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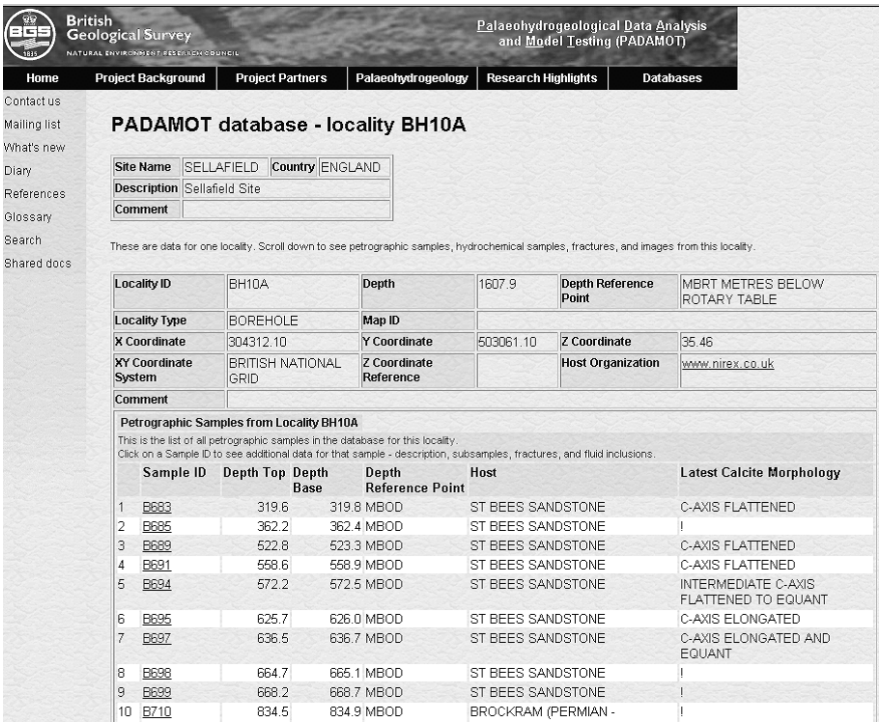
PADAMOT Project Work Package 3: Design and Compilation of Database

Information Management Programme

Commissioned Report CR/04/199N



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Palaeohydrogeological Data Analysis and Model Testing (PADAMOT)

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PADAMOT database - locality BH10A

Site Name	SELLAFIELD	**Country**	ENGLAND
Description	Sellafield Site		
Comment			

These are data for one locality. Scroll down to see petrographic samples, hydrochemical samples, fractures, and images from this locality.

Locality ID	BH10A	**Depth**	1607.9	**Depth Reference Point**	MBRT METRES BELOW ROTARY TABLE
Locality Type	BOREHOLE	**Map ID**			
X Coordinate	304312.10	**Y Coordinate**	503061.10	**Z Coordinate**	35.46
XY Coordinate System	BRITISH NATIONAL GRID	**Z Coordinate Reference**		**Host Organization**	www.nirex.co.uk
Comment					

Petrographic Samples from Locality BH10A

This is the list of all petrographic samples in the database for this locality.
Click on a Sample ID to see additional data for that sample - description, subsamples, fractures, and fluid inclusions.

	Sample ID	Depth Top	Depth Base	Depth Reference Point	Host	Latest Calcite Morphology
1	B683	319.6	319.8	MBOD	ST BEES SANDSTONE	C-AXIS FLATTENED
2	B685	362.2	362.4	MBOD	ST BEES SANDSTONE	!
3	B689	522.8	523.3	MBOD	ST BEES SANDSTONE	C-AXIS FLATTENED
4	B691	558.6	558.9	MBOD	ST BEES SANDSTONE	C-AXIS FLATTENED
5	B694	572.2	572.5	MBOD	ST BEES SANDSTONE	INTERMEDIATE C-AXIS FLATTENED TO EQUANT
6	B695	625.7	626.0	MBOD	ST BEES SANDSTONE	C-AXIS ELONGATED
7	B697	636.5	636.7	MBOD	ST BEES SANDSTONE	C-AXIS ELONGATED AND EQUANT
8	B698	664.7	665.1	MBOD	ST BEES SANDSTONE	!
9	B699	668.2	668.7	MBOD	ST BEES SANDSTONE	!
10	B710	834.5	834.9	MBOD	BROCKRAM (PERMIAN -	!

BRITISH GEOLOGICAL SURVEY

INFORMATION MANAGEMENT PROGRAMME

COMMISSIONED REPORT CR/04/199N

PADAMOT Project Work Package 3: Design and Compilation of Database

T McCormick, M Nayembil and J R A Giles

Contributor

P Bell

Keywords

Report; PADAMOT; palaeohydrogeology; database.

Front cover

A screen from the PADAMOT web database application showing details about a sampling locality.

Bibliographical reference

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Keyworth, Nottingham British Geological Survey 2004

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Foreword

This report describes work carried out by the British Geological Survey (BGS) on the European Union 5th Framework Project "PADAMOT" (**Pa**laeohydrogeological **D**ata **A**nalysis and **Mo**del **T**esting) Work Package 3: "Design and Compilation of Database", between the project's inception and April 2004.

Acknowledgements

The authors of this report benefited at various stages throughout the work from discussions with Antoni Milodowski and Jon Bouch (British Geological Survey), Adrian Bath (Intellisci Ltd), and Paul Degnan (United Kingdom Nirex Limited).

