - (PAGENOS) Up to 32 characters for the page numbers of the reference - e.g. '234-257'.

Reference ID - (REFID) As in the Top Block of the form - the primary reference key.

12 - THE LITHOLOGY DATA TYPES FORM

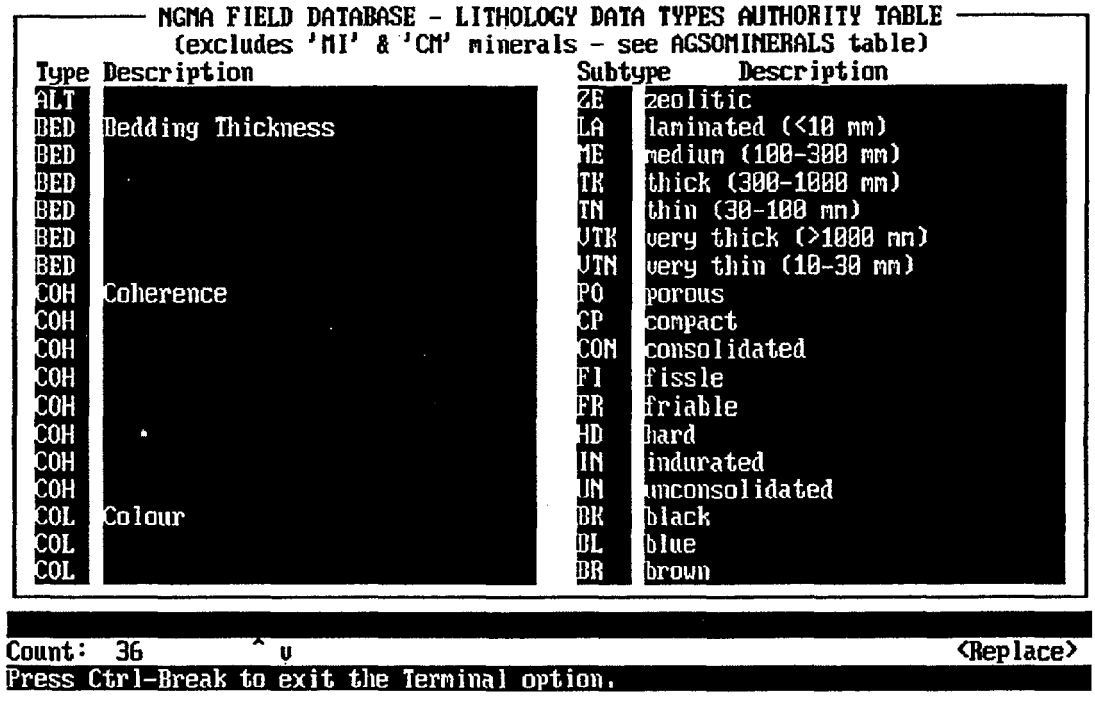

Figure 12. The Lithology Data Types Form.

The Lithology Data Types Form covers the the NGMA.LITHDATATYPES lookup table. This table lists of all valid Data Types (Attributes) and Subtypes (Descriptors) for the NGMA.LITHDATA table, which corresponds to the second block of the Rocks and Structures Form. The abbreviation used for Subtype need only be unique to a particular Data Type. Only the custodian (Peter Stuart-Smith) may add or change records in this form.

Type - (DATATYPE) A mandatory field of up to 4 capital letters for a Data Type abbreviation - e.g. 'COH' for Coherence.

Description - (TYPEDESC) A field of 16 characters for the name of the Data Type - e.g. 'Coherence'. The name must begin with a capital letter (it is, in effect, an attribute name) and it can only appear once in the table. It must be entered if the record is the first of its type in the table - if not, the field remains empty.

Subtype - (SUBTYPE) A mandatory field of up to 4 capital letters for a Subtype abbreviation - e.g. 'FR' for 'friable', one of the 'Coherence' Subtypes. The Subtype must be unique to the Data Type.

Description - (SUBDESC) An optional field of 16 characters for the Name of the Subtype - e.g. 'friable'. Words entered here should be in lower case unless there is some overriding reason they should be otherwise.

13 - THE STRUCTURE TYPES FORM

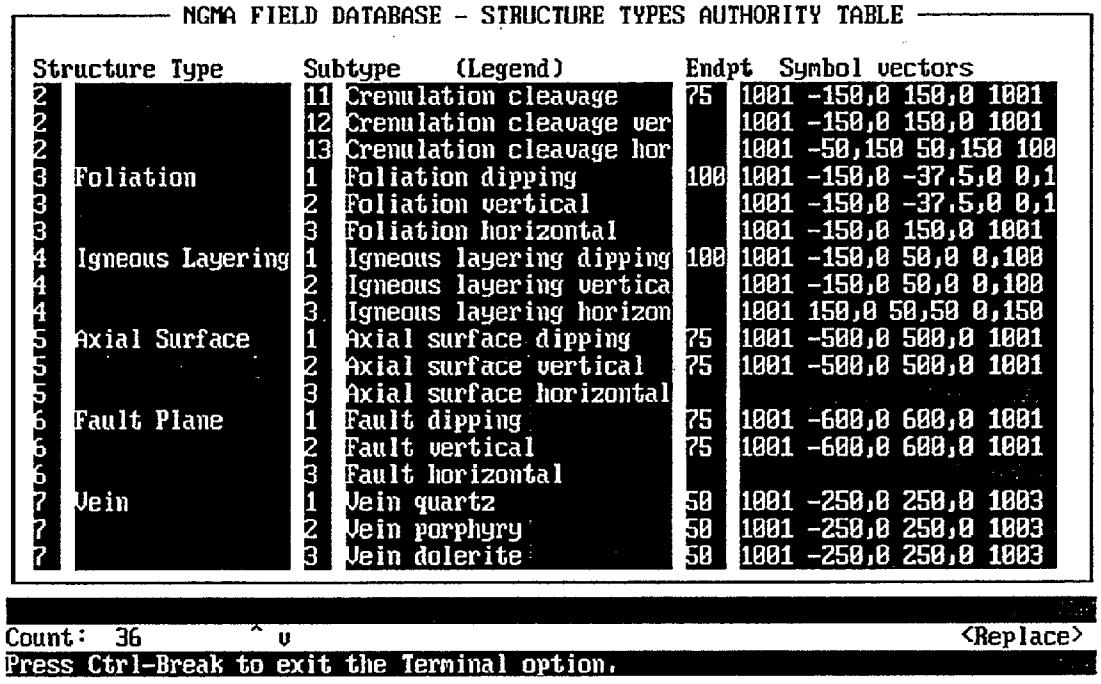

Figure 13. The Structure Types Form.

The Structure Types form covers the STRUCTYPES authority table that defines the kinds of structure types that can be entered into STRUCTURES. It serves a similar purpose to the LITHDATATYPES table in relation to ROCKS by providing extendable structure types. It also has a long field containing vectors used to draw the symbols on a map.

Structure Type - (TYPE) Mandatory field for a positive integer of up to 3 digits indicating the major classifiation of the structure - e.g., bedding or fold hinge.

(TYPEDESC) 16 character field for a description of the structure type - e.g. 'Bedding'. A trigger in the form prevents the description being entered more than once for each structure type. The first record entered of a new structure type always contains the description of the structure type.

Subtype - (SUBTYPE) Mandatory field for a positive integer of up to 2 digits indicating the structure's subtype or minor classification. Examples include overturned bedding and crenulation cleavage.

(LEGEND) 35 character field for a description of the structure subtype - e.g. 'Bedding, overturned'. This field contains text that would normally appear in a legend to a structural geology map. The terms used must be unique.

Endpoint - (ENDPT) A number field defining the location of the numerical value of the symbol in relation to the symbol itself. Used in plotting dip or plunge values on maps (see Appendix B of Collins, 1990).

