British Geological Survey

Mineral Reconnaissance Programme

Geochemistry database: data analysis and proposed design

Department of Trade and Industry

MRP Report 125
Technical Report WF/92/5

Geochemistry database: data analysis and proposed design

J R Harris and J S Coats

BRITISH GEOLOGICAL SURVEY

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Mineral Reconnaissance Programme Report 125

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This report was prepared for the Department of Trade and Industry

Maps and diagrams in this report use topography based on Ordnance Survey mapping

Bibliographical reference

Harris, J R, and Coats, J S. 1992. Geochemistry database: data analysis and proposed design. *British Geological Survey Technical Report* WF/92/5 (*BGS Mineral Reconnaissance Programme Report* 125).

Keyworth, Nottingham 1992

BRITISH GEOLOGICAL SURVEY

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This report relates to work carried out by the British Geological Survey on behalf of the Department of Trade and Industry. The information contained herein must not be published without reference to the Director, British Geological Survey.

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Printed in England for the British Geological Survey by
Saxon Printing Limited, Derby

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SUMMARY

The results of the data analysis for a geochemistry relational database to hold the UK, land-based datasets currently managed by the Minerals and Geochemical Surveys Division plus some other geochemical datasets held by BGS are presented in full in the form of a geochemistry data model. Recommendations for the formal acceptance of this model by the management of the Minerals and Geochemical Surveys Division are also produced. Financial support for this project has come from the Department of Trade and Industry Mineral Reconnaissance Programme.

The minimum requirement for all potential datasets is defined. The same standard sample numbering system must be used for all samples. All batches of analysed samples must have the correct and complete index information available.

An entity relationship diagram showing all relationships between the 43 identified entities is provided. Thirty five of the entities, which map directly onto the relations identified by data normalisation, are defined in detail and all 79 of their associated domains are also defined.

Defects identified during the data analysis and subsequent quality assurance review are listed and discussed.

Excluded from this data analysis are offshore and overseas data.

Gas and vegetation entities are not adequately covered by this report and require further work. Few samples of these types have been collected in the past.

RECOMMENDATIONS

1. This data analysis and proposed design should be accepted by BGS. It should be incorporated in the BGS data architecture and should form the geochemistry subject area of that architecture.

2. The data analysis and proposed design should be used as the basis for the detailed physical design to be implemented on Oracle version 6.

3. The report highlights the importance of the sample and laboratory batch numbering systems and it is recommended that a detailed analysis of these systems is completed as soon as possible.

4. A structured systems analysis and design methodology, SSADM (Cutts, 1991) or LSDM should be employed in BGS and used to control and structure all future changes and developments to this proposed design.

5. Further data analysis of sample preparation is required if complete information on sample preparation is to be stored.

6. The data model should be managed by a working group that will recommend and accept additions to the domains.

ACCEPTANCE OF THE GEOCHEMISTRY DATA MODEL

Management of the Minerals and Geochemical Surveys Division formally

i) Accept the proposed design as a satisfactory model of BGS geochemical data.

ii) Agree that it should form the basis for the geochemistry area of the BGS data architecture.

iii) Agree that defects identified by this report are acceptable and cannot be removed without considerable further data analysis.

iv) Accept that modification to the proposed design will have to be costed and reviewed by a software quality assurance committee before being implemented.

Signed ..... Head Minerals and Geochemical Surveys Division

..... Group Manager Geochemistry Group

..... Group Manager Minerals Group

..... Group Manager Analytical Geochemistry Group

INTRODUCTION

A proposal was put to the Department of Trade and Industry (DTI) in 1985 for BGS to setup a data archive of the geochemical information that had been collected by BGS for the DTI-funded Mineral Reconnaissance Programme (MRP). This project was accepted in 1986. The archive would allow easy retrieval and facilitate validation of the MRP geochemical data it contained. A similar project to archive MRP geophysical data was accepted at the same time.

The geochemical archive was necessary because of the difficulty in managing and maintaining access to the large dataset that had been collected by the MRP. The data covered the previous 12 years work and were still being accumulated. Managing the dataset was particularly difficult due to the many formats in which the data were stored. Hand written and printed paper records, punched paper tape, punched cards, magnetic tape and datafiles on the computers at Keyworth and Rutherford were all common formats. Increased urgency was brought to the project due to the imminent removal of card readers from the GEC computer at Keyworth and the reduction in staffing on the MRP. The Oracle Relational Database Management System had just become available on the VAX8600 at Keyworth and a decision was taken to use this Relational Database Management System, RDBMS, for the archive project.

The initial data analysis and design of the MRP database was carried out in 1986 by K A Holmes and J S Coats. Earlier attempts to perform this task had been made by the MRP staff using the G-EXEC system at Rutherford but this was only completed for data from limited areas of Scotland and south-west England. In 1986 a data analysis was carried out which basically incorporated the existing Rutherford G-EXEC file format, with some modifications, into Oracle tables. This conformed to the format of the field cards which had been used by the MRP, and Geochemical Survey Programme (GSP), since 1970. A standard sample numbering system has been employed since that time and this system was used to relate information recorded on the field cards, and stored in one Oracle table, with the analytical results which were produced by the BGS laboratories. This produced an easily understood concept of the field data tables, one for each sample type, and one analytical results table.

There was little attempt to normalise the relations produced by the data analysis and few integrity rules were enforced. The main requirement was for a data archive, so the data analysis was not carried out to meet specific user requirements but rather to model the data.

Simple programs were written and Quality Control procedures established for data loading. Oracle forms were designed for easy access to the data so that corrections could be made and the data could be accessed in a relatively straightforward manner.

During 1988 a menu-driven front end was developed for the database that would for the first time allow non-expert users to access the data. New columns were added to various database tables and a rock sample table, specified in the original design, was finally established. The existing Oracle forms were redesigned and improved and a new loading program was developed which incorporated all the QC procedures that had previously been carried out manually. In December 1988 a divisional seminar was held at which the database front end program was described and user manuals were distributed.

Increased use of the database in 1989 highlighted defects in the original data analysis. By the summer of 1989 it was obvious that a new data analysis was required to rectify these defects and take account of data types not identified in the original analysis.

Experience gained through use of the first database enabled a more accurate description of the data to be developed. This data had been collected over 15 years by over 150 people within BGS (know as the Insitute of Geological Sciences between 1965 and 1984) and no single person in the MRP could produce an accurate description of all the data held. A fundamental, but unstated, requirement of the first database design was that it should hold as much of the geochemical data as possible. The data model produced by the second data analysis was based on a superset of the data that exists and was therefore data driven.

The data analysis was carried out between November 1989 and January 1991. A great deal of information was available in the form of field cards, used to record data about samples and sites, and the associated field handbooks, containing instructions for filling in the cards. A complete set of these documents was gathered together dating back to the first edition of the geochemical field cards produced in 1970.

Since the first production of three field cards, one each for streams, soils and rocks, and the associated field handbook the recording system had evolved on a yearly basis. The field cards were altered before each field season by the addition of new fields, and new code values were added to the field handbooks. Usually these changes were relatively minor bur major redesigns were carried out at intervals of approximately five years. Some fields were dropped completely from the cards and, more recently, a few fields were reinstated. In total ten sets of field cards and associated handbooks were identified.

A dictionary was compiled in the form of an Oracle table containing every possible value of every field on each different field card. Due to the extensive redundancy and complexity of the complete set of valid codes, it was decided to translate all past data into a new set of comprehensive codes based on the old field codes. Thus the data would be stored in a single format that would make the job of searching the whole dataset far more efficient. Multiple translations would then be unnecessary before comparing values of a single attribute. The task of translating the data would be done only once and not every time a retrieval was executed. However, this approach means that the data will not be stored in the same format it appears on the field cards. To prevent the potential problems this could cause it was decided that as far as possible all new codes had to map back onto the original codes so that any field card could be recreated in its original format for data validation purposes.

The new codes, called the '90' codes, were created and adopted as the domains for the data analysis which followed. During the creation of the '90' codes a set of attributes was produced, each attribute using one of the codes as its domain. These attributes were grouped into initial relations similar in structure to the existing database tables. They were then normalised to 3rd normal form or higher (Date, 1981). Two, however, remained at 2nd normal form (NORMAL_SITE and DRAINAGE_SITE). Several other entities may remain in third normal form due to functional dependency between attributes. This occurs only with attributes which are on the edge of the geochemical universe of interest. Further work has not been carried out as these attributes are defined sufficiently for their required purpose.

Given the set of normalised relations an entity relationship diagram was produced (Barker, 1990) in which each entity mapped directly onto one of the normalised relations. Several super type and subtype entities were also identified.

During this second data analysis it was realised that the GSP data structure was nearly identical because the information collected by the MRP and the GSP was very similar and the two groups had used the same field cards up until the early 1980s. A proposal was put to senior management to merge the MRP and GSP data in the new database when it was established. This proposal was accepted by the head of the group which then incorporated both the MRP and GSP.

During the later stages of the design process BGS awarded a consultancy to Logica to devise a data architecture for BGS and the Entity-Relationship diagram of the geochemistry data model was submitted and incorporated in the architecture (Logica, 1991). One of the main points of the Logica report was that data should be shared more effectively within and across directorates (p 4), and that benefits of a more integrated approach are the reduced effort required to develop and maintain this data and the improved availability and accessibility of information (p 5). This report attempts to achieve this integration in the field of geochemical data and gain the benefits noted in the Logica report.

PROJECT REQUIREMENT

To carry out a full data analysis of existing UK land-based geochemical datasets in the Applied Geochemistry Group, now Geochemistry Group and Minerals Group, and to produce an accurate detailed data model.

The data model should facilitate the management of these data by a relational database management system.

STANDARD NUMBERING SYSTEMS

Batch registration

The massive extent of the data suitable for inclusion in the database produced a need for a comprehensive and consistent index. This index exists in the form of a laboratory batch registration system established on the 4th April 1970 by the analytical chemistry laboratories. This system is still in use today and is vital to the success of the database project. It is estimated that the final database will contain approximately 8 million analyte determinations, and that these will have been produced by the analysis of 4500 batches of samples. Without the index of these 4500 batches it would be impossible to manage the analyte determinations effectively, which is the main purpose of the database.

Whilst a majority of the data was produced by the BGS laboratories a significant proportion was produced by external laboratories and is therefore not registered in the BGS registration system. However most external laboratories issue a unique reference number for each analysis they produce. When enough other index information is present external batches can be entered into the registration system.

There is a minimum amount of information that must be known about a dataset before it can be loaded to the database. It must have a complete set of valid index information. This will mean certain datasets, which otherwise appear perfectly valid will not be loaded to the database as they cannot be effectively managed. This will affect an insignificant proportion of the data.

Sample numbering

A standard numbering system was introduced with the first edition of the geochemical field cards in 1970. This numbering system has been in use ever since and has proved reasonably successful at uniquely identifying sample sites and very effective at uniquely identifying samples. All MRP and GSP data conform to this system. It became apparent during the data analysis that some renumbering would be inevitable so that sample sites could be uniquely identified. It was decided that any renumbering should be kept to a minimum and that any renumbered sample must retain the original number as part of the new identifier. All MRP and GSP drainage data will retain their original numbers although some MRP rock, soil and drillcore samples will be renumbered.

Data that are not numbered using the MRP / GSP system cannot be loaded to this database model without being renumbered first. The MRP and GSP datasets make up well over 70 percent of BGS's geochemical data. Smaller datasets will be renumbered to conform with the major portion of BGS's data. The model described in this report can be extended to included two other major BGS sample numbering systems, the MinPet and Biostrat, with little difficulty. This is the subject a a later report (Harris, Glaves and Coats, in preparation).

DIAGRAMS

Subject area diagram

The subject area diagram shows the major subject areas identified by the data analysis. It is not an entity relationship diagram but, for ease of comparison, it is drawn in a similar way. It shows conceptually useful groupings of entities, attributes and relationships (Barker, 1990).

The following Data Subject Areas were identified:

Locations
All locations identified during a survey at which geochemical samples where collected or information relevant to geochemistry was recorded.

Location Descriptions
Descriptions relevant to geochemistry of identified locations.

Samples
All samples collected from identified locations and subsequently chemically analysed.

Sample Descriptions
Descriptions relevant to geochemistry of collected samples.

Batch and Sample Information

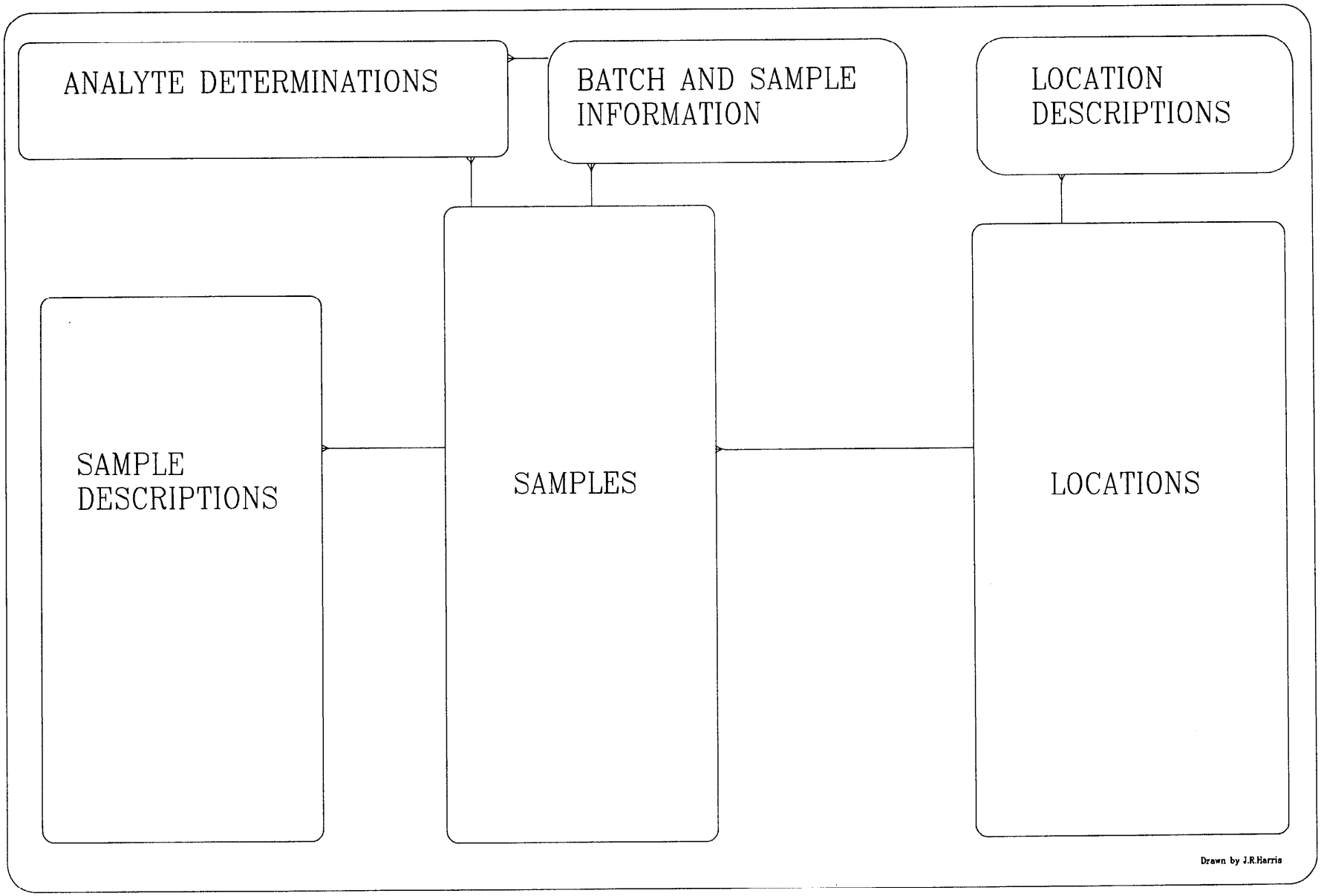
Index information identifying all samples registered and analysed by the BGS labs, and external labs.

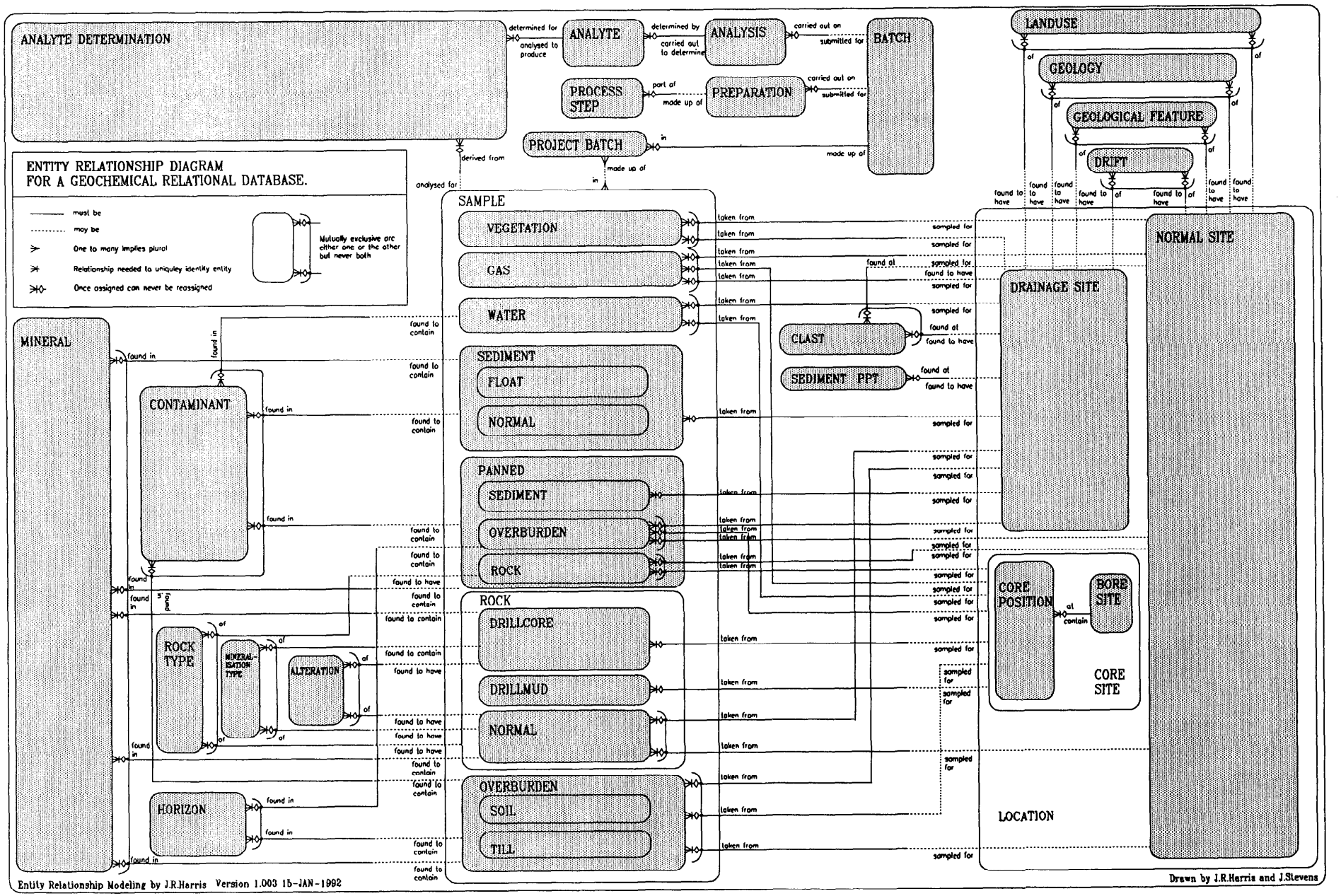
Analyte Determinations

All analyte determinations of analysed collected samples.