Nirex supplied data and information on the Sellafield and Dounreay sites (UK). Eva-Lena Tullborg, Terralogica AB supplied data on the Aspo-Laxemar site (Sweden). Further data on the Sellafield, Aspo-Laxemar, and Olkiluoto (Finland) sites were provided by the EU 4th Framework EQUIP Project, funded by the EU 4th Framework Programme.

The authors gratefully acknowledge the European Union for funding of the PADAMOT project through the EU 5th Framework Programme under CEC contract number FIKW-CT2001-20129, and for information obtained through their earlier funding of the EQUIP project.

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Summary

The European Union 5th Framework Project "PADAMOT" (**Pa**laeohydrogeological **D**ata **A**nalysis and **Mo**del **T**esting) uses advanced analytical techniques and numerical modelling to investigate the evolution of groundwater and minerals during the Quaternary climate changes, in order to gain insight into processes significant to the safety of radioactive waste repositories. A consortium of ten organizations representing four countries is carrying out the project. BGS has particular responsibility to carry out work under Work Package 3 (WP3) of the project: 'Design and Compilation of Database'. Within this context, the two main deliverables have been achieved: construction of the project web site, and development and population of the project database, which has been made available to project partners via the web site.

This report describes work undertaken and deliverables achieved on WP3. Section 1 provides a brief introduction. In Section 2, the background to the project and the BGS role within it are described. Section 3 describes the software architecture supporting the PADAMOT web site and project database. Section 4 describes the web site in some detail. In Section 5, development and population of the project database and its associated web-based data browser application are described. A number of appendices provide additional detailed information too bulky to fit in the body of the report. A brief glossary and references are provided at the end of the report.

1 Introduction

The PADAMOT (**Pa**laeohydrogeological **D**ata **A**nalysis and **Mo**del **T**esting) Project is a 5th Framework Project[1] of the European Union funded under CEC contract number FIKW-CT2001-20129. The broad aims of the project and its research objectives are described briefly below. During the Quaternary, European climate has alternated between glacial conditions and climate states warmer than today. In northerly latitudes the potential for cold region processes to affect groundwater pathways, fluxes, residence times and hydrochemistry is significant, whereas for southern European localities the alternation between pluvial and arid conditions is equally important. PADAMOT has investigated the evolution of groundwater systems through geochemical signatures recorded by contemporary mineral growth, in response to these climate changes. This palaeohydrogeological approach investigates processes that are significant for radioactive waste repository safety studies on size- and time-scales that cannot be simulated by experiment. The use of advanced analytical techniques and numerical modelling tools allow palaeohydrogeological interpretations to be developed that can be used to constrain the range of scenarios for conceptual model development and time variant modelling in performance assessment.

This individual report describes in more detail the work undertaken on, and deliverables of, one of the component Work Packages of the PADAMOT project: Work Package 3 (WP3) – 'Design and Compilation of Database'. The first main achievement of WP3 has been to design and develop the PADAMOT project web site:

http://www.bgs.ac.uk/padamot/home.html

The second main achievement has been to design the project database, populate it with data essential to the project and make it available to all project partners through the web site.

[1] http://www.cordis.lu/fp5/home.html

2 Background to PADAMOT Project

PADAMOT (Palaeohydrogeological Data Analysis and Model Testing) is a project in the 5th Framework R&D Programme of the European Union. The research being carried out is contributing to the understanding of the long-term safety of placing radioactive wastes in underground repositories.

Safety considerations for storing radioactive wastes must take into account the various scenarios for environmental change over the long period of time during which they will pose a hazard. One of the factors potentially affecting safety is changing climate. Putting high-level radioactive wastes and spent nuclear fuel deep underground in a "geological repository" is the generally preferred option for their long-term management. A major reason for preferring this option is that the impacts of changing climate and the consequent increased uncertainty about long-term safety are removed or at least reduced by putting the waste deep underground.

Stability of groundwater conditions is one of the most important safety requirements because the chemical composition of water and its rate of water movement are factors in the reliability of containment in the repository and the transport of radionuclides back to the surface. How can this stability be assessed with respect to changes in climate? What evidence is there that storage underground will not be affected by extreme climatic conditions on the surface in the long term? How can the additional stability and safety of the deep geosphere be demonstrated with evidence from the natural system? PADAMOT is investigating methods for addressing these questions by looking at what has happened in the past, as recorded by the rock mass and groundwater system (*i.e.* palaeohydrogeology).

During the last two million years or so (the Quaternary Period), European climate has alternated between extremes of ice ages and conditions that were warmer and wetter, or drier than today. Large areas of northern Europe were covered by ice sheets and experienced extensive permafrost, whereas southern Europe was more arid. The present-day climate is not representative of the climate that existed for much of the Quaternary, and it could be argued that present-day groundwater conditions are not an adequate basis for assessing long-term repository safety. Variations of climate above a repository could affect groundwater flows and compositions. PADAMOT investigates how groundwater systems at a number of sites have evolved through past climate changes, by analysis of geochemical signatures recorded by contemporary mineral precipitates, and what their compositions record about the sensitivity of groundwater conditions to climate at various depths. The project uses advanced analytical techniques to make geochemical measurements and numerical modelling tools to interpret those data. In addition, the project has developed a database for handling and correlating the large amounts of complex information generated by palaeohydrogeological studies so that they can be used for site characterisation and safety

Table 1 PADAMOT project partners.