Vectors making up symbol - (SYMBOL) A 'long' datatype field containg the coded symbol string used for plotting the symbol on a geological map. The symbol code is defined numerically in a text string (see Appendix B of Collins, 1990).

14 - THE STRATIGRAPHIC LEXICON FORM

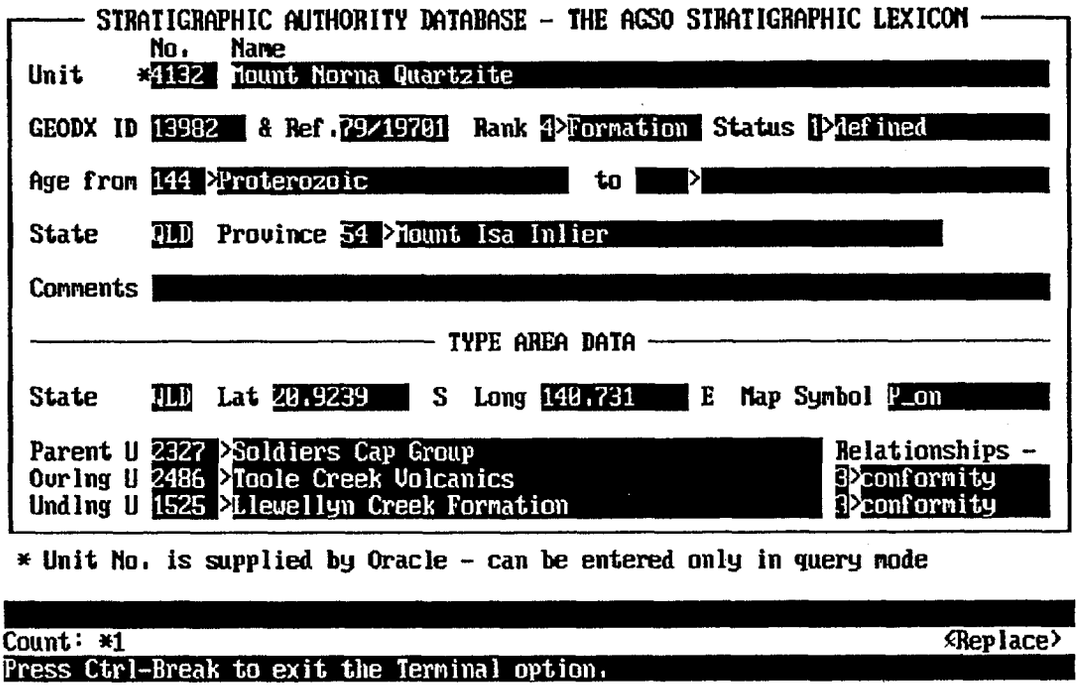

Figure 14. The Stratigraphic Lexicon Form.

AGSO's Statigraphic Lexicon Form presents Australian stratigraphic units one at a time. It covers the tables STRATA.STRATLEX and STRATA.STRATSTATE, both of which are part of the Stratigraphic Authority Database (Ryburn, in prep.). The latter table has a many-to-one relationship with STRATLEX via a common 'Unitno' field. The majority of units in the Lexicon are derived from the GEODX Stratigraphic Index Database. Most users are not able to enter new units into STRATLEX, but there are currently several custodians who are.

Unit Number - (UNITNO) System-supplied integer of up to 6 digits that is the primary key of the STRATLEX table. Automatically generated when commiting new records to the table. The cursor can be placed in this field only in query mode.

Unit Name - (UNITNAME) Mandatory 64 character field for the name of the stratigraphic unit, including any rank term that may be part of the name - e.g. 'Soldiers Cap Group' (where 'Group' is the rank term). Use a combination of initial capitals and lower case letters - except where the ranking term is deliberately used with a lower case letter to signify an informal term - e.g. 'Corella beds'.

GEODX ID - (GEODXID) A positive integer of up to 5 digits that identifies stratigraphic units in the Lexicon that have come from the GEODX Stratigraphic Index Database. A powerful feature of this field is that all GEODX bibliographic references to stratigraphic units with a GEODX ID may be seen by pressing ***LIST*** to engage the following form (described fully by Ryburn, in prep) -

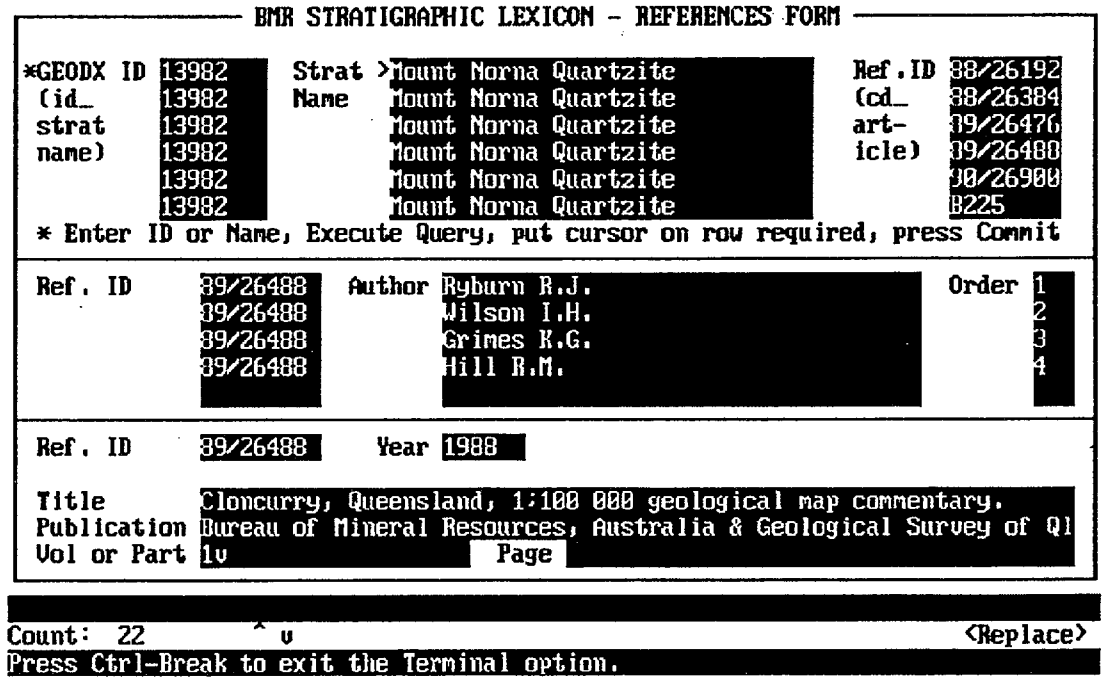

Figure 15. The GEODX Bibliographic References Form.

Reference - (DEFREF) An 8-character ID pointing to the most authoritative GEODX reference defining or redefining the unit. This is normally the bibliographic reference from which the information in the current record was taken. Can sometimes be a map.

Rank - (RANK, RANKNAME) A one-digit numeric field indicating the stratigraphic rank of the unit - e.g., Group, Formation, Member, etc. The rank name, which is also stored in STRATLEX, is automatically selected from the STRATA. STRATRANK table when a valid number is entered - otherwise an error message results. This table may be viewed as a pop-up list by pressing the ***LIST*** key when the cursor is in the field.

Rank No.	Rank Name
1	Supergroup
2	Group
3	Subgroup
4	Formation
5	Member
6	Bed
7	beds

Status - (STATUS, STATUSNAME) Mandatory one-digit number for the status of the unit. The status name is also stored in STRATLEX. The following values from the STRATA.STRATSTATUS table, may be viewed with the ***LIST*** function. The equivalent alphabetic code from the GEODX database is also shown -

Status No.	GEODX Code	Status Description
1	DEF	defined
2	RDEF	redefined
3	FD	fully described
4	DESC	described
5	BD	briefly described
6	M	mentioned
7	I	informal
8	D	deleted

Age From - (AGE1) A positive integer of up to 4 digits pointing to the older age limit of the stratigraphic unit - that is the age of the base of the unit. The corresponding term from the STRATA.GEOTIME Authority Table is displayed in the next field. Where no younger age limit is entered the 'Age From' term is taken to be a general age for the unit as a whole. Press ***LIST*** to access a pop-up list of terms from the GEOTIME table.