Entity relationship diagram

The entity relationship diagram shows all data entities and relationships identified by the data analysis. No meta data entities are shown. Forty three entities were identified, of which thirty two map directly onto the relations produced by data normalisation, shown in grey. The remaining eleven entities which do not map onto relations will be created as views in the final database, whilst the thirty two which do map onto relations will be created as tables.


ANALYTE DETERMINATIONS
BATCH AND SAMPLE INFORMATION
LOCATION DESCRIPTIONS
SAMPLE DESCRIPTIONS
SAMPLES
LOCATIONS
Drawn by J.R.Harris


ANALYTE DETERMINATION
determined for
analysed to produce
ANALYTE
determined by
carried out to determine
ANALYSIS
carried out on
submitted for
BATCH
PROCESS STEP
part of
made up of
PREPARATION
carried out on
submitted for
PROJECT BATCH
in
made up of
derived from
made up of
in
analysed for
ENTITY RELATIONSHIP DIAGRAM
FOR A GEOCHEMICAL RELATIONAL DATABASE.
must be
may be
One to many implies plural
Relationship needed to uniquley identify entity
Once assigned can never be reassigned
Mutually exclusive arc either one or the other but never both
LANDUSE
GEOLOGY
GEOLOGICAL FEATURE
DRIPT
found to have
SAMPLE
VEGETATION
GAS
WATER
SEDIMENT
FLOAT
NORMAL
PANNED
SEDIMENT
OVERBURDEN
ROCK
ROCK
DRILLCORE
DRILLMUD
NORMAL
OVERBURDEN
SOIL
TILL
taken from
sampled for
found at
CLAST
SEDIMENT PPT
DRAINAGE SITE
NORMAL SITE
MINERAL
CONTAMINANT
found in
found to contain
ROCK TYPE
MINERAL-ISATION TYPE
ALTERATION
HORIZON
of
CORE POSITION
at
contain
BORE SITE
CORE SITE
LOCATION
Entity Relationship Modeling by J.R.Harris Version 1.003 15-JAN-1992
Drawn by J.R.Harris and J.Stevens

DETAILED ENTITY DEFINITIONS

This chapter contains detailed entity definitions for the thirty five entities which map directly onto the relations produced by data normalisation. It is intended that these entities will be created as tables in the final database. The chapter is divided into six sections with one section for each subject area shown on the subject area diagram. The twelve entities which do not map directly onto relations are not defined.

Index of detailed entity definitions

Location sub entities

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Normal Site	
Subtype of	: Location	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A site at which no form of drainage exists and which is not part of a borehole.

ATTRIBUTES

Name	:Project		Domain :PROJECT	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :SITENO	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Easting		Domain :EASTING	
Optional	:Yes	Format :Num	Length :6	Unique :No
Definition	:National grid rectangular easting co-ordinate of the site in metres from the OS origin.			
Name	:Northing		Domain :NORTHING	
Optional	:Yes	Format :Num	Length :7	Unique :No
Definition	:National grid rectangular northing co-ordinate of the site in metres from the OS origin.			
Name	:Grid_accuracy		Domain :DISTANCE	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Accuracy of the National grid rectangular co-ordinates of the site in metres.			
Name	:Grid_derivation		Domain :GRID_DERIVATION	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method of derivation of the National grid coordinates of the site			
Name	:Elevation		Domain :ELEVATION	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Height above ordnance datum of the ground surface.			
Name	:Top_depth		Domain :DEPTH	
Optional	:Yes	Format :Num	Length :6,2	Unique :No
Definition	:Depth to the top of the site from the ground surface.			
Name	:Bottom_depth		Domain :DEPTH	
Optional	:Yes	Format :Num	Length :6,2	Unique :No
Definition	:Depth to the bottom of the site from the ground surface.			
Name	:Local_east		Domain :LOCAL_EAST	
Optional	:Yes	Format :Num	Length :5	Unique :No
Definition	:Local grid easting (X Axis value) of the site.			
Name	:Local_north		Domain :LOCAL_NORTH	
Optional	:Yes	Format :Num	Length :5	Unique :No
Definition	:Local grid northing (Y Axis value) of the site.			

Name :Map_scale Domain :MAP_SCALE
Optional :Yes Format :Num Length :5 Unique :No
Definition :Scale of the original field map from which the site coordinates where derived.

Name :Map_sheet Domain :MAP_SHEET
Optional :Yes Format :Char Length :7 Unique :No
Definition :Map sheet of the original field map from which the site coordinates were derived.

Name :Relief Domain Name :Relief
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the site relief

Name :Profile_drainage Domain :PROFILE_DRAINAGE
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the site soil drainage.

Name :Gamma_count Domain :GAMMA_COUNT
Optional :Yes Format :Num Length :4 Unique :No
Definition :Gamma activity of the site.

Name :Gamma_angle Domain :GAMMA_ANGLE
Optional :Yes Format :Num Length :1 Unique :No
Definition :Solid angle of the site material measured for gamma activity.

Name :Gamma_environment Domain :GAMMA_ENVIRONMENT
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the site material measured for gamma activity.

Name :Date_visited Domain :DATE
Optional :Yes Format :Date Length :9 Unique :No
Definition :Date on which the site was visited.

Name :Date_accuracy Domain :DATE_ACCURACY
Optional :Yes Format :Char Length :1 Unique :No
Definition :Accuracy of the date on which the site was visited.

Name :Collector Domain :NAME
Optional :Yes Format :Char Length :30 Unique :No
Definition :Name of the collector who visited the site.

Name :Detailed_locality Domain :TEXT
Optional :Yes Format :Char Length :240 Unique :No
Definition :Location of the site with reference to at least one fixed point identifiable on the field map and in the field.

Name :Comments Domain :TEXT
Optional :No Format :Char Length :240 Unique :No
Definition :Comments on the site and samples collected from the site which cannot be recorded elsewhere.

Name :Code_version Domain :CODE_VERSION
Optional :No Format :Num Length :3,1 Unique :No
Definition :Geochemistry code version of field card information.

KEYS
Primary :NORMAL_SITE_KEY Attribute(s) :Project, Siteno
Alternate : Attribute(s) :

RELATIONSHIPS

Each NORMAL_SITE LOCATION MAY BE found to have ONE OR MORE LANDUSES

Each NORMAL_SITE LOCATION MAY BE found to have ONE OR MORE GEOLOGYS

Each NORMAL_SITE LOCATION MAY BE found to have ONE OR MORE GEOLOGICAL_FEATURES

Each NORMAL_SITE LOCATION MAY BE found to have ONE OR MORE DRIFTS

Each NORMAL_SITE LOCATION MAY BE found to have ONE OR MORE CLASTS

Each NORMAL_SITE LOCATION MAY BE sampled for ONE OR MORE VEGETATION SAMPLES

Each NORMAL_SITE LOCATION MAY BE sampled for ONE OR MORE GAS SAMPLES

Each NORMAL_SITE LOCATION MAY BE sampled for ONE OR MORE OVERBURDEN PANNED SAMPLES

Each NORMAL_SITE LOCATION MAY BE sampled for ONE OR MORE ROCK PANNED SAMPLES

Each NORMAL_SITE LOCATION MAY BE sampled for ONE OR MORE NORMAL ROCK SAMPLES

Each NORMAL_SITE LOCATION MAY BE sampled for ONE OR MORE OVERBURDEN SAMPLES

VALIDATION RULES

Bottom_depth > = Top_depth

NOTES AND REMARKS

This entity is normalised to second normal form only, as easting, northing are functionally dependant upon local_east and local_north. This is acceptable as both will often be required for plotting purposes. Removing the local coordinates would make for unnecessary complication in calculating the easting and northing at retrieval time. This entity should have an alternate key of (Easting, Northing, Elevation, Date_visited). However not all of these attributes are known with sufficient accuracy to uniquely identify every tuple so an alternate key cannot be enforced. Map_scale and Map_sheet may also be functionally dependant.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Drainage site	
Subtype of	: Location	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A site at which a form of surface drainage exists and which is not part of a borehole.

ATTRIBUTES

Name	:Project		Domain :PROJECT	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :SITENO	
Optional	:No	Format :Char	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Easting		Domain :EASTING	
Optional	:No	Format :Num	Length :6	Unique :No
Definition	:National grid rectangular easting co-ordinate of the site in metres from the OS origin.			
Name	:Northing		Domain :NORTHING	
Optional	:No	Format :Num	Length :7	Unique :No
Definition	:National grid rectangular northing co-ordinate of the site in metres from the OS origin.			
Name	:Grid_accuracy		Domain :DISTANCE	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Accuracy of the National grid rectangular co-ordinates of the site in metres.			
Name	:Grid_derivation		Domain :GRID_DERIVATION	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method of derivation of the National grid coordinates of the site.			
Name	:Elevation		Domain :ELEVATION	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Height above ordnance datum of the ground surface.			
Name	:Top_depth		Domain :DEPTH	
Optional	:Yes	Format :Num	Length :6,2	Unique :No
Definition	:Depth to the top of the site from the ground surface.			
Name	:Bottom_depth		Domain :DEPTH	
Optional	:Yes	Format :Num	Length :6,2	Unique :No
Definition	:Depth to the bottom of the site from the ground surface.			
Name	:Local_east		Domain :LOCAL_EAST	
Optional	:Yes	Format :Num	Length :5	Unique :No
Definition	:Local grid easting (X Axis value) of the site.			
Name	:Local_north		Domain :LOCAL_NORTH	
Optional	:Yes	Format :Num	Length :5	Unique :No
Definition	:Local grid northing (Y Axis value) of the site in metres.			
Name	:Map_scale		Domain :MAP_SCALE	

Optional :Yes Format :Num Length :5 Unique :No
Definition :Scale of the original field map from which the site coordinates where derived.

Name :Map_sheet Domain :MAP_SHEET
Optional :Yes Format :Char Length :7 Unique :No
Definition :Map sheet of the original field map from which the site co-ordinates were derived.

Name :Relief Domain :RELIEF
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the site relief.

Name :Type Domain :DRAINAGE
Optional :Yes Format :Char Length :1 Unique :No
Definition :Classification of the drainage type found at the site.

Name :Conditions Domain :DRAINAGE_CONDITIONS
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the drainage conditions at the site.

Name :Stream_order Domain :STREAM_ORDER
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the stream order, derived from the field map, by Strahler's method.

Name :Catchment_area Domain :AREA
Optional :Yes Format :Num Length :4,1 Unique :No
Definition :Catchment area of the stream or river, at the site in KM^2.

Name :Weather Domain :WEATHER
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the weather conditions at the site prior to sampling.

Name :Gamma_count Domain :GAMMA_COUNT
Optional :Yes Format :Num Length :4 Unique :No
Definition :Gamma activity of the site.

Name :Gamma_angle Domain :GAMMA_ANGLE
Optional :Yes Format :Num Length :1 Unique :No
Definition :Solid angle of the site material measured for gamma activity.

Name :Gamma_environment Domain :GAMMA_ENVIRONMENT
Optional :Yes Format :Num Length :1 Unique :No
Definition :Classification of the site material measured for gamma activity.

Name :Date_visited Domain :DATE
Optional :Yes Format :Date Length :9 Unique :No
Definition :Date on which the site was visited.

Name :Date_accuracy Domain :DATE_ACCURACY
Optional :Yes Format :Char Length :1 Unique :No
Definition :Accuracy of the date on which the site was visited.

Name :Collector Domain :NAME
Optional :Yes Format :Char Length :30 Unique :No
Definition :Name of the collector who visited the site.

Name	:Detailed_locality		Domain :TEXT	
Optional	:Yes	Format :Char	Length :240	Unique :No
Definition	:Location of the site with reference to at least one fixed point identifiable on the field map and in the field.			

Name	:Comments		Domain :TEXT	
Optional	:No	Format :Char	Length :240	Unique :No
Definition	:Comments on the site and samples collected from the site which cannot be recorded elsewhere.			

Name	:Code_version		Domain :CODE_VERSION	
Optional	:No	Format :Num	Length :3,1	Unique :No
Definition	:Geochemistry code version of field card information.			

KEYS

Primary	:DRAINAGE_SITE_KEY	Attribute(s) :Project, Siteno
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each DRAINAGE_SITE LOCATION MAY BE found to have ONE OR MORE LANDUSES

Each DRAINAGE_SITE LOCATION MAY BE found to have ONE OR MORE GEOLOGYS

Each DRAINAGE_SITE LOCATION MAY BE found to have ONE OR MORE GEOLOGICAL_FEATURES

Each DRAINAGE_SITE LOCATION MAY BE found to have ONE OR MORE DRIFTS

Each DRAINAGE_SITE LOCATION MAY BE found to have ONE OR MORE CLASTS

Each DRAINAGE_SITE LOCATION MAY BE found to have ONE OR MORE SEDIMENT_PPTS

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE VEGETATION SAMPLES

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE GAS SAMPLES

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE WATER SAMPLES

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE SEDIMENT SAMPLES

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE SEDIMENT PANNED SAMPLES

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE OVERBURDEN PANNED SAMPLES

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE NORMAL ROCK SAMPLES

Each DRAINAGE_SITE LOCATION MAY BE sampled for ONE OR MORE OVERBURDEN SAMPLES

VALIDATION RULES

Bottom_depth > = Top_depth

NOTES AND REMARKS

This entity is normalised to second normal form only, as easting and northing are functionally dependant on local_east and local_north. This entity should have an alternate key of (Easting, Northing, Elevation, Date_visited) However not all of these attributes are known with sufficient accuracy to uniquely identify every tuple so an alternate key cannot be enforced. Map_scale and Map_sheet may also be functionally dependant.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Bore site	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A site at which a bore hole was drilled. A normal site becomes a bore hole site when a hole is drilled with the intention of retrieving rock samples. Overburden sampling which uses shallow drilling techniques does not constitute a borehole.

ATTRIBUTES

Name	:Bore_Name		Domain :TEXT	
Optional	:No	Format :Char	Length :50	Unique :No
Definition	:Borehole name.			
Name	:Boreno		Domain :BORENO	
Optional	:No	Format :Num	Length :10,4	Unique :No
Definition	:Borehole number.			
Name	:Registration		Domain :BGS.BORE_REGISTRATION	
Optional	:No	Format :*	Length :*	Unique :Yes
Definition	:BGS standard borehole reference number.			
Name	:Easting		Domain :EASTING	
Optional	:No	Format :Num	Length :6	Unique :No
Definition	:National grid rectangular easting co-ordinate of the collar of the borehole in metres from the OS origin.			
Name	:Northing		Domain :NORTHING	
Optional	:No	Format :Num	Length :7	Unique :No
Definition	:National grid rectangular northing co-ordinate of the collar of the borehole in metres from the OS origin.			
Name	:Grid_Accuracy		Domain :DISTANCE	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Accuracy of the National grid rectangular co-ordinate of the borehole collar in metres.			
Name	:Grid_Derivation		Domain :GRID_DERIVATION	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method of derivation of the coordinates of the borehole collar.			
Name	:Collar_Elevation		Domain :ELEVATION	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Height above ordnance datum of the collar of the borehole in metres.			
Name	:Drilled_length		Domain :DISTANCE	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Length of borehole drilled.			
Name	:Inclination		Domain :INCLINATION	
Optional	:Yes	Format :Num	Length :5,1	Unique :No
Definition	:Initial inclination of the borehole in degrees from the horizontal.			
Name	:Azimuth		Domain :AZIMUTH	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Initial azimuth of the borehole in clockwise degrees from grid north.			

Name	:Drilled_by		Domain :ORGANISATION	
Optional	:Yes	Format :Char	Length :4	Unique :No
Definition	:Organisation responsible for drilling the borehole.			

Name	:Logged_by		Domain :NAME	
Optional	:Yes	Format :Char	Length :30	Unique :No
Definition	:Name of geologist responsible for the borehole log.			

Name	:Detailed_Locality		Domain :TEXT	
Optional	:Yes	Format :Char	Length :240	Unique :No

Definition :Location of the collar of the borehole with reference to at least one fixed point identifiable on the field map and in the field.

KEYS

Primary	:BORE_SITE_KEY	Attribute(s) :Bore_Name, Boreno
Alternate	:BGS_BORE_KEY	Attribute(s) :Registration

RELATIONSHIPS

Each BORE_SITE LOCATION MAY BE found to contain ONE OR MORE CORE_POSITIONS

Each BORE_SITE LOCATION MUST BE issued with ONE AND ONLY ONE BGS.BORE_REGISTRATION
Foreign Key Attribute(s) Registration
Primary key Entity BGS.BORE_REGISTRATION (Does not exist yet)

VALIDATION RULES

Where Inclination = 90 or Inclination = -90 then Azimuth is null

NOTES AND REMARKS

This entity may be replaced by the BGS.BORE_REGISTRATION entity when such an entity is defined.
* See detailed domain definition for full description.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name : Geochemistry
Entity name : Core position
Subtype of :
Version : 1.002 Date : 25-MAR-91

DEFINITION
A site within a bore hole at which sampling occurred.