Organization	Type of Organization	Country
British Geological Survey (BGS)	Research	UK
Cento de Investigaciones Energeticas, Medioambientales y Tecnologicas (CIEMAT)	Research	Spain
Charles University, Prague	University	Czech Republic
Edinburgh University	University	UK
Empresa Nacional de Residuos Radioactivos S.A. (ENRESA)	Rad-Waste Management	Spain
Intellisci Ltd	Consultant	UK
Polytechnical University of Madrid - School of Mines (UPM-ETSIMM)	University	Spain
Svensk Kärnbränslehantering AB (SKB)	Rad-Waste Management	Sweden
Terralogica AB	Consultant	Sweden
United Kingdom Nirex Limited (NIREX)	Rad-Waste Management	UK

assessment.

PADAMOT is the successor to the 4th EU Framework project EQUIP (Evidence from Quaternary Infills and Palaeohydrogeology), and aims to build on the achievements of that project (Bath et al. 2000). EQUIP data have been incorporated along with PADAMOT data into the project database.

2.1 PROJECT CONSORTIUM

The PADAMOT consortium consists of ten organizations, of which three have national responsibility for the management of radioactive wastes, three are university departments, two are geoscience consultancies and two are research organizations. The project partners are listed in Table 1.

2.2 PROJECT STRUCTURE

The PADAMOT project is divided into a series of semi-autonomous work packages, which each deliver a key suite of project deliverables. There are five such work packages, listed in Table 2. This report details work carried out under WP3.

Table 2 Project work packages.

ID	Work Package	Lead Partner
WP1	Palaeohydrogeological Workshop	NIREX
WP2	Palaeohydrological Data Measurements	BGS
WP3	Design and Compilation of Database	BGS
WP4	Development of Models for Process Understanding and Testing	ENRESA
WP5	Dissemination and Use of Results for Performance Assessment	SKB

3 IT Architecture

This section describes the IT architecture that supports the PADAMOT project database, web site, and web-based data access facilities.

3.1 THREE-TIER ARCHITECTURE

A standard "three-tier" architecture is used, consisting of three logical divisions (Figure 1):

- The "data tier" where the project database resides and where database security is implemented;
- The "application tier" where static web pages and an application for accessing the project database are hosted;
- The "client tier" where the user makes requests for items, and where those items are displayed to the user.

3.1.1 Data Tier

The database was constructed using Microsoft® SQL Server 2000 Standard Edition, installed on a Windows 2000 Server operating system.

SQL Server is a relational database management system (RDBMS), supporting data organization based on a relational data model. It provides simplified database administration, data security in any networked environment, and exceptional scalability and reliability. It enables web access to data with or without additional programming. It also automates routines that extract, transform and load data from heterogeneous sources.

The relational database design is described in Section 5.