Age To - (AGE2) As for the 'Age From' pointer, but referring to an younger age limit for the unit, if one is known - that is the age of the top of the unit.

State - (STRATSTATES.STATE) Two or three capital letters indicating the Australian state in which the stratigraphic unit falls. This is the only field in the form from the STRATA.STRATASTATES table. About 300 units occur in more than one state, so two or more states may be indicated here. A pop-up list of valid states from the NGMA.AGSOSTATES table may be seen by pressing ***LIST***.

Geological Province - (GEOLPROV) An integer of up to 4 digits pointing to the geological province in the STRATA.GEOPROVS table. While the cursor is in this field you may press ***LIST*** to enter the Geological Provinces Form. You can

also enter a name in the name field and the corresponding number is automatically supplied when the cursor leaves the field.

Comments - (COMMENTS) A scrolling field of 240 characters for comments on the unit, particularly those on any synonymy and the history of definition and nomenclature. Any conflicts with other stratigraphic names in STRATLEX should also be noted.

TYPE AREA DATA

The part of the Stratigraphic Lexicon Form below the horizontal line is for information pertaining to the type area or type section for the stratigraphic unit. It does not necessarily apply to the unit as a whole.

State - (TYPESTATE) Two or three capital letters indicating the State in Australia. A pop-up validation list of states is available. Valid States are those in the NGMA.AGSOSTATES table. This field could be used to subdivide the database if the custodianship were to be distributed amongst the States.

Latitude - (DLAT) A numeric field with up to 2 digits in front of the decimal point, and up to 6 digits after the decimal point. All latitudes and longitudes must be entered in decimal degrees and must not be negative. They should mark the centroid of the type area or the centre of the type section. A location in the southern hemisphere and at longitudes east of Greenwich are implicit.

Longitude - (DLONG) A numeric field with up to 3 digits in front of the decimal point and up to 6 digits after the decimal point. Otherwise as for latitude.

Map Symbol - (SYMBOL) A 24 character field for the unit's map symbol in the type area. The map symbol should come from the most recently published 1:100 000 geological map, or from the most recent 1;250 000 sheet if no 1:100 000 map. Non ASCII symbols should be represented according to the following table -

Description		Symbol	Comment
Proterozoic 'P'	-	P_	
Archaean-Proterozoic 'AP'	-	AP	used in Western Australia
Cambrian slashed 'C'	-	C_	
Ordovician slashed 'O'	-	O_	no longer used in AGSO
Triassic 'TR'	-	TR	
Superscript	-	^	e.g. 'Ta^c'
Subscript	-	/	e.g. 'Pkc/br'

The map symbol entered here is the prevailing symbol at the time of data entry, and need be unique only for the map from which it was obtained. It would be nice if all letter codes were unique, but this is not really practical on a continent-wide basis. The symbols would inevitably be too long to be cartographically

useful, and they would also lose mnemonic value. A better proposition would be symbols unique within a geological province, but even this would be difficult in provinces like the Lachlan Fold Belt. A few units cross between provinces.

Parent Unit - (PARENT) A positive integer of up to 5 digits for the unit number of the parent stratigraphic unit - i.e. the related unit that is one rank higher. For example, the parent unit for a Member would always be a Formation, while the parent unit for a Formation could be a Group or a Subgroup. The Name of the parent unit is displayed automatically as soon as the parent's Unit Number is entered. Only valid Unit Numbers may be entered. Alternatively, the Name may be entered and the Number automatically displayed. It is possible to engage a second copy of the Stratigraphic Lexicon Form by pressing ***LIST*** when the cursor is in either of these fields. In this way you can query STRATLEX to view data on the Parent Unit. To return to the original form just press ***EXIT***.

Overlying Unit - (OVERLYING) A positive integer of up to 5 digits for the Unit Number of the stratigraphically overlying unit. The name of this unit is automatically displayed. Only valid Unit Numbers may be entered.

Underlying Unit - (UNDERLYING) A positive integer of up to 5 digits for the unit number of the stratigraphically underlying unit. The name of this unit is automatically displayed. Only valid Unit Numbers may be entered.

Boundary Relationships - (OVEREL, UNDEREL) Two positive two-digit integer fields indicating relationships to the overlying and underlying units. The associated terms are automatically displayed from the Stratigraphic Relations Table (STRATA.STRATRELS). Valid numbers and terms are -

Number		Name
1	-	unknown
2	-	not exposed
3	-	conformity
4	-	unconformity
5	-	disconformity
6	-	nonconformity
7	-	paraconformity
8	-	diastem

15 - THE GEOLOGICAL PROVINCES FORM

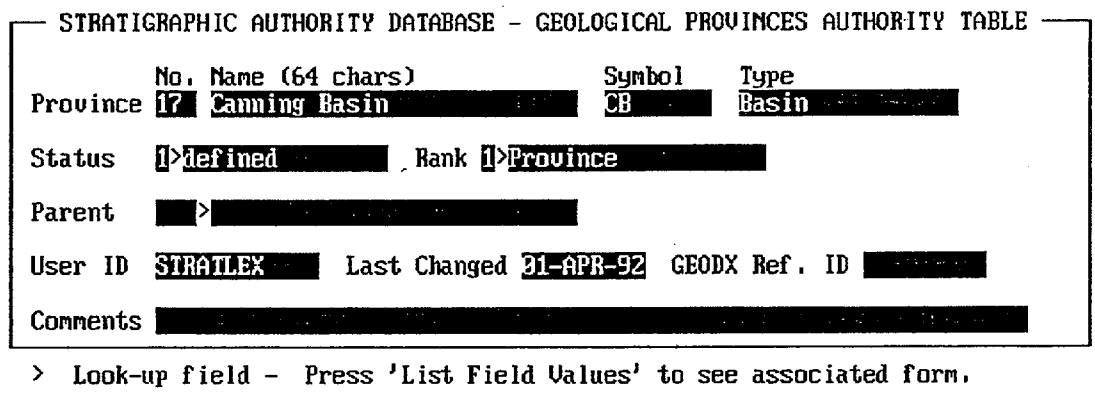

Figure 16. The Geological Provinces Form.

This important form covers the STRATA.GEOPROVS table, part of the Stratigraphic Authority Database. GEOPROVS attempts to provide an authoritative subdivision of the Australian Continent into Geological Provinces and Sub-provinces - based initially on the account of Palfreyman (1980). The table also has provision for Domains and Sub-domains, but at this level the terms used are not yet regarded as formal subdivisions. However, the Domain rank has already found a useful purpose in providing a pigeon-hole for batholith names, which are not regarded as part of mainstream stratigraphic nomenclature. The term Domain is also used for subdivisions of Sub-provinces in the sense normally used by structural geologists. 'Sub-domain' has not yet been used.

Province Number - (PROVNO) System-supplied positive integer of up to 5 digits - the primary key for the STRATA.GEOPROVS table. Automatically generated when commiting new records to the table. The cursor can be placed in this field only in query mode.

Province Name - (PROVNO) A 64-character mandatory field for the name of the province, subprovince or domain. Province names must be unique, but Sub-province, Domain or Sub-domain names can re-occur in different provinces (e.g. 'Eastern Fold Belt').

Symbol - (PROVLETS) Up to 4 capital letters for the abbreviation for the province or subprovince. These abbreviations, which must be unique, are designed to function as labels on maps and diagrams.