ATTRIBUTES

Name	:Bore_name		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :50	Unique :No
Definition	:Geochemistry borehole name.			
Name	:Boreno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :10,4	Unique :No
Definition	:Geochemistry borehole number.			
Name	:Top_depth		Domain :DEPTH	
Optional	:No	Format :Num	Length :6,2	Unique :No
Definition	:Depth to the start of the site from the collar of the borehole in metres.			
Name	:Bottom_depth		Domain :DEPTH	
Optional	:No	Format :Num	Length :6,2	Unique :No
Definition	:Depth to the end of the site from the collar of the borehole in metres.			
Name	:Project		Domain :PROJECT	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :SITENO	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Gamma_count		Domain :GAMMA_COUNT	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Gamma activity of the site.			
Name	:Gamma_angle		Domain :GAMMA_ANGLE	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Solid angle of the site material measured for gamma activity.			
Name	:Gamma_environment		Domain :GAMMA_ENVIRONMENT	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Classification of the site material measured for gamma activity.			
Name	:Date_sampled		Domain :DATE	
Optional	:Yes	Format :Date	Length :9	Unique :No
Definition	:Date on which the site was sampled.			
Name	:Date_accuracy		Domain :DATE_ACCURACY	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Accuracy of the date on which the site was sampled.			

Name	:Comments		Domain :TEXT	
Optional	:No	Format :Char	Length :240	Unique :No
Definition	:Comments on the site and samples collected from the site which cannot be recorded elsewhere.			

KEYS

Primary	:CORE_POSITION_KEY	Attribute(s) :Bore_name, Boreno, Top_depth, Bottom_depth
Alternate	:CORE_POSITION_KEY2	Attribute(s) :Project, Siteno

RELATIONSHIPS

Each CORE_POSITION MUST BE at ONE AND ONLY ONE BORE_SITE
Foreign Key Attribute(s) Bore_name, Boreno
Primary key Entity BORE_SITE

VALIDATION RULES

Bottom_depth > = Top_depth

NOTES AND REMARKS

This entity should have a primary key of (Bore_name, Boreno, Top_depth, Bottom_depth, Date_sampled) However the Date_sampled attribute is not always known with sufficient accuracy to uniquely identify every tuple so the full primary key can only be enforced with the use of an alternate key on (Project, Siteno) which carries the same meaning as the full primary key. That is, it uniquely identifies one sampling site on a particular date.
When the BGS.BORE_REGISTRATION entity is defined the Primary key will be replaced by (Registration, Top_depth, Bottom_depth) however the alternate key of (Project, Siteno) will still be required.

Location description entities

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name : Geochemistry
Entity name : Landuse
Subtype of :
Version : 1.002 Date : 25-MAR-91

DEFINITION
Landuse of a site or catchment area

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Catchment_site		Domain :CATCHMENT_SITE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the landuse describes the site or catchment area of the site.			
Name	:Type		Domain :LANDUSE	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:Classification of the land utilisation of the site or catchment area.			
Name	:Abundance		Domain :RELATIVE_ABUNDANCE	
Optional	:No	Format :Num	Length :2	Unique :No
Definition	:Ranking of land utilisation of a site or catchment area in order of relative abundance.			

KEYS

Primary	:LANDUSE_KEY	Attribute(s) :Project, Siteno, Catchment_site, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each LANDUSE MUST BE of ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE
OR
Each LANDUSE MUST BE of ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Geological feature	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Geological feature occurring at site or in a catchment area.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Catchment_site		Domain :CATCHMENT_SITE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the geological feature occurs at the site or in the catchment area of the site.			
Name	:Type		Domain :GEOLOGICAL_FEATURE	
Optional	:No	Format :Num	Length :1	Unique :No
Definition	:Classification of geological features occurring at the site or in the catchment area.			

KEYS

Primary :GEOLOGICAL_FEATURE_KEY		Attribute(s) :Project, Siteno, Catchment_site, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each GEOLOGICAL_FEATURE MUST BE of ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE
OR
Each GEOLOGICAL_FEATURE MUST BE of ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Geology	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A rock occurring as part of the solid geology of a site or catchment area

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Catchment_Site		Domain :CATCHMENT_SITE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the geology occurs at the site or in the catchment area of the site.			
Name	:Type		Domain :BGS.PETMIN_CODE	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:Classification of the solid rock occurring at a site or in a catchment area.			
Name	:Age		Domain :STRATIGRAPHIC_AGE	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:Classification of the stratigraphic age of the solid rock occurring at a site or in the catchment area.			
Name	:Abundance		Domain :RELATIVE_ABUNDANCE	
Optional	:No	Format :Num	Length :2	Unique :No
Definition	:Ranking of the solid rock occurring at a site or in a catchment area in order of relative abundance.			

KEYS

Primary	:GEOLOGY_KEY	Attribute(s) :Project, Siteno, Catchment_Site, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each GEOLOGY MUST BE of ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE
OR
Each GEOLOGY MUST BE of ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE

VALIDATION RULES

NOTES AND REMARKS

This entity may only be normalised to second normal form as AGE and TYPE are functionally dependant. However, the relationship between them is complex and beyond the universe of interest of a geochemical database. Some form of reasonableness check will be required to ensure the relationship between TYPE and AGE makes sense.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Drift	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A drift material occurring at a site or in a catchment area.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Catchment_site		Domain :CATCHMENT_SITE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the drift occurs at the site or in the catchment area of the site.			
Name	:Type		Domain :DRIFT	
Optional	:No	Format :Char	Length :2	Unique :No
Definition	:Classification of drift material occurring at a site or in a catchment area.			
Name	:Abundance		Domain :RELATIVE_ABUNDANCE	
Optional	:No	Format :Num	Length :2	Unique :No
Definition	:Ranking of the drift material occurring at a site or in a catchment area in order of relative abundance.			

KEYS

Primary	:DRIFT_KEY	Attribute(s) :Project, Siteno, Catchment_site, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each DRIFT MUST BE of ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE
OR
Each DRIFT MUST BE of ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Clast	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A clast occurring at a site

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			

Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			

Name	:Type		Domain :BGS.PETMIN_CODE	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:Classification of the clastic material occurring at a site.			

Name	:Abundance		Domain :RELATIVE_ABUNDANCE	
Optional	:No	Format :Num	Length :2	Unique :No
Definition	:Ranking of the clast material occurring at a site in order of relative abundance.			

KEYS

Primary	:CLAST_KEY	Attribute(s) :Project, Siteno, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each CLAST MUST BE found at ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE
OR
Each CLAST MUST BE found at ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Sediment_ppt	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A sediment ppt occurring at a drainage site.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Colour		Domain PPT_COLOUR	
Optional	:No	Format :Char	Length :2	Unique :No
Definition	:Classification of the colour of the sediment ppt occurring at a drainage site.			
Name	:Colour_method		Domain COLOUR_METHOD	
Optional	:No	Format :Num	Length :2	Unique :No
Definition	:Method used to determine the colour of the sediment ppt.			
Name	:Abundance		Domain :ESTIMATED_STRENGTH	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Ranking of the sediment ppt colour in order of the estimated strength of the ppt.			

KEYS

Primary	:SEDIMENT_PPT_KEY	Attribute(s) :Project, Siteno, Colour
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each SEDIMENT_PPT MUST BE found at ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE

VALIDATION RULES

NOTES AND REMARKS

This entity is necessary for GSP data only; the color classification used is a GSP standard and is not part of the Munsell colour system used elsewhere.

Sample sub entities

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name : Geochemistry
Entity name : Sediment
Subtype of : Sample
Version : 1.002 Date : 25-MAR-91

DEFINITION
A sediment sample taken from a drainage site

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the sediment sample is a duplicate of another sediment sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :SAMPLE_TYPE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the sediment sample.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the sediment sample.			
Name	:-Mesh_size		Domain :MESH_SIZE	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Size of the mesh through which the sediment sample passed on collection.			
Name	:+Mesh_size		Domain :MESH_SIZE	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Size of the mesh through which the sediment sample did not pass on collection.			
Name	:Environment		Domain :SEDIMENTARY_ENVIRONMENT	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Classification of the stream environment from which the sediment sample was collected.			
Name	:Active_fixed		Domain :ACTIVE_FIXED	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Indicates if the sediment sample was active or fixed prior to sampling.			
Name	:Organic		Domain :ESTIMATED_ABUNDANCE	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Estimated organic content of the sediment sample.			
Name	:Clay		Domain :ESTIMATED_ABUNDANCE	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Estimated clay content of the sediment sample.			

Name	:Colour		Domain :BGS.MUNSELL_COLOUR	
Optional	:Yes	Format :*	Length :*	Unique :No
Definition	:Classification of the colour of the sediment sample.			

Name	:Colour_method		Domain :COLOUR_METHOD	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method used to determine the colour of the sediment sample.			

Name	:Colour_state		Domain :COLOUR_STATE	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Condition of the sample at the time the colour was determined.			

Name	:Colloids		Domain :ESTIMATED_ABUNDANCE	
Optional	:Yes	Format :Num	Length :1	Unique :No

KEYS

Primary	:SEDIMENT_KEY	Attribute(s) :Project, Siteno, Sample_type, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each SEDIMENT SAMPLE MAY BE found to contain ONE OR MORE MINERALS

Each SEDIMENT SAMPLE MAY BE found to contain ONE OR MORE CONTAMINANTS

Each SEDIMENT SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE

VALIDATION RULES
-Mesh_size > +Mesh_size

NOTES AND REMARKS
Reasonableness checks will be required to ensure that the relationship between sample type and sampling method makes sense and also that environment makes sense in terms of the more general classification given by active / fixed.
* See detailed domain definition for full description.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Panned	
Subtype of	: Sample	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A sediment, overburden, drillmud or rock sample that has been panned to produce a heavy-mineral concentrate.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the panned sample is a duplicate of another panned sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :SAMPLE_TYPE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the panned sample.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the panned sample.			
Name	:-Mesh_size		Domain :MESH_SIZE	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Size of the mesh through which the sample passed before panning.			
Name	:+Mesh_size		Domain :MESH_SIZE	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Size of the mesh through which the sample did not pass before panning.			
Name	:Initial_volume		Domain :VOLUME	
Optional	:Yes	Format :Num	Length :4,3	Unique :No
Definition	:Initial volume of the panned sample before panning.			
Name	:Final_volume		Domain :VOLUME	
Optional	:Yes	Format :Num	Length :4,3	Unique :No
Definition	:Final volume of the panned sample after panning.			
Name	:Panner		Domain :NAME	
Optional	:Yes	Format :Char	Length :30	Unique :No
Definition	:Name of the panner who panned the sample.			

KEYS

Primary	:PANNED_KEY	Attribute(s) :Project, Siteno, Sample_type, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each PANNED SAMPLE MAY BE found to contain ONE OR MORE MINERALS

Each PANNED SAMPLE MAY BE found to contain ONE OR MORE CONTAMINANTS

Each OVERBURDEN PANNED SAMPLE MAY BE found to contain ONE OR MORE HORIZONS

Each ROCK PANNED SAMPLE MAY BE found to contain ONE OR MORE ROCK TYPES

Each SEDIMENT PANNED SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project Siteno
Primary key Entity DRAINAGE_SITE
Where sample type indicates a panned sediment.
OR
Each ROCK PANNED SAMPLE MUST BE taken from ONE AND ONLY ONE CORE_SITE LOCATION
Foreign Key Attribute(s) Project Siteno
Primary key Entity CORE_POSITION
Where sample type indicates a panned drillmud
OR
Each ROCK PANNED SAMPLE MUST BE taken from ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project Siteno
Primary key Entity NORMAL_SITE
Where sample type indicates a panned rock.
OR
Each OVERBURDEN PANNED SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project Siteno
Primary key Entity DRAINAGE_SITE
Where sample type indicates a panned overburden.
OR
Each OVERBURDEN PANNED SAMPLE MUST BE taken from ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project Siteno
Primary key Entity NORMAL_SITE
Where sample type indicates a panned overburden.
OR
Each OVERBURDEN PANNED SAMPLE MUST BE taken from ONE AND ONLY ONE CORE_SITE LOCATION
Foreign Key Attribute(s) Project Siteno
Primary key Entity CORE_POSITION
Where sample type indicates a panned overburden.

VALIDATION RULES

Initial_volume > Final_volume
-Mesh_size > +Mesh_size

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Overburden	
Subtype of	: Sample	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

An overburden sample, either a deep overburden or a soil.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the overburden sample is a duplicate of another overburden sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :SAMPLE_TYPE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the overburden sample.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the overburden sample.			
Name	:Drift_type		Domain :DRIFT	
Optional	:Yes	Format :Char	Length :2	Unique :No
Definition	:Classification of the type of overburden sample in terms of drift.			
Name	:-Mesh_size		Domain :MESH_SIZE	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Size of the mesh through which the overburden sample passed.			
Name	:+Mesh_size		Domain :MESH_SIZE	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Size of the mesh through which the overburden sample did not pass.			

KEYS

Primary	:OVERBURDEN_KEY	Attribute(s) :Project, Siteno, Sample_type, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each OVERBURDEN SAMPLE MAY BE found to contain ONE OR MORE MINERALS

Each OVERBURDEN SAMPLE MAY BE found to contain ONE OR MORE CONTAMINANTS

Each OVERBURDEN SAMPLE MAY BE found to contain ONE OR MORE HORIZONS

Each OVERBURDEN SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE
OR
Each OVERBURDEN SAMPLE MUST BE taken from ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE
OR
Each OVERBURDEN SAMPLE MUST BE taken from ONE AND ONLY ONE CORE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity CORE_POSITION

VALIDATION RULES
-Mesh_size > +Mesh_size

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Normal_rock	
Subtype of	: Sample	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A rock sample that is not either a drillcore or drillmud sample. Usually a hand-sampled outcrop rock, or sometimes a rock taken from the bottom of a shallow drill hole drilled for overburden sampling

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the rock sample is a duplicate of another rock sample sampled from the same site.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the rock sample.			
Name	:Thickness		Domain :DISTANCE	
Optional	:Yes	Format :Num	Length :6,2	Unique :No
Definition	:Thickness of the unit from which the rock sample was collected.			
Name	:Weathering		Domain :WEATHERING	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Classification of the degree of weathering of the rock sample.			

KEYS

Primary	:NORMAL_ROCK_KEY	Attribute(s) :Project, Siteno, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each NORMAL_ROCK SAMPLE MAY BE found to contain ONE OR MORE MINERALS

Each NORMAL_ROCK SAMPLE MAY BE found to have ONE OR MORE MINERALISATION_TYPES

Each NORMAL_ROCK SAMPLE MAY BE found to have ONE OR MORE ROCK_TYPES

Each NORMAL_ROCK SAMPLE MAY BE found to have ONE OR MORE ALTERATIONS

Each NORMAL_ROCK SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE
OR
Each NORMAL_ROCK SAMPLE MUST BE taken from ONE AND ONLY ONE NORMAL_SITE LOCATION

Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Drillcore	
Subtype of	: Sample	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A drillcore rock sample taken from a borehole.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the drillcore sample is a duplicate of another drillcore sample sampled from the same site.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the drillcore sample.			

KEYS

Primary	:DRILLCORE_KEY	Attribute(s) :Project, Siteno, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each DRILLCORE ROCK SAMPLE MAY BE found to contain ONE OR MORE MINERALS

Each DRILLCORE ROCK SAMPLE MAY BE found to have ONE OR MORE MINERALISATION_TYPES

Each DRILLCORE ROCK SAMPLE MAY BE found to have ONE OR MORE ROCK_TYPES

Each DRILLCORE ROCK SAMPLE MAY BE found to have ONE OR MORE ALTERATIONS

Each DRILLCORE ROCK SAMPLE MUST BE taken from ONE AND ONLY ONE CORE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity CORE_POSITION

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Drillmud	
Subtype of	: Sample	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A drillmud sample produced when drilling a borehole.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the drillmud sample is a duplicate of another drillmud sample sampled from the same site.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the drillmud sample.			
Name	:Colour		Domain :BGS.MUNSELL_COLOUR	
Optional	:Yes	Format :*	Length :*	Unique :No
Definition	:Classification of the colour of the drillmud sample.			
Name	:Colour_method		Domain :COLOUR_METHOD	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method used to determine the colour of the drillmud sample.			
Name	:Colour_state		Domain :COLOUR_STATE	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Condition of the sample at the time the colour was determined.			
Name	:Texture		Domain :SOIL_TEXTURE	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Classification of the relative abundance of 3 size fractions making up the drillmud sample.			

KEYS

Primary	:DRILLMUD_KEY	Attribute(s) :Project, Siteno, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each DRILLMUD SAMPLE MUST BE taken from ONE AND ONLY ONE CORE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity CORE_POSITION

VALIDATION RULES

NOTES AND REMARKS

* See detailed domain definition for full description.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Water	
Subtype of	: Sample	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A water sample, usually taken from a drainage location although it can sometimes be taken from a borehole

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the water sample is a duplicate of another water sample sampled from the same site.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the water sample.			
Name	:Temperature		Domain :TEMPERATURE	
Optional	:Yes	Format :Num	Length :2	Unique :No
Definition	:Temperature of the water sample.			
Name	:Conductivity		Domain :CONDUCTIVITY	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Conductivity of the water sample.			
Name	:pH		Domain :PH	
Optional	:Yes	Format :Num	Length :3,1	Unique :No
Definition	:pH of the water sample.			
Name	:Eh		Domain :EH	
Optional	:Yes	Format :Num	Length :3,1	Unique :No
Definition	:Eh of the water sample.			
Name	:Colour		Domain :BGS.MUNSELL_COLOUR	
Optional	:Yes	Format :*	Length :*	Unique :No
Definition	:Classification of the colour of the water sample.			
Name	:Colour_method		Domain :COLOUR_METHOD	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method used to determine the colour of the water sample.			
Name	:Colour_state		Domain :COLOUR_STATE	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Condition of the sample at the time the colour was determined.			

Name	:Opaqueness		Domain :ESTIMATED_STRENGTH	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Ranking of the estimated strength of the opacity of the water sample.			

Name	:Bicarbonate		Domain :PPM_ABUNDANCE	
Optional	:Yes	Format :Num	Length :5,1	Unique :No
Definition	:Total alkalinity expressed as equivalent bicarbonate concentration.			