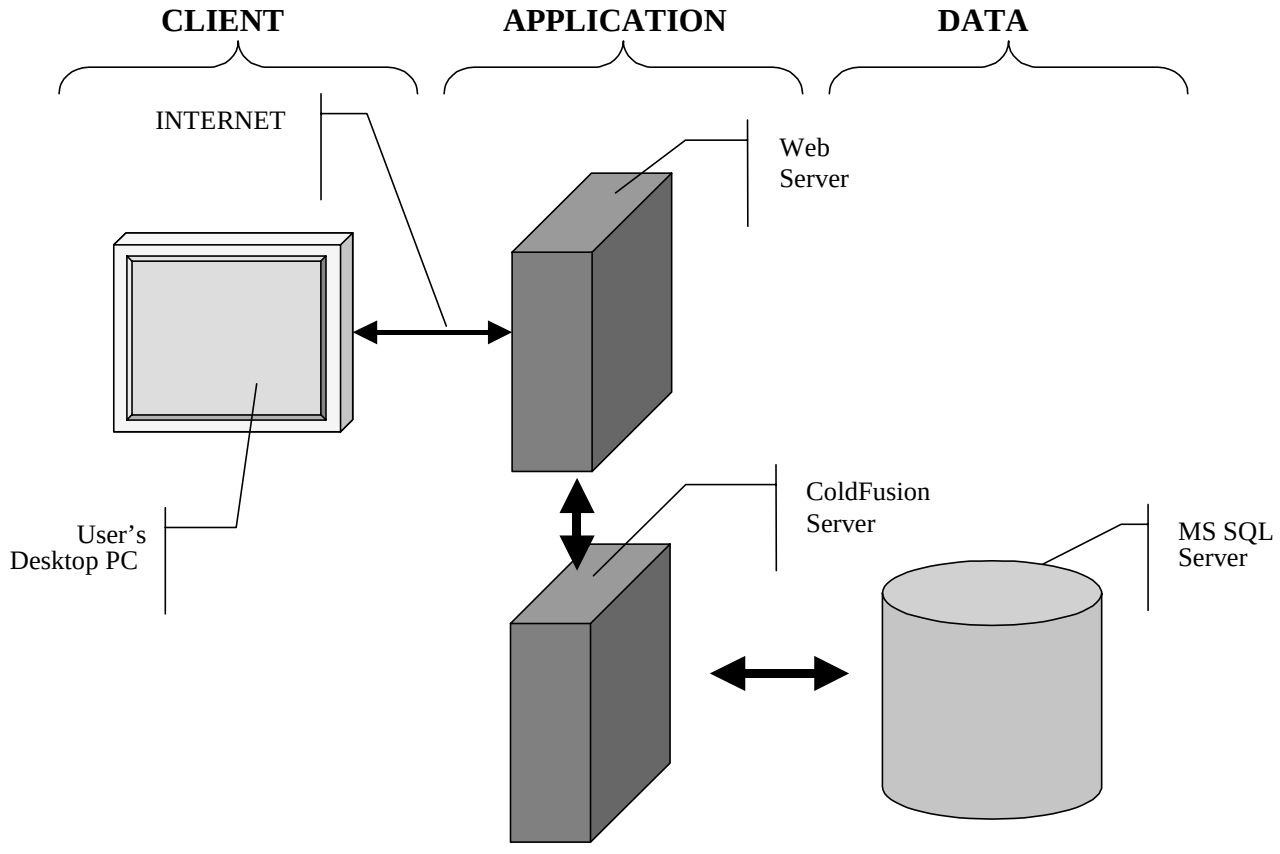
3.1.2 Application Tier

Two main software components make up the application tier:

- Microsoft® Internet Information Server (IIS) version 5 web server;
- Macromedia® ColdFusion Server version 5.

These are both installed on a Windows 2000 Server op-

Figure 1 IT architecture underlying the PADAMOT web site and database.



erating system.

Internet Information Server is able to deliver standard static content to a web client. “Static” means that the item does not change unless the author edits it. Items can include web pages, images, and video clips.

ColdFusion Server is an advanced web site application that runs on a range of platforms and offers additional functionality not available from a normal web server like Internet Information Server. The most important of these functions, for the purpose of this project, are sophisticated database manipulation tools. ColdFusion allows visitors to a web site, armed only with a conventional web browser, to query and manipulate databases stored on a remote data server.

ColdFusion Server operates on scripts written using the ColdFusion scripting language. When a web server receives a request from a client for a ColdFusion script to be served (which it recognises by the “.cfm” extension on the requested URL), it hands the request to the ColdFusion server. That application finds and runs the script. Often the script will manipulate a database in some way. Any output is formatted by the ColdFusion server into standard HTML and handed back to the web server, which serves it to the client. A major advantage is that no browser plug-ins are required for the system to work and no large applets are downloaded to the browser. All database querying, processing and formatting of results is done on the server.

3.1.3 Client Tier

The client tier is the web browser software used by the web site visitor. No specialised software over and above a standard web browser application, such as Microsoft Internet Explorer or Netscape, is required to access the PADAMOT web site and project database.

Development of the web site and web database browser were carried out using Microsoft Internet Explorer version 6.

3.2 SCRIPTING LANGUAGES USED

The scripting languages used in the development of the web site and database browser application are:

- HTML version 4;
- JavaScript;
- ColdFusion version 5.

The static pages of the PADAMOT web site have been designed using simple HTML (Hypertext Mark-up Language) version 4. This has been chosen because it is simple to write and maintain and is supported by a range of low cost tools that make maintenance easy and efficient. HTML, however, has only limited functionality. For this reason it has been supplemented by JavaScript and ColdFusion.

JavaScript is a scripting language developed by Netscape. It was designed to resemble the Java language, which in turn resembles C and C++. It is intended to provide a quick and simple language for enhancing web pages. JavaScript is embedded as a small program in a web page and is interpreted and executed by the web client. The scripter controls the time and nature of execution, and JavaScript functions can be called from within a web document, often executed by mouse clicks, buttons, or other actions from the user. JavaScript can be used to control Netscape and Microsoft Web browsers fully, including all the familiar browser attributes. It is a public domain language that can be used freely and requires no special software components on either the server or the browser.

On the PADAMOT web site JavaScript has limited use to support menu functionality. In particular it is used for the common menu available on the left-hand side of all pages. This menu is used to take the user to:

- Contact us
- Mailing list
- What’s new
- Diary
- References
- Glossary
- Search
- FTP server

The ColdFusion scripting language has been used to develop the specialised database manipulation and data display scripts used within the PADAMOT web site and database browser application. This language consists of an extended set of tags providing additional functionality over and above what is available within HTML 4. As described above, these scripts are run, and their output formatted into standard HTML, by the ColdFusion Server application working in conjunction with the Web Server.

4 Web Site

The PADAMOT project web site has been produced in close cooperation with a number of the project partners to meet a range of objectives. These include:

- Explaining and promoting the purpose of the PADAMOT project;
- Providing a range of tools to facilitate communication among the PADAMOT project partners;
- Providing a framework and context for the PADAMOT database;
- Explaining and promoting the fledgling science of palaeohydrogeology.

The web site is available to the public via the World Wide Web and most of the site can be used by anyone. Restricted access applies only to the database and to the FTP Server, which are both password protected.

An image of the top part of the home page of the web site (http://www.bgs.ac.uk/padamot/home.html) is shown in Figure 2.

4.1 WEB SITE MAP

The web site has a simple architecture restricted to a maximum of four levels. The majority of the information in the web site is accessible within two mouse clicks. This reflects the basic design philosophy that the majority of information should be found easily. The web site map is shown in Figure 3, and demonstrates the limited hierarchy used in the design.