Type - (TYPE) a 16-character field for the type of Province, Sub-province, Domain etc. The only entries in this field at present are 'Basin' and 'Batholith', but other types may be added in future (e.g. 'Fold Belt'). This field will probably graduate to being controlled by a lookup table.

Status - (STATUS) A 1-digit number pointing to the status of the name in the STRATA. STRATSTATUS table (e.g. 'redefined'). The description of the status is automatically displayed from the STRATA.STRATSTATUS table. Valid status terms are precisely those used by the Stratigraphic Lexicon (see page 31).

Rank - (RANK) A 1-digit number pointing to the rank of the name in the STRATA. PROVRANKS table (e.g. 'Sub-province'). The description of the status is automatically displayed from the STRATA.STRATSTATUS table. Press ***LIST*** with the cursor in the field to view a pop-up list of possible ranks -

Number	Rank
1	Province
2	Sub-province
3	Domain
4	Sub-domain

Parent - (PARENT) A 5-digit positive integer pointing to the Province Number of the record next highest in rank to the current Sub-province, Domain or Sub-domain. For example, the 'Eastern Fold Belt' Subprovince points to Province Number 54, the 'Mount Isa Inlier' Province. This field provides the table with a superimposed heirarchical structure. It is always left empty for Provinces.

User ID - (USERID) An 8-character field for the Oracle username - in capital letters - of the person who entered or last updated the record. Cannot be entered - system supplied on committing records.

Last Changed - (LASTCHANGED) A date field in the standard Oracle date format of 'DD-MMM-YY' indicating when the record was inserted or last updated. Cannot be entered - system supplied on committing records.

GEODX Reference ID - (GEODX_REF) A 9-character field for the ID of a bibliographic reference in the GEODX Database. The reference should contain an authoritative definition or redefinition of the Province, Sub-province, etc.

Comments - (COMMENTS) A 64-character field for any additional relevant information on the Province, Sub-province, etc.

16 - THE LITHOLOGY NAMES FORM

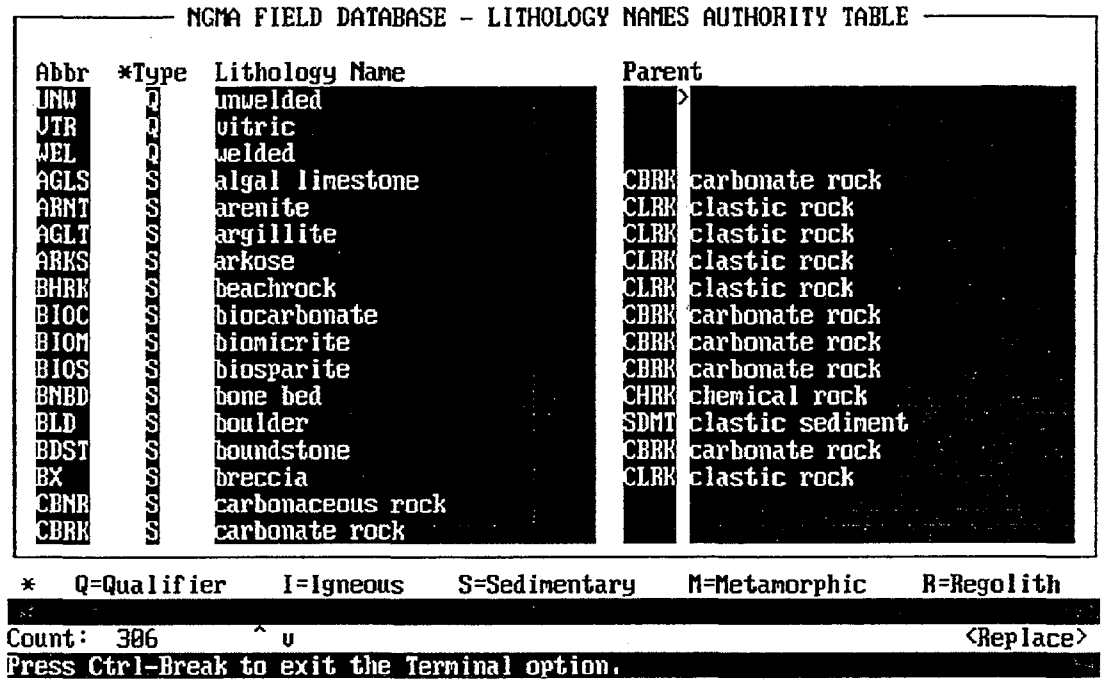

Figure 17. The Lithology Names Form.

The table underlying this form, NGMA.LITHNAMES, provides a detailed and authoritative classification of all lithologies and their qualifying terms. The table is not just a simple list as it includes a partial heirarchy. Although not yet exploited by any other tables in the NGMA Database System, the LITHNAMES table includes a pointer to the 'parent' lithology when this is appropriate. For example, the term 'norite' points to the parent term 'gabbro' (norite is a variety of gabbro). The pointer mechanism makes use of the abbreviations given to all names in the table. As well as speeding entry of data into the ROCKS form, the abbreviations can be of use in geographic information systems and in the annotation of graphs - where space is often at a premium. The table also has a single-letter field indicating the basic class of each term - igneous, sedimentary, metamorhic or qualifier. Only the owner or custodian may enter new terms into this table.

Abbreviation - (LITHID) Up to four capital letters for a unique abbreviation for the lithology or qualifying term. This field is mandatory as it is the primary key for the NGMA.LITHNAMES table. The shorter abbreviations are supposed to be reserved for the more common lithological terms. When entering new terms some trial and error may be needed to find an unused mnemonic abbreviation.

Type - (QUALIFIER) A mandatory single capital letter indicating the basic class of the term - qualifier (Q), igneous (I), sedimentary (S), metamorphic (M) or regolith(R). Terms with a 'Q' here are used as an authority list for the Qualifier field in the NGMA.ROCKS table. An example of a qualifier term is 'volcanic'. The other classes provide validation for the Lithname field in the same table.

Lithology Name - (LITHNAME) A mandatory field of up to 32 characters for the lithological name or term - e.g. 'shale'. The lithology names entered here should not include attached qualifiers. For example, the term 'volcanic sandstone' should not be entered as one record - volcanic is a qualifier term while sandstone is a sedimentary name. Synonyms should not be entered. For example, the table includes 'dolerite' but not the equivalent (but less commonly used) term 'diabase'.

Parent - (PARENT) An abbreviation pointing to the related term that is higher in the heirarchy. For example, the term 'breccia' points to 'CLRK' - the abbreviation for 'clastic rock'. As indicated by the 'greater-than' symbols in the form, the descriptions of the parent terms do not come from a separate column in the LITHNAMES table, but are merely copied from the Lithology Name field by a form trigger. It is not possible to enter a parent abbreviation that is not already in the table. Qualifiers and some lithologies do not have parent pointers.

17 - THE 1:100 000 MAPS FORM

NGMA FIELD DATABASE - 1:100 000 MAPS AUTHORITY TABLE

100K No.	1M ID	250K No.	100K Name	State Maj.	State Min.	NW Corner Lat	NW Corner Long	AMG Ref. SW Cnr m East	AMG Ref. SW Cnr m North
1446	SG49	8	QUOIN	WA		25.5	112.5	650127	7123444
1447	SG49	8	INSCRIPTION	WA		25	112.5	650757	7178826
1544	SG49	12	PEPPER	WA		26.5	113	698454	7011981
1545	SG49	12	EDEL	WA		26	113	699325	7067379
1546	SG49	8	DENHAM	WA		25.5	113	700181	7122774
1547	SG49	8	DORRE	WA		25	113	701021	7178165
1548	SG49	4	BERNIER	WA		24.5	113	701846	7233553
1549	SG49	4	QUOBBA	WA		24	113	702656	7288938
1550	SF49	16	MONUMENT	WA		23.5	113	703450	7344319
1640	SH49	4	ABROLHOS	WA		28.5	113.5	743541	6789426
1641	SH49	4	WALLABI	WA		28	113.5	744705	6844848
1643	SG49	16	ZUYTDORP	WA		27	113.5	746977	6955683
1644	SG49	12	TAMALA	WA		26.5	113.5	748085	7011096
1645	SG49	12	PERON	WA		26	113.5	749174	7066505
1646	SG49	8	SHARK BAY	WA		25.5	113.5	750244	7121912
1647	SG49	8	GREENOUGH	WA		25	113.5	751295	7177315
1648	SG49	4	CARNARVON	WA		24.5	113.5	752327	7232715

Count: 17 u <Replace>

Press Ctrl-Break to exit the Terminal option.