KEYS

Primary	:WATER_KEY	Attribute(s) :Project, Siteno, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each WATER SAMPLE MAY BE found to contain ONE OR MORE CONTAMINANTS

Each WATER SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE
OR
Each WATER SAMPLE MUST BE taken from ONE AND ONLY ONE CORE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity CORE_POSITION

VALIDATION RULES

NOTES AND REMARKS

A sample is normally defined as material that is taken away from the site for later examination. However, certain attributes, such as temperature, may be measured at the site, not on the sample which is take away. Other samples may be collected at the site, have only one determination made on them, such as pH, before they are discarded. The distinctions between measurements made on the sample or at the site are therefore not always apparent. Similar problems exist for gas samples.

* See detailed domain definition.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Vegetation	
Subtype of	: Sample	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A sample consisting of plant matter

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the vegetation sample is a duplicate of another vegetation sample sampled from the same site.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the vegetation sample.			

KEYS

Primary	:VEGETATION_KEY	Attribute(s) :Project, Siteno, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each VEGETATION SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE
OR
Each VEGETATION SAMPLE MUST BE taken from ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE

VALIDATION RULES

NOTES AND REMARKS

As yet no attributes exist for vegetation samples: this entity will require future work.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name : Geochemistry
Entity name : Gas
Subtype of : Sample
Version : 1.002 Date : 25-MAR-91

DEFINITION
A gas sample

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area.			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :DUPLICATE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the gas sample is a duplicate of another gas sample sampled from the same site.			
Name	:Sampling_method		Domain :SAMPLING_METHOD	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Method of collection of the gas sample.			

KEYS

Primary	:GAS_KEY	Attribute(s) :Project, Siteno, Duplicate
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each GAS SAMPLE MUST BE taken from ONE AND ONLY ONE DRAINAGE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity DRAINAGE_SITE
OR
Each GAS SAMPLE MUST BE taken from ONE AND ONLY ONE NORMAL_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity NORMAL_SITE
OR
Each GAS SAMPLE MUST BE taken from ONE AND ONLY ONE CORE_SITE LOCATION
Foreign Key Attribute(s) Project, Siteno
Primary key Entity CORE_SITE

VALIDATION RULES

NOTES AND REMARKS
As yet no attributes exist for gas samples: this entity will require future work.

Sample description entities

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Rock type	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A type of rock making up a rock sample

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the rock sample is a duplicate of another rock sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the rock sample.			
Name	:Type		Domain :BGS.PETMIN_CODE	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:Classification of the rock type making up the rock sample.			
Name	:Lithostrat_age		Domain :STRATIGRAPHIC_AGE	
Optional	:Yes	Format :Char	Length :4	Unique :No
Definition	:Classification of the lithostratigraphic age of the rock type making up the rock sample.			
Name	:Chronostrat_age		Domain :STRATIGRAPHIC_AGE	
Optional	:Yes	Format :Char	Length :4	Unique :No
Definition	:Classification of the chronostratigraphic age of the rock type making up the rock sample.			
Name	:Abundance		Domain :PERCENTAGE_ABUNDANCE	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Abundance of the rock type as a percentage of the sample.			
Name	:Colour		Domain :BGS.MUNSELL_COLOUR	
Optional	:Yes	Format :*	Length :*	Unique :No
Definition	:Classification of the colour of the rock type making up the rock sample.			
Name	:Colour_method		Domain :COLOUR_METHOD	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method used to determine the colour of the rock type making up the rock sample.			
Name	:Colour_state		Domain :COLOUR_STATE	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Condition of the sample at the time the colour was determined.			

KEYS

Primary	:ROCK_TYPE_KEY	Attribute(s) :Project, Siteno, Duplicate, Sample_type, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each ROCK_TYPE MUST BE of ONE AND ONLY ONE NORMAL ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity NORMAL_ROCK
Where sample type indicates a normal rock
OR
Each ROCK_TYPE MUST BE of ONE AND ONLY ONE DRILLCORE ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity DRILLCORE
Where sample type indicates a drillcore rock
OR
Each ROCK_TYPE MUST BE of ONE AND ONLY ONE DRILLMUD ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity DRILLMUD
Where sample type indicates a drillmud rock
OR
Each ROCK_TYPE MUST BE of ONE AND ONLY ONE ROCK PANNED SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity PANNED
Where sample type indicates a panned rock or panned drillmud rock

VALIDATION RULES

NOTES AND REMARKS

*	See detailed domain definition.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Alteration	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A type of alteration found in a rock sample. (Does not apply to drillmud samples)

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the rock sample is a duplicate of another rock sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the rock sample.			
Name	:Type		Domain :ALTERATION	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the alteration type occurring in the rock sample.			
Name	:Abundance		Domain :PERCENTAGE_ABUNDANCE	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Abundance of the alteration type as a percentage of the rock sample.			

KEYS

Primary	:ALTERATION_KEY	Attribute(s) :Project, Siteno, Duplicate, Sample_type, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each ALTERATION MUST BE of ONE AND ONLY ONE DRILLCORE ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity DRILLCORE
Where sample type indicates drillcore rock
OR
Each ALTERATION MUST BE of ONE AND ONLY ONE NORMAL ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity NORMAL_ROCK
Where sample type indicates normal rock

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Mineralisation Type	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A type of mineralisation found in a rock sample (Does not apply to drillmud samples)

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the rock sample is a duplicate of another rock sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the rock sample.			
Name	:Type		Domain :MINERALISATION	
Optional	:No	Format :Num	Length :1	Unique :No
Definition	:Classification of the mineralisation style occurring in the rock sample.			
Name	:Abundance		Domain :PERCENTAGE_ABUNDANCE	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Abundance of the mineralisation style as a percentage of the rock sample.			

KEYS

Primary	:MINERALISATION_TYPE_KEY	Attribute(s) :Project, Siteno, Duplicate, Sample_type, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each MINERALISATION_TYPE MUST BE of ONE AND ONLY ONE DRILLCORE ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity DRILLCORE
Where sample type indicates a drillcore rock
OR
Each MINERALISATION_TYPE MUST BE of ONE AND ONLY ONE NORMAL ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity NORMAL_ROCK
Where sample type indicates a normal rock

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Horizon	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A horizon found within an overburden sample.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the overburden sample is a duplicate of another overburden sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the overburden sample.			
Name	:Type		Domain :HORIZON	
Optional	:No	Format :Char	Length :8	Unique :No
Definition	:Classification of the horizon type found in the overburden sample.			
Name	:Colour		Domain :BGS.MUNSELL_COLOUR	
Optional	:Yes	Format :*	Length :*	Unique :No
Definition	:Classification of the colour of the horizon found in the overburden sample.			
Name	:Colour_method		Domain :COLOUR_METHOD	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Method used to determine the colour of the horizon found in the overburden sample.			
Name	:Colour_state		Domain :COLOUR_STATE	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Condition of the sample at the time the colour was determined.			
Name	:Texture		Domain :SOIL_TEXTURE	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Classification of the relative abundance of 3 size fractions making up the horizon found in the overburden sample.			
Name	:Peat		Domain :PEAT	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Classification of the humification of the horizon found in the overburden sample.			
Name	:Soil_type		Domain :SOIL	
Optional	:Yes	Format :Num	Length :1	Unique :No
Definition	:Classification of the soil type of the horizon found in the overburden sample.			

KEYS

Primary	:HORIZON_KEY	Attribute(s) :Project, Siteno, Duplicate, Sample_type, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each HORIZON MUST BE found in ONE AND ONLY ONE OVERBURDEN SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity OVERBURDEN
OR
Each HORIZON MUST BE found in ONE AND ONLY ONE OVERBURDEN PANNED SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity PANNED

VALIDATION RULES

NOTES AND REMARKS

* See detailed domain definition.

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Mineral	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A mineral species or group found in a sample.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the sample is a duplicate of another sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the sample .			
Name	:Type		Domain :BGS.PETMIN_CODE	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:Classification of the mineral found in the sample.			
Name	:Abundance		Domain :PERCENTAGE_ABUNDANCE	
Optional	:Yes	Format :Num	Length :3	Unique :No
Definition	:Abundance of the mineral as a percentage of the sample.			

KEYS

Primary	:MINERAL_KEY	Attribute(s) :Project, Siteno, Duplicate, Sample_type, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each MINERAL MUST BE found in ONE AND ONLY ONE OVERBURDEN SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity OVERBURDEN
Where sample_type indicates an overburden sample
OR
Each MINERAL MUST BE found in ONE AND ONLY ONE NORMAL ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity NORMAL_ROCK
Where sample type indicates a normal rock
OR
Each MINERAL MUST BE found in ONE AND ONLY ONE DRILLCORE ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity DRILLCORE

Where sample type indicates a drillcore rock
OR
Each MINERAL MUST BE found in ONE AND ONLY ONE PANNED SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity PANNED
Where sample type indicates a panned sample
OR
Each MINERAL MUST BE found in ONE AND ONLY ONE SEDIMENT SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity SEDIMENT
Where sample type indicates a sediment sample

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Contaminant	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A contaminant found in a sample.

ATTRIBUTES

Name	:Project		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area			
Name	:Siteno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :5	Unique :No
Definition	:Number given to the site.			
Name	:Duplicate		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Indicates if the sample is a duplicate of another sample of the same type sampled from the same site.			
Name	:Sample_type		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the sample.			
Name	:Type		Domain :CONTAMINANT	
Optional	:No	Format :Char	Length :2	Unique :No
Definition	:Classification of the contaminant found in the sample.			

KEYS

Primary	:CONTAMINANT_KEY	Attribute(s) :Project, Siteno, Duplicate, Sample_type, Type
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each CONTAMINANT MUST BE found in ONE AND ONLY ONE OVERBURDEN SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity OVERBURDEN
Where sample type indicates an overburden sample
OR
Each CONTAMINANT MUST BE found in ONE AND ONLY ONE PANNED SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity PANNED
Where sample type indicates a panned sample
OR
Each CONTAMINANT MUST BE found in ONE AND ONLY ONE SEDIMENT SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity SEDIMENT
Where sample type indicates a sediment sample
OR
Each CONTAMINANT MUST BE found in ONE AND ONLY ONE WATER SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity WATER

Where sample type indicates a water sample

VALIDATION RULES

NOTES AND REMARKS

This entity may also relate to potential contamination from contaminants observed at the site but not necessarily seen in the sample.

Batch and sample information entities

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Project batch	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A sub batch of samples with the same Geochemistry Project code and Sample type, submitted for analysis to an analytical laboratory as part of an analysis batch.

ATTRIBUTES

Name	:Lab		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:The analytical laboratory responsible for issuing the analysis batch number.			
Name	:Batch_id		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :8	Unique :No
Definition	:The unique batch number issued by an analytical laboratory to identify the batch of samples.			
Name	:Numbering_system		Domain :NUMBERING_SYSTEM	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:British Geological Survey numbering system used to number samples.			
Name	:Project		Domain :PROJECT	
Optional	:No	Format :Char	Length :3	Unique :No
Definition	:Geochemistry project code referring to a collector or an area.			
Name	:Min_siteno		Domain :SITENO	
Optional	:Yes	Format :Num	Length :5	Unique :No
Definition	:Minimum siteno of the project batch.			
Name	:Max_siteno		Domain :SITENO	
Optional	:Yes	Format :Num	Length :5	Unique :No
Definition	:Maximum siteno of the project batch.			
Name	:Sample_type		Domain :SAMPLE_TYPE	
Optional	:No	Format :Char	Length :1	Unique :No
Definition	:Classification of the sample type of the project batch.			
Name	:Samples		Domain :QUANTITY	
Optional	:Yes	Format :Num	Length :5	Unique :No
Definition	:Total number of samples in the project batch.			

KEYS

Primary	:PROJECT_BATCH_KEY	Attribute(s) :Lab, Batch_id, Project, Sample_type, Numbering_system
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each PROJECT_BATCH MUST BE made up of ONE OR MORE SAMPLES
Foreign Key Attribute(s)
Primary Key Entity
Many to many relationship makes constraints impossible.

Each PROJECT_BATCH MUST BE in ONE AND ONLY ONE BATCH

Foreign Key Attribute(s) Lab, Batch
Primary Key Entity BATCH

VALIDATION RULES

Max_siteno > = Min_siteno

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Batch	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A batch of samples, registered as a batch by a laboratory.

ATTRIBUTES

Name	:Lab		Domain :ORGANISATION	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:The analytical laboratory responsible for issuing the analysis batch number.			
Name	:Batch_id		Domain :BATCH_ID	
Optional	:No	Format :Char	Length :8	Unique :No
Definition	:The unique batch number issued by an analytical laboratory to identify the batch of samples.			
Name	:Owned_by		Domain :NAME	
Optional	:Yes	Format :Char	Length :30	Unique :No
Definition	:Name of the person currently responsible for the batch.			
Name	:Registered		Domain :DATE	
Optional	:Yes	Format :Date	Length :9	Unique :No
Definition	:Date of registration of the batch.			
Name	:Reg_date_accuracy		Domain :DATE_ACCURACY	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Accuracy of the date of registration of the batch.			
Name	:Geographical_area		Domain :GEOGRAPHICAL_AREA	
Optional	:Yes	Format :Char	Length :50	Unique :No
Definition	:Geographical area from which the samples were collected.			
Name	:Locality		Domain :BGS.GAZETTEER	
Optional	:Yes	Format :Char	Length :50	Unique :No
Definition	:Geographical locality from which the samples were collected.			
Name	:Notes		Domain :TEXT	
Optional	:Yes	Format :Char	Length :240	Unique :No
Definition	:Notes on the samples in the batch which may be of use to the analytical or sample preparation staff.			

KEYS

Primary	:BATCH_KEY	Attribute(s) :Lab, Batch_id
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each BATCH MAY BE submitted for ONE OR MORE PREPARATIONs

Each BATCH MAY BE submitted for ONE OR MORE ANALYSES

Each BATCH MUST BE made up of ONE OR MORE PROJECT_BATCHES
Foreign Key Attribute(s) Lab, Batch_id
Primary Key Entity PROJECT_BATCH

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Analysis	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

An analysis carried out or to be carried out by an analytical laboratory on a batch of samples by a particular method of analysis.

ATTRIBUTES

Name	:Lab		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:The analytical laboratory responsible for issuing the analysis batch number.			
Name	:Batch_id		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :8	Unique :No
Definition	:The unique batch number issued by an analytical laboratory to identify the batch of samples.			
Name	:Method		Domain :ANALYSIS_METHOD	
Optional	:No	Format :Char	Length :6	Unique :No
Definition	:Method of analysis carried out or to be carried out on the batch of samples.			
Name	:Requested_by		Domain :NAME	
Optional	:Yes	Format :Char	Length :30	Unique :No
Definition	:Name of the person who requested the analysis.			
Name	:Requested		Domain :DATE	
Optional	:Yes	Format :Date	Length :9	Unique :No
Definition	:Date on which the analysis was requested.			
Name	:Req_date_accuracy		Domain :DATE_ACCURACY	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Accuracy of the date on which the analysis was requested.			
Name	:Requested_for		Domain :DATE	
Optional	:Yes	Format :Date	Length :9	Unique :No
Definition	:Date by which the analysis is to be reported.			
Name	:Req_for_date_accuracy		Domain :DATE_ACCURACY	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Accuracy of the date by which the analysis is to be reported.			
Name	:Received		Domain :DATE	
Optional	:Yes	Format :Date	Length :9	Unique :No
Definition	:Date on which the prepared batch of samples was received by the analytical laboratory.			
Name	:Rec_date_accuracy		Domain :DATE_ACCURACY	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Accuracy of the date on which the prepared batch of samples was received by the analytical laboratory.			
Name	:Reported		Domain :DATE	
Optional	:Yes	Format :Date	Length :9	Unique :No
Definition	:Date on which the analyte determinations were reported by the analytical laboratory.			

Name	:Rep_date_accuracy		Domain :DATE_ACCURACY	
Optional	:Yes	Format :Char	Length :1	Unique :No
Definition	:Accuracy of the date on which the analyte determinations were reported by the analytical laboratory.			

Name	:Costing_code		Domain :BGS.COSTING_CODE	
Optional	:Yes	Format :Char	Length :9	Unique :No
Definition	:British Geological Survey costing code to which the cost of analysis was or will be charged.			

Name	:Cost		Domain :MONEY	
Optional	:Yes	Format :Num	Length :6,2	Unique :No
Definition	:Cost of the analysis charged to the costing code.			

KEYS

Primary	:ANALYSIS_KEY	Attribute(s) :Lab, Batch_id, Method
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each ANALYSIS MAY BE carried out to determine ONE OR MORE ANALYTES

Each ANALYSIS MUST BE carried out on ONE AND ONLY ONE BATCH
Foreign Key Attribute(s) Lab, Batch_id
Primary Key Entity BATCH

VALIDATION RULES

Requested > = BATCH.Registered
Received > = Requested
Received > = PREPARATION.Reported
Reported > = Received

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name : Geochemistry
Entity name : Preparation
Subtype of :
Version : 1.002 Date : 25-MAR-91

DEFINITION
A series of mechanical processes carried out or to be carried out on a batch of samples to facilitate chemical analysis.

ATTRIBUTES

Name :Lab Domain :FOREIGN KEY
Optional :No Format :Char Length :4 Unique :No
Definition :The analytical laboratory responsible for issuing the analysis batch number.

Name :Batch_id Domain :FOREIGN KEY
Optional :No Format :Char Length :8 Unique :No
Definition :The unique batch number issued by an analytical laboratory to identify one batch of samples.

Name :Prepno Domain :SEQUENCE
Optional :No Format :Num Length :2 Unique :No
Definition :The order in which the preparation is carried out on the batch of samples relative to other preparations carried out on the same batch.

Name :Received Domain :DATE
Optional :Yes Format :Date Length :9 Unique :No
Definition :Date on which the batch of samples was received by the sample preparation laboratory.

Name :Rec_date_accuracy Domain :DATE_ACCURACY
Optional :Yes Format :Char Length :1 Unique :No
Definition :Accuracy of the date on which the batch of samples was received by the sample preparation laboratory.

Name :Prepared Domain :DATE
Optional :Yes Format :Date Length :9 Unique :No
Definition :Date on which the preparation of the batch of samples was completed.

Name :Prep_date_accuracy Domain :DATE_ACCURACY
Optional :Yes Format :Char Length :1 Unique :No
Definition :Accuracy of the date on which the preparation of the batch of samples was completed.