4.2 HOW THE WEB SITE MEETS ITS OBJECTIVES

Individual pages and other web site components combine together to meet the basic objectives of the web site. The individual elements that support the objectives are discussed below.

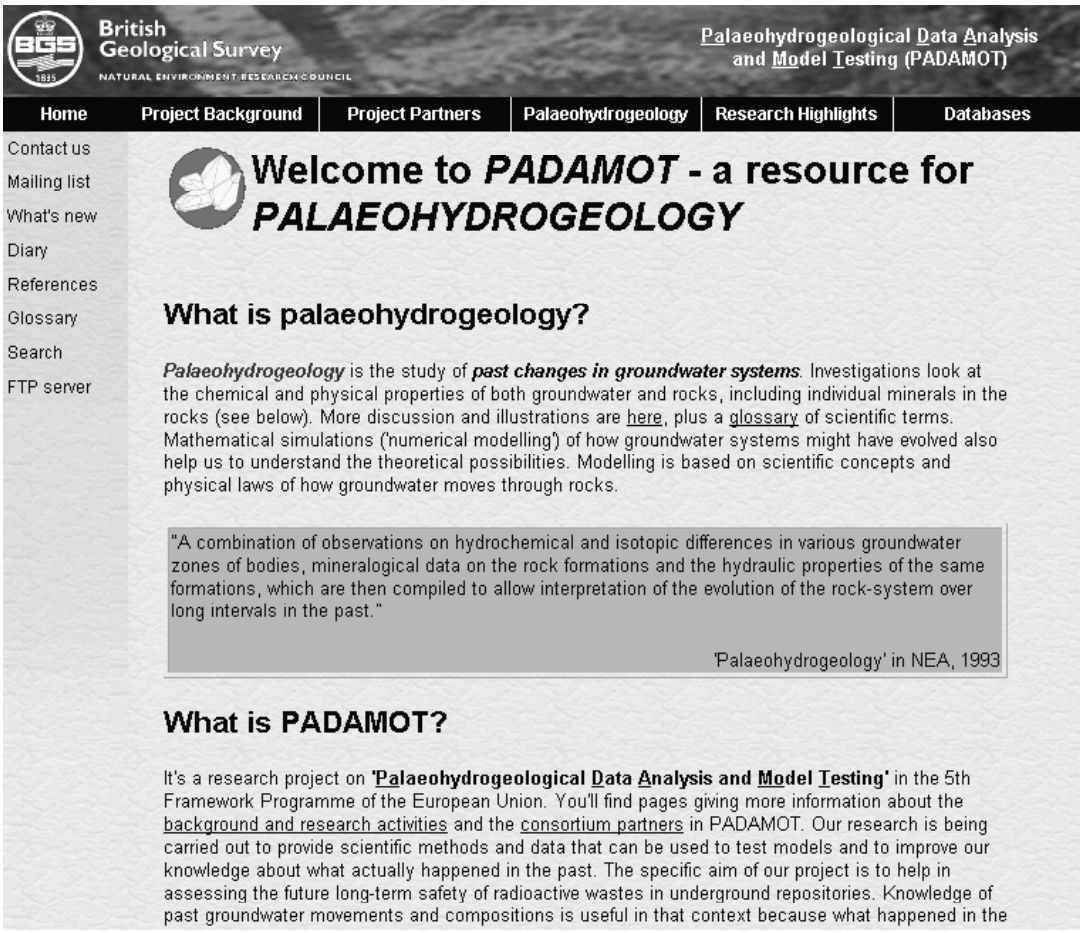


Figure 2 PADAMOT web site home page.

- PADAMOT Home Page
  - Background Information
    - Project Overview
    - Project Work Programme
    - Project Analytical Tasks
    - Project Modelling Tasks
    - Project Applications to PA
    - Project Communications
    - Project Partners
    - Scientific and Technological Objectives
    - Related Projects
      - Related Projects – BIOCLIM
      - Related Projects – PERMA
      - Related Projects – EQUIP
  - Project Partners
    - Project Partners, NIREX
    - Project Partners, SKB
    - Project Partners, Terralogica AB
    - Project Partners, ENRESA
    - Project Partners, CIEMAT
    - Project Partner s, Intellisci Ltd
    - Project Partners, British Geological Survey
    - Project Partners, Charles University
    - Project Partners, Edinburgh University
    - Project Partners, UPM
  - Palaeohydrogeology
    - What is palaeohydrogeology?
    - Why study palaeohydrogeology?
    - Why is palaeohydrog eology relevant for safety of radioactive waste repositories?
    - Palaeohydrogeology of aquifers
    - Reference list
  - Research Highlights
    - Deliverables
  - Data Access Login Page
  - Contacts
  - Mailing List
  - What's New
  - Diary of Events
  - Reference List
  - Glossary
  - Search Page
  - FTP Ser ver

Figure 3 PADAMOT web site map.

4.2.1 Explaining and promoting the purpose of the PADAMOT project

A key role of the web site is dissemination of information about the PADAMOT project. This is achieved through the development, in conjunction with the specialist scientists and engineers involved in the project, of a series of pages explaining the project and how the information is obtained, used and disseminated. Several such pages are identified and explained in Table 3.

Table 3 Web pages explaining and promoting PADAMOT.