Figure 18. The 1:100 000 Maps Form.

The 1:100 000 Maps Form is included in this guide primarily as an example of a multi-record form for a straightforward lookup or authority table. Other simple NGMA lookup tables like ORIGINATORS, AGSOCOUNTRIES, QMAPS AND LOCMETHODS have similar forms showing many records, one per line. Most users have select priviledges only on these lookup tables. Attempts to insert new records will elicit the Oracle error - 'insufficient priviledges'. Only the Oracle owner and custodians may update these tables. Most of these forms do an automatic query, so that some data are initially displayed.

100K Map Number - (HMAPNO) The four digit number that identifies the 1:100 000 map sheet from about 3000 covering Australia. Primary key.

1M Map ID - (MMAPID) The 1:1 000 000 map sheet in which the 1:100 000 sheet lies. This ID consists of two capital letters followed by two numbers - e.g., 'SF54'. The two digits are the UTM zone, which is needed to convert metric references to latitude and longitude.

250K Map Number - (QMAPID) Up to 2 digits identifying the 1:250 000 map sheet from 16 covering each 1:1 000 000 map area. The full 1:250 000 map ID is obtained by joining the 1:1 000 000 map ID to this number - e.g., SF54-12, which is the Winton 1:250 000 map sheet, in Queensland. Note that the 1:250 000 map sheets in Tasmania are the theoretical ones, not the shifted ones actually published.

100K Map Name - (HMAPNAME) Up to 22 capital letters for the name of the 1:100 000 map sheet identified by the 100K Map Number. There are many offshore sheets which are named 'UNNAMED'.

State - Major & Minor - (STATE1, STATE2) Two fields of 3 characters for the state in which the 1:100 000 sheet lies. If only State1 has a state then the sheet is entirely within that state. If the sheet crosses state boundaries then State2 indicates the state encompassing the lesser area on the sheet. Only 37 sheets out of 3000 fall on more than one state.

100K Map NW Corner Lat. & Long. - (N_LAT, W_LONG) The decimal latitude and longitude of the northwest corner of the 1:100 000 map sheet. It is possible, using a single SQL*Plus command, to make use of these fields to select the name of a 1:100 000 map sheet for any given latitude and longitude, e.g. -

```
SELECT HMAPNAME, HMAPNO FROM NGMA.HMAPS
    WHERE  21.66 >= N_LAT  AND  21.66 < N_LAT  + 0.5
    AND   140.66 >= W_LONG AND 140.66 < W_LONG + 0.5;
```

The values returned by this example will be '**CLONCURRY**' and '**7056**'.

Another important function of these two fields is to validate new records entered into the SITES table. All given lattitudes and longitudes can be checked to see that they fall within the stated 1:100 000 map sheet area.

100K Map AMG Ref. SW Corner Easting and Northing - (MEAST, MNORTH) The metric easting and northing of the southwest corner of the 1:100 000 map sheet. These values can be used convert a 6-digit grid reference obtained from a 1:100 000 map to the full Australian Map Grid metres east and metres north. They also allow a similar validation of SITES records to that mentioned under lattitude and longitude. In this case, however, the check is less precise, as we have to allow a buffer of 1500 metres around each 1:100 000 sheet to accommodate grid convergence - the angle between sheet boundaries and the metric grid lines. This increases southwards and towards the margins of each 6-degree AMG zone.

18 ACKNOWLEDGEMENTS

The development of the NGMA Field Database has been very much a team effort, and its conception and evolution to date have been influenced by many people - in this context we wish to mention Lynton Jaques, Lesley Wyborn, Murray Hazell and John Sheraton of AGSO's Minerals and Land Use Program, and Ian Withnal and Bill Whitaker of the Geological Survey of Queensland. Lynton Bond assisted with the development of screen forms, validation triggers, and Pró-Fortran coordinate conversion programs.

This Record has benefitted greatly from reviews by John Sheraton and Murray Hazell.