Name :Costing_code Domain :BGS.COSTING_CODE
Optional :Yes Format :Char Length :8 Unique :No
Definition :British Geological Survey costing code to which the cost of preparation was or will be charged

Name :Cost Domain :MONEY
Optional :Yes Format :Num Length :6,2 Unique :No
Definition :Cost of preparation charged to the costing code.

KEYS
Primary :PREPARATION_KEY Attribute(s) :Lab, Batch_id, Prepno,
Alternate : Attribute(s) :

RELATIONSHIPS

Each PREPARATION MAY BE made up of ONE OR MORE PROCESS_STEPS

Each PREPARATION MUST BE carried out on ONE AND ONLY ONE BATCH

Foreign Key Attribute(s) Lab, Batch_id
Primary Key Entity BATCH

VALIDATION RULES

Received > = BATCH.Registered
Prepared > = Received

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name : Geochemistry
Entity name : Process step
Subtype of :
Version : 1.002 Date : 25-MAR-91

DEFINITION

A mechanical or other process carried out or to be carried out during the preparation of a batch of samples.

ATTRIBUTES

Name	:Lab		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:The analytical laboratory responsible for issuing the analysis batch number.			
Name	:Batch_id		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :8	Unique :No
Definition	:The unique batch number issued by an analytical laboratory to identify one batch of samples.			
Name	:Prepno		Domain :FOREIGN KEY	
Optional	:No	Format :Num	Length :2	Unique :No
Definition	:The order in which the preparation is carried out on the batch of samples relative to other preparations carried out on the same batch.			
Name	:Process_order		Domain :SEQUENCE	
Optional	:No	Format :Num	Length :2	Unique :No
Definition	:The order in which the process step is carried out during the preparation of the batch relative to other process steps carried out during the same preparation of the same batch.			
Name	:Process		Domain :PROCESS	
Optional	:Yes	Format :Char	Length :3	Unique :No
Definition	:Classification of the process step carried out as part of a preparation.			
Name	:Quantity		Domain :QUANTITY	
Optional	:Yes	Format :Num	Length :4	Unique :No
Definition	:Quantity of the sample to which each process step is applied.			
Name	:Quantity_unit		Domain :QUANTITY_UNIT	
Optional	:Yes	Format :Char	Length :2	Unique :No
Definition	:Units of the quantity measurement			

KEYS

Primary	:PROCESS_STEP_KEY	Attribute(s) :Lab, Batch_id, Prepno, Process_order
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each PROCESS_STEP MUST BE part of ONE AND ONLY ONE PREPARATION
Foreign Key Attribute(s) Lab, Batch_id, Prepno
Primary Key Entity PREPARATION

VALIDATION RULES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name	: Geochemistry	
Entity name	: Analyte	
Subtype of	:	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

An analyte determined or to be determined as part of an analysis.

ATTRIBUTES

Name	:Lab		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :4	Unique :No
Definition	:The analytical laboratory responsible for issuing the analysis batch number.			
Name	:Batch_id		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :8	Unique :No
Definition	:The unique batch number issued by an analytical laboratory to identify one batch of samples.			
Name	:Method		Domain :FOREIGN KEY	
Optional	:No	Format :Char	Length :6	Unique :No
Definition	:Method of analysis carried out or to be carried out on the batch of samples.			
Name	:Analyte		Domain :ANALYTE	
Optional	:No	Format :Char	Length :2	Unique :No
Definition	:Analyte to be determined.			
Name	:Lower_limit		Domain :PPM_ABUNDANCE	
Optional	:Yes	Format :Num	Length :13,6	Unique :No
Definition	:The lower limit of detection of the analyte by the method of analysis.			
Name	:Upper_limit		Domain :PPM_ABUNDANCE	
Optional	:Yes	Format :Num	Length :13,6	Unique :No
Definition	:The upper limit of detection of the analyte by the method of analysis.			

KEYS

Primary	:ANALYTE_KEY	Attribute(s) :Lab, Batch_id, Method, Analyte
Alternate	:	Attribute(s) :

RELATIONSHIPS

Each ANALYTE MUST BE determined by ONE AND ONLY ONE ANALYSIS
Foreign Key Attribute(s) Lab, Batch_id, Method
Primary Key Entity ANALYSIS

Each ANALYTE MAY BE analysed to produce ONE OR MORE ANALYTE_DETERMINATIONs

VALIDATION RULES

Analyte determination entity

BRITISH GEOLOGICAL SURVEY
DETAILED ENTITY DEFINITION

Database name : Geochemistry
Entity name : Analyte determination
Subtype of :
Version : 1.002 Date : 25-MAR-91

DEFINITION
A determination by a given method of the abundance of a given analyte in a given sample.

ATTRIBUTES

Name :Project Domain :FOREIGN KEY
Optional :No Format :Char Length :3 Unique :No
Definition :Geochemistry project code referring to a collector or an area

Name :Siteno Domain :FOREIGN KEY
Optional :No Format :Num Length :5 Unique :No
Definition :Number given to the site.

Name :Sample_type Domain :FOREIGN KEY
Optional :No Format :Char Length :1 Unique :No
Definition :Classification of the sample type of the sample.

Name :Duplicate Domain :FOREIGN KEY
Optional :No Format :Char Length :1 Unique :No
Definition :Indicates if the sample is a duplicate of another sample of the same type sampled from the same site.

Name :Lab Domain :FOREIGN KEY
Optional :No Format :Char Length :4 Unique :No
Definition :Analytical laboratory responsible for issuing the analysis batch number.

Name :Batch_id Domain :FOREIGN KEY
Optional :No Format :Char Length :8 Unique :No
Definition :The unique batch number issued by an analytical laboratory to identify the batch to which the analyte determination belongs.

Name :Method Domain :FOREIGN KEY
Optional :No Format :Char Length :6 Unique :No
Definition :Method of analysis carried out on the sample.

Name :Analyte Domain :FOREIGN KEY
Optional :No Format :Char Length :6 Unique :No
Definition :The analyte determined by the analysis.

Name :Abundance Domain :PPM_ABUNDANCE
Optional :Yes Format :Num Length :13,6 Unique :No
Definition :The abundance determined of the analyte in parts per million.

Name :Qualifier Domain :ANALYSIS_QUALIFIER
Optional :Yes Format :Char Length :1 Unique :No
Definition :Indicator of the quality of the determined abundance.

KEYS
Primary :ANALYTE_DETERMINATION_KEY Attribute(s): Project, Siteno, Sample_type, Duplicate, Lab, Batch_id, Method, Analyte,

Alternate : Attribute(s) :

RELATIONSHIPS

Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE SEDIMENT SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity SEDIMENT
Where the sample type indicates a sediment sample
OR
Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE PANNED SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity PANNED
Where the sample type indicates a panned sample
OR
Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE OVERBURDEN SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate, Sample_type
Primary Key Entity OVERBURDEN
Where the sample type indicates an overburden sample
OR
Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE NORMAL ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity NORMAL ROCK
Where the sample type indicates a normal rock sample
OR
Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE DRILLCORE ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity DRILLCORE
Where the sample type indicates a drillcore rock sample
OR
Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE DRILLMUD ROCK SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity DRILLMUD
Where the sample type indicates a drillmud rock sample
OR
Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE WATER SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity WATER
Where the sample type indicates a water sample
OR
Each ANALYTE_DETERMINATION MUST BE derived from ONE AND ONLY ONE VEGETATION SAMPLE
Foreign Key Attribute(s) Project, Siteno, Duplicate
Primary Key Entity VEGETATION
Where the sample type indicates a vegetation sample

Each ANALYTE_DETERMINATION MUST BE determined for ONE AND ONLY ONE ANALYTE
Foreign Key Attributes(s) Lab, Batch_id, Method, Analyte
Primary Key Entity ANALYTE

VALIDATION RULES

NOTES AND REMARKS

DETAILED DOMAIN DEFINITIONS

The following chapter contains detailed domain definitions for every domain of every attribute identified by the data analysis. The chapter contains two types of domain; domains modelled as validation rules and domains modelled as meta data entities. The domains are arranged in alphabetical order.

Index of detailed domain definitions

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Active fixed
Version : 1.002 Date : 25-MAR-91

DEFINITION
Indicates if a sediment was active or fixed.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Active sediment	Sediment occurring below the highest water level of the stream.
2	Fixed sediment	Sediment occurring above the highest water level of the stream. River terrace material.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Alteration
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of the style of alteration.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
U	Undifferentiated	
A	Argillic	
B	Propylitic	
C	Kaolinisation	
D	Sericitic	
E	Phyllic	
F	Silicification	
G	Potassic	
H	Epidotisation	
I	Chloritisation	
J	Fenitisation	
K	Amphibolisation	
L	Serpentinisation	
M	Carbonation	
N	Hematitisation	
O	Tourmalinisation	
P	Zeolitisation	

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Analysis method
Version : 1.002 Date : 25-MAR-91

DEFINITION
Method of chemical analysis.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
AAS	Atomic Absorption Spectrometry	Atomic Absorption Spectrometry
BERYL	Beryllometry	Gamma excitation of Beryllium and detection of neutrons
BETAP	Beta Probe	Direct electron excitation X-ray spectrometry.
COL	Colorimetric Method	Colorimetric Method
COLHEX	Colorimetric Hot Extractable	Colorimetric Hot Extractable
DNA	Delayed Neutron Activation	Delayed Neutron Activation
DCOES	Direct Reading Optical Emission Spectroscopy	Direct Reading Optical Emission Spectroscopy
ETAAS	Electrothermal AAS	Electrothermal Atomic Absorption Spectrometry
FAAS	Fire Assay Atomic Absorption Spectroscopy	Fire Assay Atomic Absorption Spectroscopy
FDCP	Fire Assay d.c. Plasma	Fire Assay d.c. Plasma
FICP	Fire Assay Inductively Coupled Plasma Atomic Emission Spectrometry	Fire Assay Inductively Coupled Plasma Atomic Emission Spectrometry
FICPMS	Fire Assay Inductively Coupled Plasma Mass Spectrometry	Fire Assay Inductively Coupled Plasma Mass Spectrometry
FLAAS	Flame Atomic Absorption Spectrometry	Flame Atomic Absorption Spectrometry.
FLAES	Flame Atomic Emission Spectrometry	Flame Atomic Emission Spectrometry.
FNA	Fire Assay Neutron Activation	Fire Assay Neutron Activation
GRAV	Gravimetric method	Gravimetric method
HYICP	Hydride Generation Inductively Coupled Plasma	Hydride Generation Inductively Coupled Plasma
ICP	Inductively Coupled Plasma	Inductively Coupled Plasma
ICPMS	Inductively Coupled Plasma Mass Spectrometry	Inductively Coupled Plasma Mass Spectrometry
ISE	Ion Selective Electrode	Ion Selective Electrode
LAICP	Laser Ablation ICP- MS	Laser Ablation ICP-MS
NA	Neutron Activation	Neutron Activation
OES	Optical Emission Spectroscopy	Optical Emission Spectroscopy
SPPHOT	Spectrophotometric method	Spectrophotometric method
TITRE	Titrimetric method	Titrimetric method
XRF	X-Ray Fluorescence Pressed Pellets	X-Ray Fluorescence Pressed Pellets
XRFB	X-Ray Fluorescence On Fused Beads	X-Ray Fluorescence On Fused Beads

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS
The codes used are kept to a maximum of 6 characters to save space in the physical implementation. Abbreviations in common use are employed where possible.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Analysis qualifier	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Indicator of the probable abundance of an analyte which could not be precisely determined.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
<	Probably low	Not determined due to interference: probably low.
>	Probably high	Not determined due to interference: probably high.
^	No estimate possible	Not determined due to interference: no estimate possible.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

Several analytical methods are very inaccurate at concentrations outside the range for which they are calibrated or because of inter-element interference (particularly on 'background' positions in a spectrum). The analyst is therefore reluctant to quote a result beyond a qualitative > or < particular values.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Analyte
Version : 1.002 Date : 25-MAR-91

DEFINITION
An element determined, or to be determined, by chemical analysis.

VALIDATION RULES
Must be a valid code.

SYMBOL	NAME	ATOMIC NUMBER, WEIGHT	
H	Hydrogen	1	1.008
He	Helium	2	4.003
Li	Lithium	3	6.939
Be	Beryllium	4	9.012
B	Boron	5	10.811
C	Carbon	6	12.011
N	Nitrogen	7	14.007
O	Oxygen	8	15.999
F	Fluorine	9	18.998
Ne	Neon	10	20.183
Na	Sodium	11	22.99
Mg	Magnesium	12	24.312
Al	Aluminium	13	26.982
Si	Silicon	14	28.086
P	Phosphorus	15	30.974
S	Sulphur	16	32.064
Cl	Chlorine	17	35.453
Ar	Argon	18	39.948
K	Potassium	19	39.102
Ca	Calcium	20	40.08
Sc	Scandium	21	44.956
Ti	Titanium	22	47.9
V	Vanadium	23	50.942
Cr	Chromium	24	51.996
Mn	Manganese	25	54.938
Fe	Iron	26	55.847
Co	Cobalt	27	58.933
Ni	Nickel	28	58.71
Cu	Copper	29	63.546
Zn	Zinc	30	65.37
Ga	Gallium	31	69.72
Ge	Germanium	32	72.59
As	Arsenic	33	74.922
Se	Selenium	34	78.96
Br	Bromine	35	79.904
Kr	Krypton	36	83.8
Rb	Rubidium	37	85.47
Sr	Strontium	38	87.62
Y	Yttrium	39	88.905
Zr	Zirconium	40	91.22
Nb	Niobium	41	92.906
Mo	Molybdenum	42	95.94
Tc	Technetium	43	98

Ru	Ruthenium	44	101.07
Rh	Rhodium	45	102.905
Pd	Palladium	46	106.4
Ag	Silver	47	107.868
Cd	Cadmium	48	112.4
In	Indium	49	114.82
Sn	Tin	50	118.69
Sb	Antimony	51	121.75
Te	Tellurium	52	127.6
I	Iodine	53	126.904
Xe	Xenon	54	131.3
Cs	Caesium	55	132.905
Ba	Barium	56	137.34
La	Lanthanum	57	138.91
Ce	Cerium	58	140.12
Pr	Praseodymium	59	140.907
Nd	Neodymium	60	144.24
Pm	Promethium	61	145
Sm	Samarium	62	150.35
Eu	Europium	63	151.96
Gd	Gadolinium	64	157.25
Tb	Terbium	65	158.924
Dy	Dysprosium	66	162.5
Ho	Holmium	67	164.93
Er	Erbium	68	167.26
Tm	Thulium	69	168.934
Yb	Ytterbium	70	173.04
Lu	Lutecium	71	174.97
Hf	Hafnium	72	178.49
Ta	Tantalum	73	180.948
W	Tungsten	74	183.85
Re	Rhenium	75	186.2
Os	Osmium	76	190.2
Ir	Iridium	77	192.2
Pt	Platinum	78	195.09
Au	Gold	79	196.967
Hg	Mercury	80	200.59
Tl	Thallium	81	204.37
Pb	Lead	82	207.19
Bi	Bismuth	83	208.98
Po	Polonium	84	209
At	Astatine	85	210
Rn	Radon	86	222
Fr	Frankium	87	223
Ra	Radium	88	226
Ac	Actinium	89	227
Th	Thorium	90	232.038
Pa	Protactinium	91	231
U	Uranium	92	238.03
Np	Neptunium	93	237
Pu	Plutonium	94	244
Am	Americium	95	243
Cm	Curium	96	247
Bk	Berkelium	97	247
Cf	Californium	98	251
Es	Einsteinium	99	254
Fm	Fermium	100	257
Md	Mendelevium	101	256

No	Nobelium	102	254
Lr	Lawrencium	103	257

ORIGIN AND REFERENCES

Derived from

The Periodic Table of the Elements (Netherlands : Philips.).

NOTES AND REMARKS

As presently designed, the domain definition only includes chemical elements. Other analytes may be incorporated in this domain, such as molecular or ionic species.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Area
Version : 1.002 Date : 25-MAR-91

DEFINITION
Measure of surface.

VALIDATION RULES
0 < Area < = 1000

UNITS
Square kilometres.

ORIGIN AND REFERENCES
Taken from
Uvarov, E B et al. (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Azimuth	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The clockwise angular distance of a horizontal direction from grid north.

VALIDATION RULES

0 < = Azimuth < 360

UNITS

Degrees

ORIGIN AND REFERENCES

Derived from

Uvarov, E B et al. (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Batch id	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A unique batch number issued by an analytical laboratory to identify one analytical batch of samples.

VALIDATION RULES

Must be a batch number issued by a laboratory.

ORIGIN AND REFERENCES

Established 4th April 1970 by the Analytical Chemistry Unit of the Institute of Geological Sciences.
Other analytical laboratories (Organisations) also issue batch numbers.

NOTES AND REMARKS

The structure and format of this code do not lie within the control of BGS. This domain is incomplete. Validation and completion of this domain is beyond the scope of this report.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: BGS.Bore registration	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The definitive BGS borehole index.

VALIDATION RULES

Must be a valid BGS borehole registered in the index.

ORIGIN AND REFERENCES

Taken from

Bain, K A. (1991).

NOTES AND REMARKS

See reference for a full explanation and definition of the BGS borehole index. This domain is 4 concatenated attributes which make up the primary key of the BGS Borehole entity. It is a data entity in its own right and the BGS Borehole entity should replace the Bore site entity defined in this report.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: BGS.Costing code	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The identifier of a BGS costing code against which costs are charged.

VALIDATION RULES

Must be a valid BGS costing code issued by Finance Section.

ORIGIN AND REFERENCES

NOTES AND REMARKS

The definitive list of the BGS costing codes is held by Finance Section in the MSA system.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: BGS.Gazetteer	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

All location names shown on the Ordnance Survey 1:10000 maps.

VALIDATION RULES

Must be a valid location.

ORIGIN AND REFERENCES

NOTES AND REMARKS

A full listing and explanation of the Gazetteer and structure of the domain is currently held in the Oracle table K_KAMA.GAZETTEER on the VAX at BGS Keyworth.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: BGS.Munsell colour	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Classification of colour using the Munsell coding system.

VALIDATION RULES

Must be a valid Munsell Color code.

ORIGIN AND REFERENCES

Taken from

Munsell Color (1988).

Geological Society of America (1963).