Page	Description
Home Page	Gives a high-level overview of palaeohydrogeology and the PADAMOT project.
Background Information	Introduction page for a group of pages describing the project in much more detail.
Project Analytical Tasks	Describes how samples of fracture mineralisation from sites in the United Kingdom, Sweden, Spain and the Czech Republic are being studied in the PADAMOT project.
Project Applications to PA	The role of performance assessment (PA), and how the results of the PADAMOT project will be used in the construction of safety assessments, is explained.
Project Communications	Dissemination of the results of the project is key to its success and this page explains how this is done.
Project Modelling Tasks	Explains that the overall purpose of the modelling task is to create a framework of theory and measurement that can be evaluated for consistency, and which can then provide understanding and the basis for making predictions about the modelled system
Project Partners	Catalogues who is involved with the project and their role and background. Links from this page take users to the individual web sites of the organizations involved.
Related Projects	Lists other European Union Framework projects that have direct relevance to this project and provides a brief overview of these projects.
Scientific and Technological Objectives	Highlights the principal scientific and technological objectives of the project.

4.2.2 Providing a range of tools to facilitate communication among the PADAMOT project partners

The web site is designed to provide a range of facilities to improve communication between the consortium members. These are detailed in Table 4.

Table 4 Web pages to promote intra-project communication.

Page	Description
Contacts	Rapid e-mail links to the project coordinator and to the individual work package leaders.
Deliverables	A central catalogue of the agreed project deliverables, which is available to all partners and the public.
Diary of Events	A diary of events relevant to the project, such as conferences and workshops. Ensures that all partners and public users are aware of key events.
FTP Server	A password protected area that allows members of the project to transfer large files and images between themselves without having to burn the data to CD or DVD and use conventional postal services.
Project Partners	Contact details for all the partners involved in the project.
Reference List	A resource for the project members and public listing the references to key scientific publications relevant to the project. Ensures all involved are aware of all the relevant literature.
Research Highlights	Catalogues the highlights of the research conducted to date.

4.2.3 Providing a framework and context for the PADAMOT database

The PADAMOT web site provides access to, and a context for, the project database. The web site hosts a login page. On supplying a valid user id and password, the web site visitor is admitted to the web-based database browser application. This consists of a set of dynamic web pages that display data from the project database, and which may be used to browse the data (see Section 5).

4.2.4 Explaining and promoting the fledgling science of palaeohydrogeology

The final role of the web site is to explain something about palaeohydrogeology. This is a relatively small discipline with little explanation of its role and purpose on the Internet. These pages are identified and briefly described in Table 5.

Table 5 Web pages explaining palaeohydrogeology.

Page	Description
What is palaeohydro-geology?	Defines palaeohydrogeology and explains it role.
Why study palaeohydro-geology?	Explains why it is important to study palaeohydrogeology.
Why is palaeohydro-geology relevant for safety of radioactive waste repositories?	Describes the relationship be-tween the area of research and safety assessments in radioac-tive waste repositories.
Palaeohydrogeology of aquifers	Notes that most palaeohydro-geological studies to date have been conducted on aquifers rather than the low permeability rocks typical of the host rock of a radioactive waste repository.

4.3 DYNAMIC WEB PAGES WITHIN THE PADAMOT WEB SITE

ColdFusion is used extensively in the database component of the PADAMOT web site (Section 5), but it is also used for three other elements of the web site. These are:

- References
- Mailing list
- Glossary

4.3.1 The References subsystem of the web site

The References area of the web site, mentioned in Table 4, allows visitors to see a list of bibliographical references relevant to palaeohydrogeology, and to submit references to be considered for addition. The area is accessed by clicking on the "References" hyperlink in the left margin of any page of the PADAMOT web site (Figure 2). The operation of this subsystem is shown diagrammatically in Figure 4. The ColdFusion script REFERENCES.CFM generates a dynamic web page entitled "PADAMOT reference list", populated with references that are stored in the MS SQL Server data table PADAMOT_REFERENCES. If a text summary or abstract is available for a reference (not always the case), the visitor can click on a hyperlink that causes a pop-up window REFPOPUP.CFM to appear containing the summary/abstract. Clicking on a "Submit a reference" hyperlink on REFERENCES.CFM causes the script REFFORM.CFM to run. This is a web form that the user can use to enter a new reference for consideration. The user types reference data into the form and clicks the "Submit Form" button. This causes the script REFADD.CFM to run, which inserts the reference into PADAMOT _REFERENCES, displays an acknowledgement to the user, and sends an email message to the data table manager at BGS to alert him that a new reference has been submitted. The BGS table manager may then either accept or reject the new reference. The new reference does not appear on the web site until the table manager has accepted it, which he does by setting a flag in the PADAMOT_REFERENCES table.

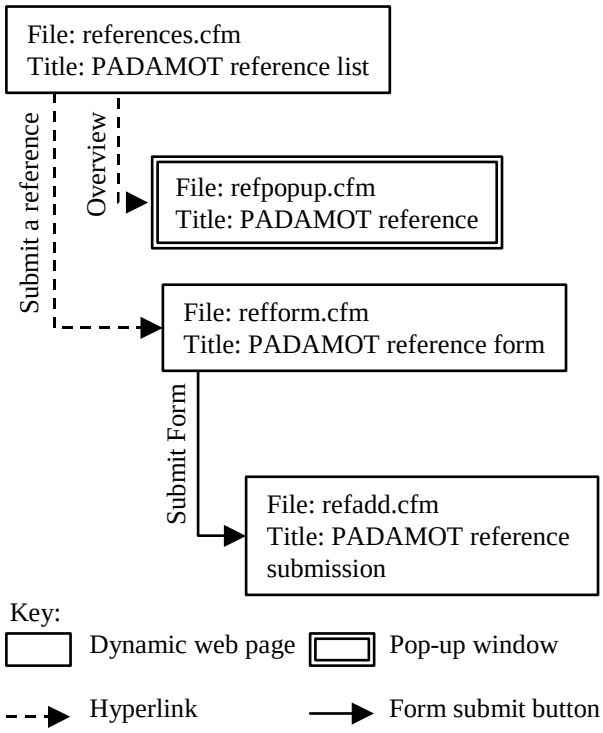


Figure 4 Functional diagram of the References subsystem of the PADAMOT web site.