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APPENDIX - NGMA FIELD DATABASE DEFINITIONS

```
REM  THE PRIMARY AND FOREIGN KEY ('REFERENCES') DEFINITIONS IN
REM  CREATE-TABLE STATEMENTS ARE A FEATURE OF ORACLE VERSION 7
REM  AND ARE IGNORED BY ORACLE VERSION 6 -  DOCUMENTATION ONLY


REM ************************************************************
REM ** NGMA FIELD DATABASE MAIN DATA TABLES - OWNER IS NGMA  ***
REM ************************************************************

REM  SITES IS FOR GROUND POINT LOCATIONS + ACCURACY & LINEAGE

CREATE TABLE SITES (
        ORIGNO       NUMBER (5)    NOT NULL  REFERENCES NGMA.ORIGINATORS,
        SITEID       CHAR   (16)   NOT NULL,
        FIELDID      CHAR   (16),
        OBSDATE      DATE,
        OBSTIME      NUMBER (4,2),
        COUNTRYID    CHAR   (3)    NOT NULL  REFERENCES NGMA.AGSOCOUNTRIES,
        STATE        CHAR   (3)              REFERENCES NGMA.AGSOSTATES,
        GEOPROVNO    NUMBER (5)              REFERENCES STRATA.GEOPROVS,
        SUBPROVNO    NUMBER (5)              REFERENCES STRATA.GEOPROVS,
        DOMAINNO     NUMBER (5)              REFERENCES STRATA.GEOPROVS,
        GEOGAREA     CHAR   (64),
        LOCDESC      CHAR   (64),
        HMAPNO       NUMBER (4)              REFERENCES NGMA.HMAPS,
        QMAPID       CHAR   (6)              REFERENCES NGMA.QMAPS,
        EASTING      NUMBER (8,2),
        NORTHING     NUMBER (9,2),
        ACCURACY     NUMBER (4)    NOT NULL,
        HEIGHT       NUMBER (5,0),
        HEIGHTACC    NUMBER (3,0),
        DLAT         NUMBER (8,6),
        NS           CHAR   (1),
        DLONG        NUMBER (9,6),
        EW           CHAR   (1),
        METHOD       NUMBER (3)    NOT NULL  REFERENCES NGMA.LOCMETHODS,
        BIBREF       CHAR   (9)              REFERENCES GEOREF.AGSOREFS,
        AIRPHOTO     CHAR   (36),
        OC           CHAR   (1),             /* OUTCROPS     TABLE    */
        RO           CHAR   (1),             /* ROCKS        TABLE    */
        ST           CHAR   (1),             /* STRUCTURE    TABLE    */
        PE           CHAR   (1),             /* PETROGRAPHY DATABASE */
        RC           CHAR   (1),             /* ROCKCHEM     DATABASE */
        OZ           CHAR   (1),             /* OZCHRON      DATABASE */
        OM           CHAR   (1),             /* OZMIN        DATABASE */
        SC           CHAR   (1),             /* STREAMCHEM   DATABASE */
        RT           CHAR   (1),             /* REGOLITH     DATABASE */
        RP           CHAR   (1),             /* ROCKPROPS    DATABASE */
        SP           CHAR   (1),             /* SPECPROPS    DATABASE */
        ENTEREDBY    CHAR   (8)    NOT NULL,
        ENTRYDATE    DATE          NOT NULL,
        LASTUPDATE   DATE,
        PRIMARY KEY (ORIGNO,SITEID) );

GRANT SELECT ON SITES TO PUBLIC;
```

```
CREATE UNIQUE INDEX SITESUNIQUE   ON SITES ( ORIGNO, SITEID );
CREATE         INDEX SITESIDS     ON SITES ( SITEID );
CREATE         INDEX SITESUSERS   ON SITES ( ENTEREDBY );
CREATE         INDEX SITESPROVS   ON SITES ( GEOPROVNO );
CREATE         INDEX SITESSUBPROVS ON SITES ( SUBPROVNO );
CREATE         INDEX SITESHMAPS   ON SITES ( HMAPNO );
CREATE         INDEX SITESQMAPS   ON SITES ( QMAPID );
CREATE         INDEX SITESDLATS   ON SITES ( DLAT );
CREATE         INDEX SITESDLONGS  ON SITES ( DLONG );
CREATE         INDEX SITESSTRUC   ON SITES ( ST );
CREATE         INDEX SITESOZMIN   ON SITES ( OM );
CREATE         INDEX SITESRTMAP   ON SITES ( RT );

REM  USITES IS THE INSERT/UPDATE VIEW OF THE SITES TABLE

CREATE VIEW USITES AS SELECT * FROM SITES WHERE ENTEREBY = USER;

GRANT SELECT, INSERT, UPDATE, DELETE ON USITES TO PUBLIC;


REM  OUTCROPS IS FOR OUTCROP-SCALE DATA AND DRILL-HOLE IDS

CREATE TABLE OUTCROPS (
        ORIGNO       NUMBER (5,0)  NOT NULL  REFERENCES NGMA.ORIGINATORS,
        SITEID       CHAR   (16)   NOT NULL,
        ROCKRELS     CHAR   (128),
        SKETCH       CHAR   (64),
        PHOTO        CHAR   (64),
        DHCOMPNY     CHAR   (48),
        DRILLHOLEID  CHAR   (48),
        DHAZIMUTH    NUMBER (3,0),
        DHINCLIN     NUMBER (2,0),
        VEGCODE      CHAR   (4)              REFERENCES QUATDB.VEGTYPES,
        VEGETATION   CHAR   (64),
        LANDCODE     CHAR   (4)              REFERENCES RTMAP.LANDF,
        LANDFORM     CHAR   (64),
        ENTEREDBY    CHAR   (8)    NOT NULL,
        ENTRYDATE    DATE          NOT NULL,
        PRIMARY KEY (ORIGNO,SITEID)
        FOREIGN KEY (ORIGNO,SITEID) REFERENCES NGMA.SITES(ORIGNO,SITEID);

GRANT SELECT ON OUTCROPS TO PUBLIC;

CREATE UNIQUE INDEX OCORIGSITES ON OUTCROPS ( ORIGNO, SITEID );
CREATE         INDEX OCSITEIDS   ON OUTCROPS ( SITEID );
CREATE         INDEX OCUSERS     ON OUTCROPS ( ENTEREDBY );

REM  UOUTCROPS IS THE INSERT/UPDATE VIEW OF THE OUTCROPS TABLE

CREATE VIEW UOUTCROPS AS SELECT * FROM OUTCROPS WHERE ENTEREDBY = USER;

GRANT SELECT, INSERT, UPDATE, DELETE ON UOUTCROPS TO PUBLIC;
```

```
REM  ROCKS IS FOR DATA ON LITHOLOGIES AND SAMPLES

CREATE TABLE ROCKS (
        ROCKNO        NUMBER (6)     NOT NULL  PRIMARY KEY,
        ORIGNO        NUMBER (5,0)   NOT NULL  REFERENCES NGMA.ORIGINATORS
        SITEID        CHAR   (16)    NOT NULL,
        SAMPLEID      CHAR   (16),
        ROCKTYPE      NUMBER (2,0)             REFERENCES NGMA.ROCKTYPES
        QUALIFIER     CHAR   (20)              REFERENCES NGMA.LITHNAMES
        LITHNAME      CHAR   (32)              REFERENCES NGMA.LITHNAMES
        GROUPING      CHAR   (50),
        STRATNO       NUMBER (5,0)             REFERENCES NGMA.STRATLEX
        INFORMAL      CHAR   (64),
        AGE           CHAR   (54),
        STRATHEIGHT   NUMBER (8,3),
        HOLEDEPTH     NUMBER (8),
        HOLEDEPTH2    NUMBER (8),
        DESCRIPTION   CHAR   (64),
        OTHERINFO     CHAR   (64),
        ENTEREDBY     CHAR   (8)      NOT NULL,
        ENTRYDATE     DATE            NOT NULL,
        FOREIGN KEY (ORIGNO,SITEID) REFERENCES NGMA.SITES(ORIGNO,SITEID) );

GRANT SELECT ON ROCKS TO PUBLIC;

CREATE UNIQUE INDEX ROCKROCKNOS   ON ROCKS ( ROCKNO );
CREATE         INDEX ROCKORIGSITES ON ROCKS ( ORIGNO, SITEID );
CREATE         INDEX ROCKSITES     ON ROCKS ( SITEID );
CREATE         INDEX ROCKORIGSAMPS ON ROCKS ( ORIGNO, SAMPLEID );