NOTES AND REMARKS

See reference for full listing and explanation of the code and its structure. The Munsell Color code is 4 concatenated attributes which define a single colour. The BGS.Munsell Oracle table translates these codes into colour names. Two colour naming systems are available Munsell Rock Colors and Munsell Soil Colors. Both use the same Munsell Color coding system but each has its own different way of translating the codes into colour names.

Name	:Hue			
Optional	:No	Format :Num	Length :3,1	Unique :Yes
Definition	:Sub-division of COLOR into into 10 units.			
Domain	: 0.0 < = Hue < = 10.0			

Name	:Color			
Optional	:No	Format :Char	Length :2	Unique :Yes
Definition	:Division of the visible spectrum into into 10 units.			
Domain	: 'R', 'RY', 'Y', 'GY', 'G', 'BG', 'B', 'PB', 'RP' and 'N' = no color			

Name	:Value			
Optional	:No	Format :Num	Length :3,1	Unique :Yes
Definition	:Division of lightness into 10 units.			
Domain	: 0.0 < = Value < = 10.0			

Name	:Chroma			
Optional	:No	Format :Num	Length :3,1	Unique :Yes
Definition	:Division of color intensity 'Chroma' into 10 units.			
Domain	: 0.0 < = Chroma < = 10.0			

Validation Rules

When COLOR = 'N'	HUE	is null
	CHROMA	is null

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: BGS.Petmin code	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
Classification of rock types and minerals.

VALIDATION RULES
Must be a valid code.

ORIGIN AND REFERENCES
Harrison and Sabine (1970).

NOTES AND REMARKS
See reference for full listing and explanation of the code and its structure.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Boreno	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The unique integer assigned to a single borehole at a particular location during a specific survey.

VALIDATION RULES
0 < Boreno

UNITS
None.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Catchment site
Version : 1.002 Date : 25-MAR-91

DEFINITION
Indicates either catchment or site.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
C	Catchment	Catchment.
S	Site	Site.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Code version
Version : 1.002 Date : 25-MAR-91

DEFINITION
Code version of Geochemical field card information.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
0	Unknown	Unknown or not necessary
68	1968	Code compatible with the 1968 Geochemical field card.
70	1970	Code compatible with the 1970 Geochemical field card.
71	1971	Code compatible with the 1971 Geochemical field card.
72	1972	Code compatible with the 1972 Geochemical field card.
74	1974	Code compatible with the 1974 Geochemical field card.
75	1975	Code compatible with the 1975 Geochemical field card.
76	1976	Code compatible with the 1976 Geochemical field card.
81	1981	Code compatible with the 1981 Geochemical field card.
87	1987	Code compatible with the 1987 Geochemical field card.
88	1988	Code compatible with the 1988 Geochemical field card.
89	1989	Code compatible with the 1989 Geochemical field card.
90	1990	Standard code used by Geochemistry database.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Colour method
Version : 1.002 Date : 25-MAR-91

DEFINITION
Method used to determine colour.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	No reference to standards	Colour derived in the field without reference to a Munsell Color Chart or a restricted list of colour names.
2	Colour names list	Colour derived in the field without reference to a Munsell Color Chart, using a restricted list of colour names.
3	Munsell Color Chart	Colour derived in the field with reference to a Munsell Color Chart.
4	Munsell Color Chart in Lab	Colour derived in the lab with reference to a Munsell Color Chart under normal lighting.
5	Munsell Color Chart in Lab	Colour derived in the lab with reference to a Munsell Color Chart under balanced lighting.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Colour state
Version : 1.002 Date : 25-MAR-91

DEFINITION

Classification of the condition of the sample when the colour was determined.

VALIDATION RULES

Must be a valid code.

CODE	PARENT	TRANSLATION	DEFINITION
000		Undifferentiated	Undifferentiated
D00	000	Dry sample	
D10	D00	Dry field sample	
D20	D00	Dry processed powder	
D30	D00	Dry pressed pellet	Dry pressed pellet with binder.
W00	000	Wet sample	
W10	W00	Wet field sample	

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Conductivity	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The reciprocal of the resistivity or specific resistance (the resistance offered by a centimetre cube of a material at 0 degrees centigrade) of a conductor.

VALIDATION RULES

0 < Conductivity < 9999

UNITS

Microsiemans (Micro Ohms $^{-1}$).

ORIGIN AND REFERENCES

Derived from
Uvarov et al. (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Contaminant
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of contamination by type.

VALIDATION RULES
Must be a valid code.

CODE	PARENT	TRANSLATION	DEFINITION
00		Undifferentiated	Undifferentiated
A0	00	Manufactured metal	Manufactured metal
A1	A0	Iron, Steel wire	Iron, steel wire
A2	A0	Galvanized iron	Galvanized iron
A3	A0	Copper	Copper
A4	A0	Lead	Lead
A5	A0	Zinc	Zinc
A6	A0	Brass	Brass
A7	A0	Aluminium	Aluminium
B0	00	Ceramic	Ceramic
B1	B0	Pottery	Pottery
B2	B0	Tiles	Tiles
B3	B0	Bricks	Bricks
B4	B0	Glazed china	Glazed china
C0	00	Glass	Glass
D0	00	Plastic	Plastic
D1	D0	Fertilizer sack	Fertilizer sack
E0	00	Rubber	Rubber
F0	00	Chemical	Chemical
F1	F0	Paint	Paint
G0	00	Liquid effluent	Liquid effluent
G1	G0	Farm effluent	Farm effluent
G2	G0	Domestic effluent	Domestic effluent
G3	G0	Industrial effluent	Industrial effluent
H0	00	Bulk industrial waste	Bulk industrial waste
H1	H0	Metal mine tailings	Metal mine tailings
H2	H0	Coal tailings	Coal tailings
H3	00	China clay tailings	China clay tailings
H4	H0	Slag (Furnace waste)	Slag (Furnace waste)
I0	00	Agro-chemical	Agro-chemical
I1	I0	Fertilizer	Fertilizer
I2	I0	Lime	Lime

ORIGIN AND REFERENCES
Derived and developed from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Date	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A date.

VALIDATION RULES

04-APR-70 < = Date < = Today

UNITS

Seconds, minutes, hours, days, months, years.

ORIGIN AND REFERENCES

Derived from

Data analysis of Geochemistry data since 1970.

NOTES AND REMARKS

The 4th April 1970 was the date on which the first Lab Number was issued by the Institute of Geological Sciences - Analytical Chemistry Unit and as such represents the start of systematic documentation of analytical results and roughly coincides with the start of the Institute of Geological Sciences - Geochemistry Unit sample numbering system.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Date accuracy
Version : 1.002 Date : 25-MAR-91

DEFINITION
Accuracy of a date.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
D	To the day	Date is accurate to the nearest day.
H	To the hour	Date is accurate to the nearest hour.
M	To the month	Date is accurate to the nearest month.
N	To the minute	Date is accurate to the nearest minute.
S	To the second	Date is accurate to the nearest second.
Y	To the year	Date is accurate to the nearest year.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Depth	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
Positive distance into a body, usually into the ground.

VALIDATION RULES
0 < = Depth

UNITS
Metres.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS
Not necessarily in a downwards direction, as it may describe a horizontal or inclined borehole.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Distance	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
A positive length.

VALIDATION RULES
0 < = Distance

UNITS
Metres.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Drainage
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of the type of drainage.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Seepage or spring	Seepage or spring.
2	Ditch	Ditch.
3	Drains	Drains, land drains.
4	Small stream	Small stream less than 3 m wide.
5	Stream	Stream about 3 to 10 m wide.
6	Small river	Small river about 10 to 33 m wide.
7	Large river	Large river greater than 33 m wide.
8	Estuary	Estuary.
A	Well or borehole	Well or borehole.
B	Pond	Pond or small area of enclosed water.
C	Lake external	Lake external, lake banks.
D	Lake internal	Lake internal, lake bed.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Drainage conditions
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of drainage conditions.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Dry	No visible surface drainage.
2	No flow	Water ponded, with dry sections.
3	Low flow	The majority of the stream bed is not covered by running water.
4	Moderate flow	Only stream boulders visible.
5	Strong flow	Only large boulders visible.
6	Channel filled	Channel filled from bank to bank.
7	Overflow	Banks of stream or river broken.
8	Spate	Stream or river in spate.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Drift
Version : 1.002 Date : 25-MAR-91

DEFINITION

Classification of drift (surface non-lithified material) by landform and origin.

VALIDATION RULES

Must be a valid code.

CODE	PARENT	TRANSLATION	DEFINITION
00		Undifferentiated	Undifferentiated.
A0	00	Marine	Deposits produced by marine action.
A1	A0	Blown sand	Dune and other forms often with shallow soil cover.
A2	A0	Sand	Fine inorganic material formed by action of water.
A3	A0	Beach active	Material in the area of active sedimentation between low water mark and high water mark, including storm beach.
A4	A0	Beach raised	Fossil beach often on wave cut platforms above present sea-level.
A5	A0	Estuarine	Mudflats, sandbanks and other material at the mouth of a stream or river.
B0	00	Fresh water	Deposits produced by fresh water action.
B1	B0	Alluvium active	Unfixed material between the banks of a Stream or river, below the highest water level.
B2	B0	Alluvium, raised terrace	Sedimentary material no longer moved by a stream, which now flows at a lower level.
B3	B0	Coarse gravel	Coarse gravel.
C0	00	Eluvial	Deposits derived from local material.
C1	C0	Soil, regolith	Loose weathered organic and inorganic material lying above bed-rock.
C2	C0	Marsh	Waterlogged weathered organic and inorganic material lying above bed-rock.
C3	C0	Peat bog	Waterlogged weathered organic material lying above bed-rock where growth of mosses and rushes is sufficient to produce peat.
C4	C0	Hill wash	Loose material moving downslope due to gravity and rain.
C5	C0	Solifluxion	Loose material moving downslope due to freeze-thaw action, may contain some locally derived angular blocks.
D0	00	Peri-Glacial	Deposits produced by peri-glacial conditions.
D1	D0	Clay with flints	Residual material arising from weathering of chalk.
D2	D0	Boulder field	Frost-shattered bed-rock, usually found as a capping of large boulders on mountain tops.
D3	D0	Scree, talus	Coarse debris on and at the foot of steep slopes or cliffs, formed of mechanically weathered bed-rock.
D4	D0	Head	Fossil soliflucted deposit.
E0	00	Glacial	Deposits produced by glacial action.
E1	E0	Till	Unsorted material ranging in size from clay to boulders, deposited by an ice-sheet in motion.
E2	E0	Moraine	Rock fragments carried in, on or below ice sheets. laid down at edges of moving sheets or during retreats.
E3	E0	Fluvioglacial	Material laid down by glacial meltwater in, under or around ice sheets.

ORIGIN AND REFERENCES

Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

This domain is taken from commonly used drift units marked on geological maps. It includes origin of the deposit (i.e. marine) and its composition (sand). It is clearly compound and therefore represents a lack of normalisation. However, it is easy to use in the field and is acceptable for geochemical uses.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Duplicate
Version : 1.002 Date : 25-MAR-91

DEFINITION
An indicator which identifies a duplicate record.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
+	No duplicate	No duplicate indicator
1	Duplicate	Duplicate indicator
2	Duplicate	Duplicate indicator
3	Duplicate	Duplicate indicator
4	Duplicate	Duplicate indicator
5	Duplicate	Duplicate indicator
6	Duplicate	Duplicate indicator
7	Duplicate	Duplicate indicator
8	Duplicate	Duplicate indicator
9	Duplicate	Duplicate indicator
A	Duplicate	Duplicate indicator
B	Duplicate	Duplicate indicator
C	Duplicate	Duplicate indicator
D	Duplicate	Duplicate indicator
E	Duplicate	Duplicate indicator
F	Duplicate	Duplicate indicator
G	Duplicate	Duplicate indicator
H	Duplicate	Duplicate indicator
I	Duplicate	Duplicate indicator
J	Duplicate	Duplicate indicator
K	Duplicate	Duplicate indicator
L	Duplicate	Duplicate indicator
M	Duplicate	Duplicate indicator
N	Duplicate	Duplicate indicator
O	Duplicate	Duplicate indicator
P	Duplicate	Duplicate indicator
Q	Duplicate	Duplicate indicator
R	Duplicate	Duplicate indicator
S	Duplicate	Duplicate indicator
T	Duplicate	Duplicate indicator
U	Duplicate	Duplicate indicator
V	Duplicate	Duplicate indicator
W	Duplicate	Duplicate indicator
X	Duplicate	Duplicate indicator
Y	Duplicate	Duplicate indicator
Z	Duplicate	Duplicate indicator

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS
Normally identifies a duplicate sample but may also be used to identify a duplicate analysis.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Easting	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The National Grid rectangular easting co-ordinate.

VALIDATION RULES
0 < Easting < 700000

UNITS
Metres.

ORIGIN AND REFERENCES
Derived from
Harley, J B. (1975).

NOTES AND REMARKS
The National Grid rectangular easting co-ordinate is numerical. The BGS standard for storing National Grid rectangular co-ordinates as character is a defect derived from the standard for storing National Grid references which are character in format. National Grid rectangular co-ordinates and National Grid references are not the same thing.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Eh	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Redox potential. The voltage between an inert electrode and a hydrogen electrode in an aqueous medium.

VALIDATION RULES

-2 > Eh < 2

UNITS

Volts.

ORIGIN AND REFERENCES

Derived from

Uvarov et al. (1966)

NOTES AND REMARKS

This is a measure of the ability of the medium to supply electrons and is similar to pH which is the ablity of the medium to supply protons.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Elevation	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Vertical distance above (+ve) or below (-ve) the Ordnance datum, which is the mean sea level calculated from hourly readings taken at the Ordnance Survey tidal observatory on the south pier at Newlyn between 1 May 1915 and 30 April 1921.

VALIDATION RULES

-2000 < Elevation < 2000

UNITS

Metres.

ORIGIN AND REFERENCES

Derived from
Harley (1975).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Estimated abundance	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Ranking of estimated abundance from low to high.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
0	Absent	Absent.
1	Low	Low.
2	Moderate	Moderate.
3	High	High.

ORIGIN AND REFERENCES

Derived from

Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Estimated strength
Version : 1.002 Date : 25-MAR-91

DEFINITION
Ranking of estimated strength from weak to strong.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
0	Absent	Absent.
1	Weak	Weak.
2	Moderate	Moderate.
3	Strong	Strong.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Gamma angle
Version : 1.002 Date : 25-MAR-91

DEFINITION

The angle of solid material measured for gamma activity.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	1π	Ridge sections.
2	2π	Flat surface, even slopes.
3	3π	Base of cliff or stream sections.
4	4π	Deep gullies, rock on all sides.

ORIGIN AND REFERENCES

Derived from

Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Gamma count	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
Measure of the gamma ray electromagnetic radiation.

VALIDATION RULES
0 < = Gamma count < 10000

UNITS
Microroentgen per hour.

ORIGIN AND REFERENCES
Derived from
Uvarov et al. (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Gamma environment
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of the environment affecting gamma ray measurement.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Flat rock	Flat rock, horizontal.
2	Alluvial sediment or boulders	Alluvial sediment or boulders.
3	Stream water	Stream water.
4	Seepage	Seepage.
5	Rock face	Rock face, vertical.
6	Mineral zone	Mineral zone.
7	Fault zone	Fault zone.
8	Soil	Soil or peat surfaces.
9	General	Any other environments.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Geographical area	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Name given to an area of the UK; includes county names, hill ranges, forests, moors etc.

VALIDATION RULES

None.

UNITS

None

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Geological feature
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of relevant geological features.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Fault	Fault.
2	Shear zone	Shear zone.
3	Unconformity	Unconformity.
4	Igneous contact	Igneous contact.
5	Mineralisation	Mineralisation.
6	Conformable junction	Conformable junction.
7	Dyke	Dyke.
8	Igneous vein	Igneous vein.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Grid derivation	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Method of derivation of grid co-ordinates.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Direct digitised	Direct digitised from original field map.
2	Knox protractor	Knox protractor from original field map.
3	Theodolite survey	Theodolite survey.
4	Theodolite and tape corrected	Theodolite and tape corrected for slope.
5	Theodolite and tape	Theodolite and tape not corrected for slope.
6	Tape and compass	Tape and compass.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

Grid derivation may apply to national or local grids.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Horizon	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

A layer of soil that is distinguishable from adjacent layers by characteristic physical properties.

VALIDATION RULES

Must be a valid code.

Or any combination of valid codes to indicate an intermediate horizon, like AB or BC or ABC.

Or any combination of valid codes and a '/' symbol indicating distinct horizons sampled together, like A/B or B/C or AB/C.

CODE	DEFINITION
A	Mineral horizon formed at or near the surface, and characterised by incorporation of humified organic matter, disturbance by cultivation or both.
B	Mineral sub-surface horizon without rock structure, differentiated by colour or structure from adjacent horizons, often with illuvial iron and/or silicate clay concentrations.
C	Unconsolidated or weakly consolidated mineral horizon that retains rock structure or otherwise lacks properties of overlying A, E and B horizons.
E	Subsurface mineral horizon that is lighter in colour and contains less organic matter and/or dithionite-extractable iron and/or silicate clay than the immediately underlying horizon.
F	Partly decomposed or comminuted litter remaining from previous years.
H	Well decomposed litter, often mixed with mineral matter.
L	Fresh litter deposited during previous annual cycle.
O	Peaty horizons accumulated under wet conditions.
R	Hard or very hard bed-rock that is continuous, except for cracks with an average horizontal spacing of at least 10 cm, and without significant displacement of the rock.

ORIGIN AND REFERENCES

Derived from

Bates and Jackson (1980).

Hodgson (1976).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Inclination	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The angular distance of a direction from the horizontal: (+) below horizon and (-) above horizon.

VALIDATION RULES
-90 < = Inclination < = 90

UNITS
Degrees.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Landuse
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of land utilisation.

VALIDATION RULES
Must be a valid code.