4.3.2 The Mailing List subsystem of the web site

The Mailing List area of the web site allows visitors to submit their details so that they may be entered onto the PADAMOT mailing list. The area is accessed by clicking on the "Mailing list" hyperlink in the left margin of any page of the PADAMOT web site (Figure 2). The operation of this subsystem is shown in Figure 5. The ColdFusion script MAILING.CFM is a web form into which visitors may enter their details. Clicking the "Submit Form" button causes the script MAILADD.CFM to run. This script inserts the data into an MS SQL data table PADAMOT_MAILING, displays an acknowledgement to the visitor, and sends an email message to the data table manager at BGS to alert him that an application has been made to join the mailing list. The BGS table manager may then add the visitor to the PADAMOT mailing list.

4.3.3 The Glossary subsystem of the web site

The Glossary area of the web site is intended to explain palaeohydrogeological terminology used on the web site. It is accessed by clicking on the "Glossary" hyperlink in the left margin of any page (Figure 2). Its operation is shown in Figure 6. The ColdFusion script TERMS.CFM has a hyperlink for each letter of the alphabet. Clicking on one of these causes the script to display glossary terms beginning with the selected letter, read from the MS SQL data table ACRONYMS. Clicking on the id number for one of these terms causes the pop-up window GLOSPOPUP.CFM to appear, showing more complete details.

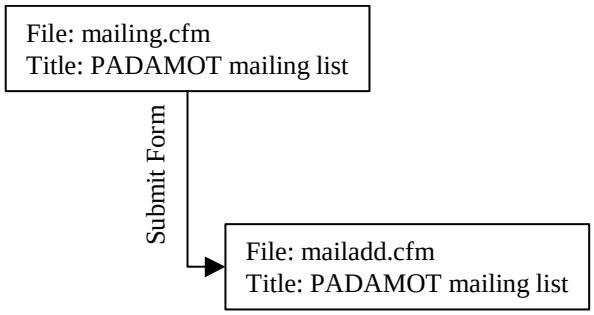


Figure 5 Functional operation of the Mailing List subsystem of the web site. Key as in Figure 4.

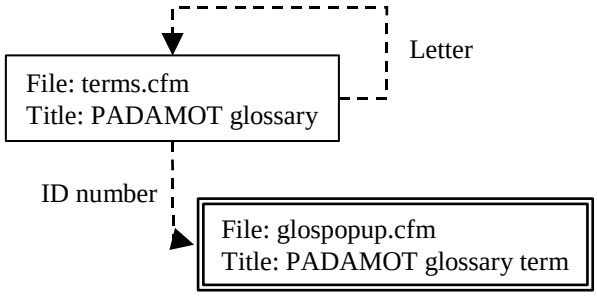


Figure 6 Functional diagram of the Glossary subsystem of the web site. Key as in Figure 4.

5 Database

The PADAMOT database has been designed to support the work of the project and the requirements of the partners involved in the various work packages. The data model has been created to hold data collected during the PADAMOT project and that generated during the EQUIP (Evidence from Quaternary Infills and Palaeohydrogeology) project.

The database can be divided into two main components:

- Data Model;
- Database Browser Application.

These are discussed in more detail below.

5.1 PADAMOT DATA MODEL

The PADAMOT data model as presented in this report aims to hold summary and some raw data from the EQUIP/PADAMOT projects in a logical, flexible and user-friendly format. The design allows users (project partners) to perform queries on the data, which was not previously possible. Example types of queries are:

- Borehole information;
- Sample information;
- Lithology;
- Microthermometry analysis - mineral paragenesis;
- Mineral assemblage;
- Chemical and isotopic analysis;
- Sample fracture information;
- Palaeoclimate and shallow surface information.

The design allows for the storage of summary information as required by the source organizations. The model also accommodates an entity for acronyms.

To allow easy referencing and cross-referencing of the data, unique identifiers, consistent with the data provided, have been incorporated into the design of the data model.

5.1.1 Programme of work

The summary of the work programme used in developing the data model is described briefly by stages in Table 6.

5.1.2 Primary design requirements

The following is a list of requirements as outlined by the partners that developers worked to achieve:

1. Design a data model (logical and physical implementation data definition language [DDL]) to hold summary data from the EQUIP and PADAMOT projects. This will make easier the task of downloading required datasets by source organizations.
2. Provide the capability within the resulting data model to hold some raw data (e.g. microthermometry analysis) to allow for some interpretations by specialists where specifically identified by the project leaders.
3. Production of a database DDL script for implementation upon a database instance.

Table 6 Stage summary.