CREATE         INDEX ROCKUSERS     ON ROCKS ( ENTEREDBY );

REM  UROCKS IS THE INSERT/UPDATE VIEW OF THE ROCKS TABLE

CREATE VIEW UROCKS AS SELECT * FROM ROCKS WHERE ENTEREDBY = USER;

GRANT SELECT, INSERT, UPDATE, DELETE ON UROCKS TO PUBLIC;


REM  LITHDATA IS THE EXTENDABLE ATTRIBUTES TABLE FOR ROCKS

CREATE TABLE LITHDATA (
        ROCKNO        NUMBER (5,0)   NOT NULL  REFERENCES NGMA.ROCKS,
        DATATYPE      CHAR(4)        NOT NULL  REFERENCES
                                                 NGMA.LITHDATATYPES(DATATYPE),
        SUBTYPE       CHAR    (4)       REFERENCES NGMA.LITHDATATYPES(SUBTYPE),
        DESCRIPTION   CHAR    (64),
        ENTEREDBY     CHAR    (8)     NOT NULL,
        ENTRYDATE     DATE            NOT NULL,
        PRIMARY KEY (ROCKNO, DATATYPE, SUBTYPE) );

GRANT SELECT ON LITHDATA TO PUBLIC;

CREATE INDEX LDLITHNO ON LITHDATA ( ROCKNO );
CREATE INDEX LDUSERS  ON LITHDATA ( USER );

REM  ULITHDATA IS THE INSERT/UPDATE VIEW OF THE LITHDATA TABLE

CREATE VIEW ULITHDATA AS SELECT * FROM LITHDATA WHERE ENTEREDBY = USER;
```

```
GRANT SELECT, INSERT, UPDATE, DELETE ON ULITHDATA TO PUBLIC;


REM  STRUCTURES IS FOR QUANTITATIVE STRUCTURAL GEOLOGY OBSERVATIONS

CREATE TABLE STRUCTURES (
        ORIGNO        NUMBER (5,0)  NOT NULL  REFERENCES NGMA.ORIGINATORS,
        SITEID        CHAR   (16)   NOT NULL,
        ROCKNO        NUMBER (6,0)            REFERENCES NGMA.ROCKS,
        TYPE          NUMBER (2,0)  NOT NULL, REFERENCES NGMA.STRUCTYPES(TYPE),
        SUBTYPE       NUMBER (2,0)            REFERENCES NGMA.STRUCTYPES(SUBTYPE),
        AZIMUTH       NUMBER (3,0),
        INCLINATION   NUMBER (2,0),
        DEFNO         NUMBER (1,0),
        DEFSURFNO     NUMBER (1,0),
        PLOTRANK      NUMBER (3,0),
        ENTEREDBY     CHAR   (8)    NOT NULL,
        ENTRYDATE     DATE          NOT NULL,
        PRIMARY KEY (ORIGNO, SITEID, TYPE, SUBTYPE, PLOTRANK),
        FOREIGN KEY (ORIGNO, SITEID) REFERENCES NGMA.SITES(ORIGNO,SITEID) );

GRANT SELECT ON STRUCTURES TO PUBLIC;

CREATE INDEX STRUCTORIGSITES ON STRUCTURES ( ORIGNO, SITEID );
CREATE INDEX STRUCTSITEIDS   ON STRUCTURES ( SITEID );
CREATE INDEX STRUCTROCKNOS   ON STRUCTURES ( ROCKNO );
CREATE INDEX STRUCTUSERS     ON STRUCTURES ( ENTEREDBY );

REM  USTRUCTURES IS THE INSERT/UPDATE VIEW OF THE STRUCTURES TABLE

CREATE VIEW USTRUCTURES AS SELECT * FROM STRUCTURES WHERE ENTEREDBY = USER;

GRANT SELECT, INSERT, UPDATE, DELETE ON USTRUCTURES TO PUBLIC;


REM  TABLE ROCKREFS RELATES ROCKS RECORDS TO AGSO CORPORATE REFERENCES

CREATE TABLE ROCKREFS (
        ROCKNO        NUMBER (6,0)  NOT NULL  REFERENCES NGMA.ROCKS,
        REFID         CHAR   (9)    NOT NULL  REFERENCES GEOREF.AGSOREFS
        ENTEREDBY     CHAR   (8)    NOT NULL,
        ENTRYDATE     DATE          NOT NULL );

GRANT SELECT ON ROCKREFS TO PUBLIC;

CREATE INDEX ROCKREFROCKNOS ON ROCKREFS ( ROCKNO );
CREATE INDEX ROCKREFREFIDS  ON ROCKREFS ( REFID );
CREATE INDEX ROCKREFUSERS   ON ROCKREFS ( ENTEREDBY );

CREATE VIEW UROCKREFS AS SELECT * FROM ROCKREFS WHERE ENTEREDBY = USER;

GRANT SELECT, INSERT, UPDATE, DELETE, ON UROCKREFS TO PUBLIC;
```

```
REM  TABLE USED TO KEEP TRACK OF CURRENT VALUES OF SYSTEM-GENERATED NUMBERS

CREATE TABLE NGMAMAXNOS (
        IDMAXNO         CHAR    (6)     NOT NULL  PRIMARY KEY,
        MAXNO           NUMBER (6)      NOT NULL );

GRANT SELECT, UPDATE ON NGMAMAXNOS TO PUBLIC;



REM ******************************************************
REM **            FIELDATA AUTHORITY TABLES              ***
REM ** UNLESS OTHERWISE SHOWN ALL TABLES OWNED BY NGMA ***
REM ******************************************************


REM  ORIGINATORS IS THE AUTHORITY TABLE FOR ORIGINATORS

CREATE TABLE ORIGINATORS (
        ORIGNO          NUMBER (5,0)  NOT NULL  PRIMARY KEY,
        ORIGINATOR      CHAR    (22)    NOT NULL,
        OWNER           CHAR    (8) );

GRANT SELECT ON ORIGINATORS TO PUBLIC;

CREATE UNIQUE INDEX ORIGNOS ON ORIGINATORS ( ORIGNO );


REM  AGSOCOUNTRIES IS THE AUTHORITY TABLE FOR COUNTRIES

CREATE TABLE AGSOCOUNTRIES (
        COUNTRYID       CHAR    (3)     NOT NULL  PRIMARY KEY,
        COUNTRYNAME     CHAR    (32)    NOT NULL  );

GRANT SELECT ON AGSOCOUNTRIES TO PUBLIC;


REM  AGSOSTATES IS THE AUTHORITY TABLE FOR AUTRALIAN STATES

CREATE TABLE AGSOSTATES (
        STATEID         CHAR    (3)     NOT NULL  PRIMARY KEY,
        STATENAME       CHAR    (32)    NOT NULL  );

GRANT SELECT ON AGSOSTATES TO PUBLIC;
```

```
REM ******************************************************
REM **      THE FOLLOWING TABLE BELONGS TO STRATA       ***
REM ******************************************************

REM  AGSO GEOLOGICAL PROVINCES TABLE

CREATE TABLE GEOPROVS (
        PROVNO        NUMBER (3,0)  NOT NULL  PRIMARY KEY,
        PROVNAME      CHAR   (64)   NOT NULL
        PROVLETS      CHAR   (4),
        TYPE          CHAR   (16),
        RANK          NUMBER (1,0)            REFERENCES STRATA.PROVRANKS,
        STATUS        NUMBER (1,0)  NOT NULL  REFERENCES STRATA.STRATRANK,
        PARENT        NUMBER (3,0)            REFERENCES STRATA.GEOPROVS,
        GEODX_REF     CHAR   (9,0)            REFERENCES GEODX.BIBLIOG,
        COMMENTS      CHAR   (64),
        USERID        CHAR   (8),
        LASTCHANGED   DATE,
        ELON          NUMBER (5,2),
        WLON          NUMBER (5,2),
        TLAT          NUMBER (5,2),
        BLAT          NUMBER (5,2),
        COORDS        LONG RAW );

GRANT SELECT ON GEOPROVS TO PUBLIC;

CREATE UNIQUE INDEX GEOPROVNOS  ON GEOPROVS ( PROVNO );
CREATE        INDEX GEOPROVNAME ON GEOPROVS ( PROVNAME );


REM  QMAPS IS THE AGSO 1:250,000 MAP SHEET TABLE

CREATE TABLE QMAPS (
        MAPNO         CHAR   (6,0)  NOT NULL  PRIMARY KEY,
        MAPNAME       CHAR   (22),
        N_LAT         NUMBER (3,1),
        W_LONG        NUMBER (4,1) );

GRANT SELECT ON QMAPS TO PUBLIC;

CREATE UNIQUE INDEX QMAPNOS   ON QMAPS ( MAPNO );
CREATE        INDEX QMAPNAMES ON QMAPS ( MAPNAME);


REM  HMAPS IS THE AGSO 1:100,000 MAP SHEET TABLE

CREATE TABLE HMAPS (
        HMAPNO        NUMBER (4,0)  NOT NULL  PRIMARY KEY,
        MMAPID        CHAR   (4),
        QMAPNO        NUMBER (2,0),
        HMAPNAME      CHAR   (22),
        N_LAT         NUMBER (3,1),