CODE	PARENT	TRANSLATION
0000		Undifferentiated
A000	0000	Natural, semi-natural
AA00	A000	Wetland and water
AAA0	AA00	Water
AAB0	AA00	Freshwater marsh
AAC0	AA00	Saltwater marsh
AB00	A000	Heath moorland and rough land
ABA0	AB00	Alpine heath and rhacomitrium on moorland and rough land
ABB0	AB00	Heather and or bilberry on moorland and rough land
ABC0	AB00	Wet sphagnum on moorland and rough land
ABD0	AB00	Dry sphagnum on moorland and rough land
ABE0	AB00	Cotton and deer sedge on moorland and rough land
ABF0	AB00	Juncus on moorland and rough land
ABG0	AB00	Bracken on moorland and rough land
ABH0	AB00	Gorse on moorland and rough land
ABI0	AB00	Scrub on moorland and rough land
AC00	A000	Grass moor
ACA0	AC00	Festuca, agrostis grass moor
ACB0	AC00	Molinia grass moor
ACC0	AC00	Nardus grass moor
AD00	A000	Dunes
AE00	A000	Woodland
AEA0	AE00	Deciduous woodland
AEAA	AEA0	Deciduous woodland recent
AEAB	AEA0	Deciduous woodland established
AEAC	AEA0	Coppice woodland
AEAD	AEA0	Coppice woodland with standards
AEB0	AE00	Coniferous woodland
AEBA	AEB0	Coniferous woodland recent
AEBB	AEB0	Coniferous woodland established
AEC0	AE00	Mixed woodland
AECA	AEC0	Mixed woodland recent
AECB	AEC0	Mixed woodland established
AED0	AE00	Woodland scrub
B000	0000	Agricultural
BA00	B000	Agricultural grassland
BAA0	BA00	Ley grass
BAB0	BA00	Long term pasture
BB00	B000	Orchards
BBA0	BB00	Orchards with grass
BBB0	BB00	Orchards with arable land
BBC0	BB00	Orchards with market gardening
BC00	B000	Market gardening

BCA0	BC00	Field vegetables
BCB0	BC00	Mixed market gardening
BCC0	BC00	Market gardening nurseries
BCD0	BC00	Allotment gardens
BCE0	BC00	Flowers
BCF0	BC00	Soft fruit
BCG0	BC00	Hops
BD00	B000	Arable land
BDA0	BD00	Cereal crops
BDB0	BD00	Ley legume crops
BDC0	BD00	Root crops
BDD0	BD00	Green fodder crops
BDE0	BD00	Industrial crops
BDF0	BD00	Fallow land
C000	0000	Transport
CA00	C000	Port areas and airfields
CB00	C000	Major roads
CC00	C000	Minor metalled roads
CD00	C000	Railways
D000	0000	Settlement
DA00	D000	Urban settlement
DAA0	DA00	Commercial and residential
DAC0	DA00	Urban open space
DACA	DAC0	Urban open space tended but unproductive
DACB	DAC0	Urban open space cleared, derelict
DB00	D000	Rural settlement
DBA0	DB00	Village
DBB0	DB00	Hamlet
DBC0	DB00	Isolated farm
DC00	D000	Caravan site, camp site
DD00	D000	Recreational area
E000	0000	Industrial
EA00	E000	Manufacturing
EAA0	EA00	Treatment of non metalliferous mining products other than coal (glass , ceramics , cement)
EAB0	EA00	Chemical and allied trades
EAC0	EA00	Metal manufacture
EAD0	EA00	Engineering manufacture, shipbuilding and electrical goods
EAE0	EA00	Vehicle manufacture
EAF0	EA00	Metal goods manufacture not elsewhere specified
EAG0	EA00	Precision instruments manufacture, jewellery
EAH0	EA00	Textile manufacture
EAI0	EA00	Leather manufacture, leather goods, furs
EAJ0	EA00	Clothing manufacture
EAK0	EA00	Food manufacture, drink , tabacco
EAL0	EA00	Wood manufacture and cork
EAM0	EA00	Paper manufacture and printing
EAN0	EA00	Other manufactureing industries
EB00	E000	Extractive
EBA0	EB00	Quarry, mine non (metalliferous, coal)
EBB0	EB00	Quarry, mine coal, lignite
EBC0	EB00	Quarry, mine metalliferous
EC00	E000	Tips
ECA0	EC00	Domestic + urban waste
ECB0	EC00	Industrial waste tip
ED00	E000	Utilities
EDA0	ED00	Water treatment works
EDB0	ED00	Gas works

EDC0	ED00	Electrical generation plant

ORIGIN AND REFERENCES

Derived from the classification system used by
The Second Land Utilisation Survey of Britain (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Local east	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The X axis value of a local grid system devised during a geochemical survey.

VALIDATION RULES
-100000 < Local east < 100000

UNITS
Metres, normally.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS
The units of this domain are normally metres but there are other conventions used in local grid systems, such as line numbers.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Local north	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The Y axis value of a local grid system devised during a geochemical survey.

VALIDATION RULES

-100000 < Local north < 100000

UNITS

Metres, normally.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

The units of this domain are normally metres but there are other conventions used in local grid systems such as line numbers.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Map scale
Version : 1.002 Date : 25-MAR-91

DEFINITION
The value of X, where the scale of a map is expressed as the ratio 1:X.

VALIDATION RULES
Must be a valid code.

CODE	DEFINITION
50000	
63360	
25000	
10000	
10560	
2500	

ORIGIN AND REFERENCES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Map sheet
Version : 1.002 Date : 25-MAR-91

DEFINITION
The unique code that identifies a single map of any scale.

VALIDATION RULES
At present these are not known.

UNITS

ORIGIN AND REFERENCES

NOTES AND REMARKS
This domain is not under the control of BGS. It is used to identify the map sheet on which the sample locations were plotted. The map sheet can be identified by a number of differing conventions and there is no standard definition in BGS which covers all scales or versions.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Mesh size	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

An indicator of the particle size passed by a square holed mesh.

VALIDATION RULES

0 < Mesh size < 10000

UNITS

Microns.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Mineralisation
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of the style of mineralisation.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Vein	Vein.
2	Fault	Fault.
3	Pod	Pod.
4	Lens	Lens.
5	Stratiform	Stratiform.
6	Joint or fracture	Joint or fracture.
7	Disseminated	Disseminated.
8	Alluvial	Alluvial.
9	Staining or coating	Staining or coating.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS
This domain will be modified in the near future to incorporate a hierachical structure.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Money	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The measure of the value of a service or product.

VALIDATION RULES
0 < Money < 10000

UNITS
Pounds sterling.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Name	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The surname and initials of a person.

VALIDATION RULES

Must be of the following format
Harris,J.R.
Coats,J.S.
Michie,U.McL.

UNITS

None.

ORIGIN AND REFERENCES

Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

This domain may require modelling as a meta data entity containing all valid names.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Northing	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The National Grid rectangular northing co-ordinate.

VALIDATION RULES
0 < Northing < 1300000

UNITS
Metres.

ORIGIN AND REFERENCES
Derived from
Harley (1975).

NOTES AND REMARKS
The national grid rectangular northing co-ordinate is numerical. The BGS standard for storing National grid rectangular co-ordinates as character is a defect derived from the standard for storing National Grid references which are character. National Grid rectangular co-ordinates and National Grid references are not the same thing.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Numbering system	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Classification of the BGS numbering system used to originally code samples..

VALIDATION RULES

Must be a valid code.

CODE	DEFINITION
1	Minpet.
2	Biostrat.
3	MRP.
4	GSP.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemical data since 1970.

NOTES AND REMARKS

This domain has not been completed and may represent a data entity in its own right. A full analysis of all geochemical numbering systems is required and is the subject of a later report.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Organisation
Version : 1.002 Date : 25-MAR-91

DEFINITION
Any organisation which is relevant to this database.

VALIDATION RULES
Must be a valid code.

CODE	ADDRESS
ACME	Mr D.Toye President ACME Analytical Laboratories Ltd 852 East Hastings Street Vancouver British Columbia V6A 1RA Canada
AHKT	Dr A.Davies Alfred H. Knight International Ltd Eccleston Grange Prescot Road St. Helens Merseyside WA10 3BQ United Kingdom
AWRE	Mr G.A.Wood Atomic Weapons Research Establishment Building R61.1 Aldermaston Berkshire RG7 4PR United Kingdom
BGSL	Group Manager Analytical Geochemistry Group British Geological Survey Keyworth Nottingham Nottinghamshire NG12 5GG United Kingdom

BORX	Mr K.J.Matterson Manager Geomet Services Borax Research Ltd Cox Lane Chessington Surrey KT9 ISJ United Kingdom
BUNI	Birmingham University Birmingham United Kingdom
CBRT	Mr T.A.Sutcliffe Chief Analyst Caleb Brett International Ltd Inchcape Inspection and testing services Lancots Lane St. Helens Merseyside WA9 3ES United Kingdom
CCSL	Mr C.R.Jackson Chief Chemist Charter Laboratory Services Charter Consolidated Services Ltd Wootton Road Ashford Kent TN23 2LZ United Kingdom
CLEG	Dr R.Calow Bondar-Clegg & Company Ltd 5420 Canotek Road Ottawa Ontario K1J 8X5 Canada
DANG	Mr A.E.Ware Director Daniel C. Griffith & Company Ltd 68 Irlam Road Bootle Merseyside L20 4EA United Kingdom
ICRC	Dr S.J.Parry Imperial College Reactor Centre Silwood Park Ascot Berkshire SL5 7PY United Kingdom

MATH

Mr A.L.Mather
Managing Director
Mather Research Limited
Hillside Road
Rothbury
Morpeth
Northumbria
NE65 7YU
United Kingdom

MESA

Mr B.P.Atkin
Midland Earth Science Associates
Conway House
Conway Street
Long Eaton
Nottingham
Nottinghamshire
NG10 2AE
United Kingdom

NASS

Nuclear Activation Services Ltd
C/O X-Ray Assay Laboratories
1885 Leslie Street
Don Mills
Ontario
M3B 3J4
Canada

NUNI

Dr B.P.Atkin
Nottingham University
Nottingham
Nottinghamshire
United Kingdom

OMAC

Mr M.J.O'Neill
Chief Chemist
OMAC Laboratories Ltd
Athenry Road
Loughrea
County Galway
Ireland

RHOL

Dr J.N.Walsh
Royal Holloway & Bedford New College
Univerity of London
Egham Hill
Egham
Surrey
TW20 0EX
United Kingdom

ROBR

Mr P.Knowles
Deputy Manager
Minerals Division
Robertson Research International Ltd
'Ty'n-y-Coed'
Llanrhos
Llandudno
Gwynedd
LL30 1SA
United Kingdom

TRCO

Dr D.Green
Tracerco
ICI Chemicals & Polymers Ltd
P.O. Box no1
Billingham
Cleveland
TS23 1LB
United Kingdom

XRAL

Mr P.Boctor
Laboratory Manager
X-Ray Assay Laboratories
1885 Leslie Street
Don Mills
Ontario
M3B 3JA
Canada

ORIGIN AND REFERENCES

Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

The limits of this domain are not definable. It will expand in the future and would probably be better defined as a data entity in its own right.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Peat
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of peat humification.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Very poor decomposition	Peat liquid is clear to slightly turbid, no peat substance is present and plant structure is intact.
2	Poor decomposition	Liquid turbid, some peat substance present, plant structure identifiable.
3	Medium decomposition	Liquid very turbid, one third peat substance oozes out, residue is mushy and plant structure identifiable.
4	Well decomposed	One half to two thirds peat substance, friable residue, only the more resistant plant structure is present.
5	Very well decomposed	No plant structure present and nearly all the peat substance passes through the fingers.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Percentage abundance	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Abundance expressed as a percentage.

VALIDATION RULES

0 < = Percentage abundance < = 100

UNITS

None.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: pH	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Log to the base 10 of the reciprocal of the number of grams of hydrogen ions in one litre of solution.

VALIDATION RULES

$0 < pH < 14$

UNITS

.

ORIGIN AND REFERENCES

Derived from

Uvarov et al. (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: PPM abundance	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Abundance expressed as parts per million by weight.

VALIDATION RULES

0 < = PPM abundance < = 1000000

UNITS

None.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : PPT colour
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of precipitate colour.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
BK	Black	Black.
BR	Brown	Brown.
OR	Orange	Orange.
WH	White	White.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Process
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of sample preparation process steps.

VALIDATION RULES
Must be a valid code.

CODE	PARENT	TRANSLATION
000		Undifferentiated
100	000	Particle size reduction
110	100	Jaw crush
120	100	Disc mill
130	100	Mixer mill
140	100	Tema
141	140	Tema, Agate
42	140	Tema, Chromium steel
143	140	Tema, Stainless steel
144	140	Tema, Tungsten carbide
150	100	P5 Ball mill
151	150	Agate
152	150	Zirconia
200	000	Retain
210	200	Retain hand sample
220	200	Retain excess
300	000	Add binder
310	300	Elvacite binder
320	300	Liquid binder
400	000	Press pellet
500	000	Fusion bead
510	500	Fusion bead, flux a
600	000	Sieving

ORIGIN AND REFERENCES

NOTES AND REMARKS
This domain is not adequate to model fully the sample preparation process and will require further work. In particular the mesh size of samples sieved during preparation for analysis cannot be recorded at present.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Profile drainage	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Classification of soil drainage conditions.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Excess drainage	No mottling appears; sandy soils. Loose, powdery, organic matter may be high, and soils scorch in dry weather.
2	Free drainage	Absence of mottling, but mottling may be partly developed below 61 cm.
3	Impeded or imperfect drainage	Predominantly brown colouration but mottling is present, especially along root channels. there is no dominant grey horizon.
4	Poor drainage	Dominant grey colour due to gleying; ochreous colours may develop.
5	Very poor drainage	Definite grey colour, usually occurs below highly organic horizons.

ORIGIN AND REFERENCES

Derived from

Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Project	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The part of the Geochemistry numbering system that identifies the collector or the collection area or the survey on which the samples were collected.

VALIDATION RULES

Must be a valid code.
As part of the Geochemistry numbering system each project code must be issued by a central system.
Project codes are active when new samples are being collected.

ORIGIN AND REFERENCES

Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

The list of project codes contains all known project codes issued by the GSP and MRP numbering systems. Validation and completion of this list will be the subject of a later report.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Quantity	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The quantity of a material.

VALIDATION RULES
0 < Quantity.

UNITS
None.

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Quantity unit
Version : 1.002 Date : 25-MAR-91

DEFINITION
Unit of measure of quantity.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
kg	Mass in kilograms	
g	Mass in grams	
mg	Mass in milligrams	
%	Percentage of the total	
l	Volume in litres	
ml	Volume in millilitres	

ORIGIN AND REFERENCES
Derived from
Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Relative abundance	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

An integer indicator used to rank occurrences of entities in order of their relative abundance. The most abundant occurrence is designated '1', followed by '2' etc.

VALIDATION RULES

0 < Relative abundance

UNITS

None

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Relief
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of surface relief.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Hill top	Hill top.
2	Gentle slope	Gentle slope 5 to 20 degrees angle of slope.
3	Steep slope	Steep slope greater than 20 degrees angle of slope.
4	Foot slope base of valley side	Foot slope base of valley side.
5	Valley floor	Valley floor
6	Hollows with marsh or bog	Hollows with marsh or bog drainage areas.
7	Level field, flood plain	Level field, flood plain, angle of slope less than 5 degrees, includes flat peat areas.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Sample type	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Classification of geochemical sample type.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
C	Stream sediment	Stream sediment.
D	Drill core	Drill core.
E	Mineral	Mineral.
F	Float sediment (Fines)	Float sediment (fines).
G	Gas	Gas.
M	Drill mud (Sludge)	Drill mud (sludge).
N	Panned sludge	Panned sludge.
P	Panned stream sediment	Panned stream sediment.
R	Rock	Rock.
S	Soil	Shallow overburden altered by soil forming processes.
T	Deep overburden	Deep overburden unaltered by soil forming processes (often a till in northern Britain).
U	Panned overburden or soil	Panned till or soil.
V	Vegetation	Vegetation.
W	Water	Water.

ORIGIN AND REFERENCES

Derived from

Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Sampling method
Version : 1.002 Date : 25-MAR-91

DEFINITION

Method used to obtain a sample.

VALIDATION RULES

Must be a valid code.

CODE	PARENT	TRANSLATION	DEFINITION
000		Undifferentiated	Undifferentiated
A00	000	Drilling	
AA0	A00	Rotary drilling	
AAA	AA0	Core drilling	
AAB	AA0	Air blast drilling	
AB0	A00	Percussion drilling	
ABA	AB0	Cobra drilling	
ABB	AB0	Wacker drilling	
AC0	A00	Rotary-percussion drilling	
ACA	AC0	Electric / Petrol hand drilling	
B00	000	Augering	
BA0	B00	Hand augering	
BB0	B00	Powered augering	
C00	000	Sawing	
CA0	C00	Hand sawing	
CB00	C00	Powered sawing	
CBA	CB0	Panel sawing	
CBB	CB0	Channel sawing	
CBC	CB0	Groove sawing	
D00	000	Excavating	
DA0	D00	Shovel excavating	
DB0	D00	Freeze core excavating	
DC0	D00	Mechanical excavating (excavator)	
DD0	D00	Crow bar excavating	
E00	000	Hammering	
EA0	E00	Geological hammering	
EAA	EA0	Grab geological hammering	
EAB	EA0	Chip geological hammering	
EB0	E00	Powered hammering	
F00	000	Concentration	
FA0	F00	Panning	
FAA	FA0	Classical panning	
FAB	FA0	Dulang panning	
FB0	F00	Genie	
FC0	F00	Sluice	
FD0	F00	Mozley table	
FE0	F00	Superpanner	
G00	G00	Bottling	Bottling of water or gas.
H00	H00	Pumping	Gas capture by pumping.

ORIGIN AND REFERENCES

Derived from

Data analysis of geochemistry data since 1970.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Sedimentary environment
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of sedimentary environment in the stream.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Middle of riffle upstream	Middle of riffle upstream.
2	Top of riffle	Top of riffle.
3	Middle of riffle downstream	Middle of riffle downstream.
4	Bottom of riffle	Bottom of riffle.
5	Waterfall	Beneath waterfall in splash pool.
6	Boulders	Around and beneath boulders.
7	Bank	Side of stream or river.
8	Bottom	Normal stream or river bottom.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Sequence	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

An integer that indicates the order of occurrences of an entity.

VALIDATION RULES

0 < Sequence

UNITS

None.

ORIGIN AND REFERENCES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Siteno	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The unique integer assigned to a site during the course of a single geochemical survey indicated by a unique project code.

VALIDATION RULES

0 < Siteno < 100000

UNITS

None.

ORIGIN AND REFERENCES

This numbering system was established in 1970 and has been in continuous use in geochemistry ever since.

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Soil
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of soil type.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Brown calcareous	Intermediate between brown earth and rendzinas.
2	Brown earth	Freely or imperfectly drained; brown, red brown or yellowish in colour due to iron oxide.
3	Brown earth gleyed	Grey mottling due to imperfect or poor drainage.
4	Podsol	Bleached, often coarse, high in quartz
5	Gley	Poorly drained, reduction of iron, mottled with ochreous material due to secondary oxidation. Grey or blue in colour.
6	Organic	Rich in humus or peat material.
7	Rendzina white	Light coloured, carbonate-rich, overlying rock.
8	Rendzina brown	Dark coloured, rich in carbonates and humus, overlying rock.

ORIGIN AND REFERENCES
Derived from
Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Soil texture	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

Classification of the relative abundance of three size fractions, sand, silt and clay.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
A	Sand	Material containing at least 85% sand, provided that the percentage of silt plus 1.5 times the percentage of clay shall not exceed 15.
B	Loamy sand	Material containing not more than 90% nor less than 70% sand, together with a percentage of silt plus 1.5 times the percentage of clay not less than 15 at the upper sand limit, or a percentage of clay not exceeding 30 at the low sand limit.
C	Sandy loam	Material containing either less than 20% of clay with the percentage of silt plus twice the percentage of clay exceeding 30, or having between 43 and 52% of sand with less than 7% of clay and less than 50% of silt.
D	Loam	Material containing between 7 and 27% of clay, 28 to 50% of silt with less than 52% sand.
E	Silt loam	Material containing either more than 50% of silt together with between 12 and 27% of clay, or which has between 50 and 80% of silt with less than 12% of clay.
F	Sandy clay loam	Material containing between 20 and 35% of clay, with less than 28% of silt and more than 45% sand.
G	Clay loam	Material that contains between 27 and 40% of clay and between 20 and 45% of sand.
H	Silty clay loam	Material that contains between 27 and 40% of clay and less than 20% of sand.
I	Silt	Material that contains more than 80% of silt with less than 12% of clay.
J	Sandy clay	Material that contains 35% or more of clay together with 45% or more of sand.
K	Medium clay	Material that contains more than 40% of clay together with less than 45% of sand and less than 40% of silt.With care a small proportion of sand can be detected.
L	Heavy clay	Material that contains more than 40% of clay together with less than 45% of sand and less than 40% of silt.
M	Silty clay	Material that contains 40% or more of clay together with 40% or more of silt.

ORIGIN AND REFERENCES

Derived from

Clarke and Beckett (1974).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Stratigraphic age
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of stratigraphic age.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
0100		Holocene / Made ground / Holocene (Deposits)
0200		Upper Pleistocene
0300		Middle Pleistocene
0400		Lower Pleistocene
0402		Pleistocene
0500		Upper Pliocene
0600		Lower Pliocene
0605		Pliocene
0700		Upper Miocene
0800		Middle Miocene
0900		Lower Miocene
0907		Miocene
1000		Upper Oligocene / Upper Hampstead Beds
1100		Lower Oligocene / Lower Hamstead Beds / Bembridge Beds / Osborne Beds / Upper Headon Beds / Middle Headon Beds
1110		Oligocene / Hampstead Beds
1200		Upper Eocene / Lower Headon Beds / Barton Beds / Upper Bracklesham Beds
1211		Headon Beds
1300		Middle Eocene / Lower Bracklesham Beds / Bagshot Beds / London Clay
1312		Bracklesham Beds
1400		Lower Eocene / Blackheath Beds / Woolwich Beds
1412		Eocene
1500		Upper Paleocene / Thanet Beds
1600		Lower Paleocene
1615		Paleocene
2300		Middle Chalk
2317		Upper Chalk
2417		Upper Cretaceous / Chalk
2423		Lower
2500		Upper Greensand
2524		Red Chalk
2625		Gault
2800		Sandgate Beds
2827		Folkestone Beds
2900		Atherfield Clay
2925		Langton Series
2927		Lower Greensand
2928		Hythe Beds
3330		Tealby Series
3400		Durlston Beds / Upper Spilsby Sandstone
3417		Cretaceous

3425	Lower Cretaceous
3426	Speeton Clay
3430	Wealden
3500	Lower Spilsby
3534	Spilsby Sandstone
3600	Portland Beds
3634	Purbeck Beds
3635	Lulworth Beds
3700	Kimmeridge Clay
3800	Corallian Beds
3900	Upper Cornbrash / Kellaway Beds
3935	Upper Jurassic
3938	Oxford Clay
4000	Lower Cornbrash / Great Oolite Series Excluding Cornbrash
4039	Cornbrash / Great Oolite Series
4140	Middle Jurassic / Great Estuarine Series / Inferior Oolite Series
4342	Upper Lias
4400	Middle Lias
4835	Jurassic
4842	Lias
4900	Rhaetic
5250	Keuper Series
5352	Muschelkalk
5549	Triassic
5600	Upper Permian / Bunter Series / Zechstein
5700	Lower Permian / Rothliegende
5750	New Red Sandstone
5756	Permian
6200	Upper Culm
6258	Coal Measures
6600	Upper Limestone Group
6700	Limestone Coal Group
6762	Passage Group
6800	Lower Limestone Group
6958	Upper Carboniferous
6963	Millstone Grit / Middle Culm
7158	Carboniferous
7162	Culm
7170	Lower Carboniferous / Carboniferous Limestone / Lower Culm / Calciferous Sandstone Group
7372	Upper Devonian
7471	Upper Old Red Sandstone
7574	Middle Devonian
7670	Middle Old Red Sandstone
7776	Brecon Series
7800	Downton Series / Wenlock Group
7871	Old Red Sandstone
7872	Devonian
7876	Lower Devonian / Lower Old Red Sandstone
7877	Ditton Series
7900	Ludlow Group
8100	Llandovery Group
8179	Silurian
8200	Ashgill Group / Upper Hartfell Shales
8982	Ardmillan Series / Hartfell Shales
8983	Lower Hartfell Shales
9182	Bala Group

9183	Caradoc Group
9185	Borrowdale Volcanics
9190	Barr Series / Glenkiln Shales
9200	Llandeilo Group
9300	Llanvirn Group
9382	Ordovician
9385	Skiddaw Slates
9400	Arenig Group / Manx Slates
9500	Tremadoc Group
9600	Upper Cambrian Excluding Tremadoc Group
9695	Upper Cambrian
9700	Middle Cambrian
9800	Lower Cambrian
9894	Durness Limestone
9895	Cambrian
9896	Upper Dalradian
YA00	Lower (Including Middle) Dalradian Series
YA96	Dalradian Series
YDYA	Arvonian
YDYB	Longmyndian / Ingletonian / Torridonian Series / Moine Series
YDYC	Charnian
YE	Moinian / Rushton Schist
YEYC	Pebibian / Uriconian
YMYL	Late Laxfordian
YNYE	Malvernian
YQYL	Laxfordian
YQYM	Early Laxfordian
YVYA	Proterozoic
ZC	Pre-Scourian
ZCYL	Lewisian
ZCZA	Scourian
ZKZA	Archaean

ORIGIN AND REFERENCES

Derived from

Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

This is a badly designed code. It contains both chronostratigraphic and lithostratigraphic ages and it has a low resolution. It will be replaced in the future with a better design, when BGS standards have been established.

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Stream order	
Version	: 1.002	**Date : 25-MAR-91**

DEFINITION

Classification of stream order using Strahler's method.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	First order stream	First order stream using Strahler's method of ordering.
2	Second order stream	Second order stream using Strahler's method of ordering.
3	Third order stream	Third order stream using Strahler's method of ordering.
4	Fourth order stream	Fourth order stream using Strahler's method of ordering.

ORIGIN AND REFERENCES

Derived from

Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Temperature	
Version	: 1.002	Date : 25-MAR-91

DEFINITION

The measure of the kinetic energy of the molecules, atoms or ions of which a body is composed.

VALIDATION RULES

-273 < Temperature

UNITS

Degrees Centigrade

ORIGIN AND REFERENCES

Derived from

Uvarov et al. (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Text	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
Descriptive free text in English including approved abbreviations and standard place names.

VALIDATION RULES
Text requires a complex set of validation rules to ensure correct spelling and use of approved abbreviations. This is beyond the scope of this report.

UNITS
None

ORIGIN AND REFERENCES

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name	: Geochemistry	
Domain name	: Volume	
Version	: 1.002	Date : 25-MAR-91

DEFINITION
The measure of bulk or space.

VALIDATION RULES
0 < Volume

UNITS
Litres

ORIGIN AND REFERENCES
Taken from
Uvarov et al. (1966).

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Weather
Version : 1.002 Date : 25-MAR-91

DEFINITION

Classification of weather conditions in the past week.

VALIDATION RULES

Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Rain light within 12 hours	Rain light within 12 hours.
2	Rain heavy within 12 hours	Rain heavy within 12 hours.
3	Rain light within 24 hours	Rain light within 24 hours.
4	Rain heavy within 24 hours	Rain heavy within 24 hours.
5	Rain light within 48 hours	Rain light within 48 hours.
6	Rain heavy within 48 hours	Rain heavy within 48 hours.
7	Rain heavy within 1 week	Rain heavy within 1 week.
8	No rain within 1 week	No rain within 1 week.

ORIGIN AND REFERENCES

Derived from

Explanation of R.R.M.U. Field Data Cards. 1970 Institute of Geological Sciences, R.R.M.U. Unpublished Report

NOTES AND REMARKS

BRITISH GEOLOGICAL SURVEY
DETAILED DOMAIN DEFINITION

Database name : Geochemistry
Domain name : Weathering
Version : 1.002 Date : 25-MAR-91

DEFINITION
Classification of the degree of weathering of a rock.

VALIDATION RULES
Must be a valid code.

CODE	TRANSLATION	DEFINITION
1	Fresh	No visible sign of rock material weathering (e.g. drill core sample).
2	Faintly weathered	Discolouration on major discontinuity surfaces.
3	Slightly weathered	Discolouration indicates weathering of rock material and discontinuity surfaces. All the material may be discoloured by weathering and may be somewhat weaker than in its fresh condition.
4	Moderately weathered	Less than half of the rock material is decomposed and or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or corestones.
5	Highly weathered	More than half of the rock material is decomposed and or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or corestones.
6	Completely weathered	All rock material is decomposed and/ or disintegrated to soil. The original mass structure is still largely intact.
7	Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

ORIGIN AND REFERENCES
Derived from
Geological Society of London Engineering Group (1977).

NOTES AND REMARKS

SOFTWARE QUALITY ASSURANCE

In an effort to implement software quality assurance within the project a review procedure has been established. A draft copy of this report was reviewed by a panel of experts on the 17th September 1991. The review panel produced a list of defects, errors and required changes. These changes have since been implemented. This section records all known defects of the data analysis and proposed design along with those identified by the review panel which have not been removed. Other peculiarities which may be of importance to future data analysis carried out by BGS are also noted. The section is divided into three parts. The first, 'Probable defects', lists known defects which are included in the design because they were too difficult to remove or would require a large effort to rectify and would only yield a small improvement. The second part, 'Possible defects', deals with features of the proposed design which may be classified as defects but which are not expected to cause serious problems. The third part, 'Other peculiarities', deals with unusual features produced by the data analysis which are perfectly valid within geochemistry but which may be considered as defects when viewed in a BGS-wide context.

Probable defects

Project requirement

The lack of a detailed formal project requirement makes software quality assurance very difficult to apply as it is impossible to measure how well the database design satisfies the requirement. This was noted by the review panel who suggested the model was flawed unless validated by reference to an unambiguous and clearly stated user requirement. The panel also suggested that the requirement should be 'signed off' by management and development staff.

Translation of codes

The decision to translate all past field codes into a standard format could be considered as a defect. However designing a database that could cope with multiple versions of domains for each attribute would not be achievable. The translation of codes will introduce new defects but will also make the data far more accessible and will require every value of each translated attribute to be validated during the translation process.

The decision to force translated codes to map directly back onto the original codes has led to many defects. For example, it is possible to collect a rock sample that is so weathered it is in fact a residual soil. Overlaps of this nature between attributes are common.

Site identification

The sample numbering system established by the original field cards, produced in 1970, has been very successful at uniquely identifying samples. From the field cards it is clear that it was also intended to uniquely identify sample sites. Unfortunately it has not succeeded in this respect. Sample sites are uniquely identified for individual sample types: all soil sites are unique, all rock sites are unique and all drainage sites are unique. When soil and rock location data are amalgamated, sites with the same primary key occur at different locations. This is a defect in the data, not the analysis. This defect is due to the tendency of geologists to treat the soil survey of an area and the rock or drainage survey as different exercises. Thus the need to identify samples uniquely across the whole spectrum of sample types is not necessary. It is only when an attempt is made to place all the data in a single database that these defects show up. This represents a defect

in the data as not all sample sites are uniquely identifiable as they are required to be by the model presented here.

Sample sub types

The distinction between the different sample sub types is not always made on the sample collected but rather on the method of collection. The drillcore, drillmud, panned sediment, panned overburden and panned rock are all distinguished by the method of sampling. There is no real difference between a drillcore rock and a normal, hand sampled, rock other than the sampling method. These defects are too entrenched to remove at this stage and are common throughout BGS. These defects will however lead to more complexity than is strictly necessary in later stages of the database project.

Overburden sub entities

There is no real difference between the description of a deep overburden sample and a soil sample. Both samples are described in the same way. The two sub entities of overburden, soil and deep overburden, are not necessary and are only included on the entity relationship diagram to aid understanding. Soil and deep overburden samples are distinguished in practice by sample type. This is unnecessary and is better done by use of the horizon entity to distinguish between different horizons of overburden sample. Removing this defect would involve reclassifying all the soil and deep overburden samples to a single sample type and is considered too difficult to be attempted at present.

Sieving during sample preparation

The inadequacies of the current data analysis for sample preparation, dealt with by the Preparation and Process step entities are highlighted by the inability of the model to describe completely samples which are sieved as part of their preparation. This area of sample preparation is beyond the scope of this report and has not been dealt with fully. It is recommended that a complete data analysis of sample preparation be produced.

Analyte determinations of molecular species

A small proportion of the analytes determined are not elements. In some samples Fe^{2+} and total Fe are determined separately and indicate the concentration of iron in two oxidation states. Similarly S may be determined as sulphide or sulphate. In some cases the analyte is compound, with loss-on-ignition being an example. H_2O is normally determined at 105 °C but some methods will give a different result at higher temperatures. These and other analyte determinations cannot be catered for by this model. However, provision will be made for these data in the physical design of the database. The decision on how to implement this will be delayed until its impact on the efficiency of the physical design can be assessed. Two alternatives seem to be available: to expand the analyte domain to include species, or to split the analyte determination entity into two, one for elements and the other for other analytes. The analyte determination entity will be the largest table in the final database, so any changes to this entity will have to be considered in the light of efficiency and data integrity requirements.

Possible defects

Missing analysed sample entity

The sample super type entity and the project batch entity are related by a many-to-many relationship which indicates a missing entity. This entity would contain one record for every analysis of every sample and would be called the analysed sample entity. The primary key of this entity would contain the primary key of the sample entity (Project, Siteno, Sample_type, Duplicate) and the primary key of the analysis entity (Lab, Batch_id, Method). Information from this entity would be of little use to the users of the database but would be of aid in the management of the analytical determination entity. This entity has been omitted for implementation reasons. The data is only available by extracting the required attributes from the analytical determinations and is therefore of little use as it can only indicate analytical determinations which exist and not those which are missing from the database.

Location sub sypes

The distinction between the different location sub types is dependant on the type of sample collected and not on the type of location. If a rock sample is collected from an outcrop in the bank of a stream the geologist then has a choice. The site can be defined as a stream site or as a normal site depending on whether he wishes to record details of the drainage. This represents a defect as the classification of sub type is sometimes subjective and therefore ambiguous.

Other peculiarities

Site definition

Current usage in geochemistry defines a site by the two dimensional national grid rectangular co-ordinates, the elevation above ordnance datum and the date on which that site was visited and any samples were collected. The inclusion of the date is an unusual feature. It is necessary because many geochemical samples are seriously affected by weather conditions and the season. Water, gas and vegetation are all affected in this way and, to a lesser extent, so too are stream sediments and panned stream sediments. The date is therefore fundamental to the definition of the site. It is also a significant meta data attribute and plays an important role in data validation.

REFERENCES

Bain, K A. 1991. *Data Analysis for a BGS Borehole Index.* British Geological Survey Technical Report WO/91/2.

Barker, R. 1990. *CASE*Method Entity Relationship Modeling.* (Wokingham : Addison Wesley.)

Bates, R L and Jackson, J A. 1980. *Glossary of Geology.* (Fallschurch : American Geological Institute.)

Clarke, G R and Beckett P. 1974. 5th Ed. *The Study of Soil in the Field.* (Oxford : Clarendon Press.)

Cutts, G. 1991. 2nd Ed. *Structured Systems Analysis and Design Methodology.* (Oxford : Blackwell Scientific Publications.)

Date, C J. 1981. *Introduction to Database Systems.* (Reading Mass : Addison Wesley.)

Geological Society of America. 1963. *Rock-color Chart.* (Netherlands : Huyskes-Enschede.)

Geological Society of London Engineering Group. 1977. *Quarterly Journal of Engineering Geology* Vol. 10, No. 4

Harley, J B. 1975. *Ordnance Survey Maps: a descriptive manual.* (Oxford : The University Press.)

Harrison, R K and Sabine, P A. (editors.) 1970. A Petrological-Mineralogical Code for Computer use. *Report of the Institute of Geological Sciences*, No. 70/6

Hodgson, J M. (editor.) 1976. Revised. *Soil Survey Field Handbook, Describing and Sampling Soil Profiles.* Soil Survey. Technical monograph No.5 (Dorking : Adlord & Son Ltd Bartholomew Press.)

Logica. 1991. *Data Architecture Study.* A C-in-C report to the British Geological Survey.

Munsell Color. 1988. *Munsell Soil Color Charts.* (Baltimore : Munsell Color.)

The Second Land Utilisation Survey of Britain. 1966. *Dumfermline (NT 08 and NT 18) Land Use Sheet S138.* Scale 1:25000. (Isle of Thanet Geographical Association.)

Uvarov, E B, Chapman, D R, and Isaacs, A. 1966 3rd Ed. Revised. *A Dictionary of Science.* (London : Penguin Books.)