        W_LONG        NUMBER (4,1),
        MEAST         NUMBER (6),
        MNORTH        NUMBER (7),
        STATE1        CHAR   (3),    /* STATE THAT INCLUDES MAJOR PART OF MAP */
        STATE2        CHAR   (3) );  /* STATE THAT INCLUDES MINOR PART OF MAP */

GRANT SELECT ON HMAPS TO PUBLIC;
```

```
CREATE UNIQUE INDEX HMAPNOS   ON HMAPS ( HMAPNO );
CREATE       INDEX HMAPNAMES ON HMAPS ( HMAPNAME );
CREATE       INDEX HMAPLATS  ON HMAPS ( N_LAT );
CREATE       INDEX HMAPLONGS ON HMAPS ( W_LONG );


REM  LOCMETHODS IS THE AUTHORITY TABLE FOR LOCATION METHODS

CREATE TABLE LOCMETHODS (
        LOCMETHNO     NUMBER (3,0)  NOT NULL  PRIMARY KEY,
        LOCMETHOD     CHAR    (64)  NOT NULL
        ACCURACY      NUMBER (4) );

GRANT SELECT ON LOCMETHODS TO PUBLIC;


REM ******************************************************
REM **       THE FOLLOWING TABLE BELONGS TO RTMAP       ***
REM ******************************************************

REM  AGSO LANDFORMS TABLE -  READ-ONLY PUBLIC SYNONYM

CREATE TABLE LANDF (
        L_CODE        CHAR    (4)   NOT NULL  PRIMARY KEY,
        L_DESC        CHAR    (4)   NOT NULL );

GRANT SELECT ON LANDF TO PUBLIC;


REM ******************************************************
REM **       THE FOLLOWING TABLE BELONGS TO QUATDB      ***
REM ******************************************************

REM  AGSO VEGETATION TABLE -  READ-ONLY PUBLIC SYNONYM

CREATE TABLE VEGET (
        V_CODE        CHAR    (4)   NOT NULL  PRIMARY KEY,
        V_DESC        CHAR    (64)  NOT NULL );

GRANT SELECT ON VEGET TO PUBLIC;


REM ******************************************************
REM **       THE FOLLOWING TABLE BELONGS TO STRATA      ***
REM ******************************************************

REM  AGSO STRATIGRAPHIC LEXICON TABLE

CREATE TABLE STRATLEX (
        UNITNO        NUMBER (5,0)  NOT NULL  PRIMARY KEY,
        UNITNAME      CHAR    (64)  NOT NULL,
        STATE         CHAR    (3)   NOT NULL  REFERENCES NGMA.AGSOSTATES,
        RANK          NUMBER (1,0)            REFERENCES STRATA.STRATRANK,
        RANKNAME      CHAR    (10),
        STATUS        NUMBER (1,0)  NOT NULL  REFERENCES STRATA.STRATSTATUS,
        STATUSNAME    CHAR    (17),
        GEODXID       NUMBER (5),             /* GEODX STRATIGRAPHIC UNIT NO. */
        AGE1          NUMBER (4,0)            REFERENCES STRATA.GEOTIME,
        AGE2          NUMBER (4,0)            REFERENCES STRATA.GEOTIME,
```

```
        GEOLPROV      NUMBER (3,0)            REFERENCES STRATA.GEOPROVS,
        COMMENTS      CHAR   (240),
        TYPESTATE     CHAR   (3)              REFERENCES NGMA.AGSOSTATES,
        DLAT          NUMBER (8,6),
        DLONG         NUMBER (9,6),
        SYMBOL        CHAR   (16),
        PARENT        NUMBER (5)              REFERENCES STRATA.STRATLEX,
        OVERLYING     NUMBER (5)              REFERENCES STRATA.STRATLEX,
        OVEREL        NUMBER (2,0)            REFERENCES STRATA.STRATRELS,
        UNDERLYING    NUMBER (5)              REFERENCES STRATA.STRATLEX,
        UNDEREL       NUMBER (2,0)            REFERENCES STRATA.STRATRELS,
        DEFREF        CHAR   (8)              REFERENCES GEODX.BIBLIOG,
        ENTRYID       CHAR   (8)    NOT NULL,
        ENTRYDATE     DATE          NOT NULL,
        UPDATEID      CHAR   (8),
        LASTUPDATE    DATE );

GRANT SELECT ON STRATLEX TO PUBLIC;

CREATE UNIQUE INDEX STRATLEXNOS   ON STRATLEX ( UNITNO );
CREATE        INDEX STRATLEXNAMES ON STRATLEX ( UNITNAME );


REM  AGSO BASIC ROCK TYPES TABLE - COARSE CLASSIFACTION

CREATE TABLE ROCKTYPES (
        ROCKNO        NUMBER (2,0)  NOT NULL  PRIMARY KEY,
        ROCKTYPE      CHAR   (32)   NOT NULL );

GRANT SELECT ON ROCKTYPES TO PUBLIC;


REM  AGSO DETAILED LITHOLOGICAL NOMENCLATURE TABLE - INCLUDING QUALIFIERS

CREATE TABLE LITHNAMES (
        LITHID        CHAR   (4)    NOT NULL  PRIMARY KEY,
        QUALIFIER     CHAR   (1)    NOT NULL,
        LITHNAME      CHAR   (32)   NOT NULL,
        PARENT        CHAR   (4)   );

GRANT SELECT ON LITHNAMES TO PUBLIC;

CREATE UNIQUE INDEX LITHNAMEIDS  ON LITHNAMES ( LITHID );
CREATE UNIQUE INDEX LITHNAMEMAES ON LITHNAMES ( LITHNAME );


REM AUTHORITY TABLE FOR EXTENDABLE ATTRIBUTES FOR THE LITHDATA TABLE

CREATE TABLE LITHDATATYPES (
        DATATYPE      CHAR   (4)    NOT NULL,
        TYPEDESC      CHAR   (32)   NOT NULL,
        SUBTYPE       CHAR   (4),
        SUBDESC       CHAR   (32),
        PRIMARY KEY (DATATYPE, SUBTYPE) );

GRANT SELECT ON LITHDATATYPES TO PUBLIC;

CREATE UNIQUE INDEX LITHTYPESUB     ON LITHDATATYPES ( DATATYPE, SUBTYPE );
CREATE UNIQUE INDEX LITHTYPESUBDESC ON LITHDATATYPES ( SUBTYPE, SUBDESC );
```

```
REM  AGSO AUTHORITY TABLE OF MINERAL NAMES & THEIR ABBREVIATIONS

CREATE TABLE AGSOMINERALS (
        MINABBREV     CHAR    (4)     NOT NULL  PRIMARY KEY,
        MINNAME       CHAR    (32)    NOT NULL,
        COMMON        CHAR    (1),
        ORE           CHAR    (1) );

CREATE UNIQUE INDEX AGSOMINABBREVS ON AGSOMINERALS ( MINABBREV );
CREATE UNIQUE INDEX AGSOMINNAMES   ON AGSOMINERALS ( MINNAME );
CREATE         INDEX AGSOMINCOMMONS ON AGSOMINERALS ( COMMON );
CREATE         INDEX AGSOMINORE     ON AGSOMINERALS ( ORE );

GRANT SELECT ON AGSOMINERALS TO PUBLIC;


REM  UNION VIEW OF LITHDATATYPES + AGSOMINERALS TABLES FOR USE AS LITHDATA LOOKUP

CREATE VIEW ROCKDATATYPES AS (
        SELECT DATATYPE, TYPEDESC, SUBTYPE, SUBDESC
            FROM NGMA.LITHDATATYPES
    UNION
        SELECT 'CM', 'Common Mineral', MINABBREV, MINNAME
            FROM NGMA.AGSOMINERALS
            WHERE COMMON = 'C'
    UNION
        SELECT 'MI', 'Mineral', MINABBREV, MINNAME
            FROM NGMA.AGSOMINERALS );

GRANT SELECT ON ROCKDATATYPES TO PUBLIC;

REM AUTHORITY TABLE FOR STRUCTURE TYPES CONTROLLING THE STRUCTURES TABLE

CREATE TABLE STRUCTYPES (
        TYPE          NUMBER (3)     NOT NULL,
        TYPEDESC      CHAR    (16),
        SUBTYPE       NUMBER (2)     NOT NULL,
        LEGEND        CHAR    (32)   NOT NULL,
        ENDPT         NUMBER (6,2),
        SYMBOL        LONG,
        PRIMARY KEY (TYPE, SUBTYPE) );

GRANT SELECT ON STRUCTYPES TO PUBLIC;

CREATE UNIQUE INDEX STRUCTYPESUB     ON STRUCTYPES ( TYPE, SUBTYPE );
CREATE UNIQUE INDEX STRUCTYPESUBDESC ON STRUCTYPES ( SUBTYPE, SUBDESC );
```