Stage	Description of Stage
1	Data Analysis: A review of the existing spreadsheet data, EQUIP and PADAMOT technical report with the development of operational rules.
2	Initial consultations with Antoni Milodowski (BGS), Adrian Bath (Intellisci) and Paul Degnan (UK NIREX).
3	Logical database design.
4	Internal review of the initial logical design.
5	Revision of the logical design, additions of physical database elements to the data model.
6	Review of logical data model (Paul Degnan / Adrian Bath, plus other PADAMOT partner organizations).
7	Final revision of data model in light of comments from stage 6.
8	Production of database data definition language (DDL) script.
9	'Recommendation Implementation' Stage.

5.1.3 Database design

The data model is constructed from logical units known as entities, which are linked together by relationships. During implementation the entities are converted to database tables that are linked by foreign keys, which are the implementation of the relationships. To improve the data quality some fields within the entities have a restricted list of values. These restricted value lists are modelled in dictionary entities and implemented as dictionary tables, with foreign key constraints enforcing the rules.

Table 7 PADAMOT data model entities.

Entity Name	Description
ACRONYMS	Table containing acronyms used in the PADAMOT project.
CHEMICAL ANALYSIS	A table containing the results of chemical analyses on solid sample material (samples, sub-samples, and regions of interest)
FI MICROANALYSIS DATA	A table containing the results of microthermometric or other analyses on individual fluid inclusions.
FI PETROGRAPHY DATA	A table containing petrographic details of the analysed fluid inclusions.
FRACTURE INFO	A table containing fracture details of samples and/or localities.
FRACTURE PARAGENE-SIS	A table containing paragenetic details of fractures.
FRACTURE PFF	A table containing the potential flowing feature (PFF) details of fractures.
FRAC MINERAL INFILL	A table containing the details of minerals found in fractures.
FRAC SAMPLE JOIN	A join table between the fracture and sample tables. Contains a listing of fractures and their matching samples.
HYDROCHEM DATA	A table containing the header details of hydrochemical analyses on fluids.
HYDROCHEM SAMPLE	A table containing the results of hydrochemical analyses on fluids.
IMAGES	A table that contains details of all images (photos, photomicrographs, chemical maps, etc.).
LOCALITY LOGISTICS	A table containing the location and other details of localities (predominantly boreholes) within a site.
MAPS	A table containing details of borehole and locality maps.
PADAMOT MAILING	A table holding email and postal addresses of visitors to the PADAMOT web site who wish to be added to the project mailing list.
PADAMOT REFERENCES	A table holding bibliographical references on palaeohydrogeology submitted by visitors to the PADAMOT web site.
PALAEO CLIMATE	A table containing the details of the palaeoclimate history for each site.
PALAEO CLIMATE SITE JOIN	A join table between the palaeoclimate and site tables. Contains details of the palaeoclimate history and the corresponding site.
REGION OF INTEREST	A table containing details of the regions of interest within a sample. A region of interest can represent an area, a line or a point on a sample (particularly thin-sections), which is used to relate photomicrographs and analyses from the same areas/points on a subsample.
SAMPLE LOGISTICS	A table containing information about the source of each sample.
SAMPLE PARAGENESIS	A table containing details of the paragenesis within a given sample.
SAMPLE SUMMARY	A table containing the complete history or description of a sample.
SHALLOW SURFACE	A table containing the details of the shallow surface history for each site.
SHALLOW SURFACE SITE JOIN	A join table between the shallow surface and site tables. Contains details of the shallow sur-face history and the corresponding site.
SITE	A table containing names of the investigation sites and their countries.
SITE PARAGENESIS SCHEME	A table containing details of the summary paragenesis within an investigation site.
STAFF DETAIL	A table containing project staff details.
SUBSAMPLE LOGISTICS	A table containing details of subsamples (e.g. thin-sections, polished sections) derived from samples listed in the SAMPLE LOGISTICS table.
SUBSAMP PETROGRAPHY DATA	A table containing details of the paragenetic sequence within a subsample.

Table 8 PADAMOT dictionary entities.

Dictionary Name	Description
DIC ANALYTICAL METHOD	Dictionary table listing the different instruments used by different labs to derive data/analyses.
DIC CHEM DETERMINAND	Dictionary table containing codes and explanations of the different chemical species and other analytical measurements.
DIC COUNTRY	Dictionary table containing the names of the countries of PADAMOT participating organizations.
DIC DEPTH REFERENCE POINT	Dictionary table containing codes and explanations of the depth referencing systems used in the various localities.
DIC FRACTURE APERTURE	Dictionary table containing codes and the numerical values (range) for fracture apertures.
DIC FRAC CLASSIFICATION SCHEME	Dictionary table containing codes and explanations of the different fracture classification schemes.
DIC HYDRO TEST TYPE	Dictionary table containing codes and explanations of the different hydrological test types.
DIC IMAGE TYPE	Dictionary table containing codes and explanations of the different types of images.
DIC INCLUSION TYPE	Dictionary table containing codes and explanations for the different types of fluid inclusions (liquid, liquid + vapour, etc).
DIC LITHOLOGY	Dictionary table containing codes and explanations for the different lithologies.
DIC LOCALITY TYPE	Dictionary table containing codes and explanations for the different types of localities (boreholes, outcrops, etc.).
DIC MINERAL	Dictionary table containing codes and explanations for mineral species. The contents are derived from Kretz, R. (1983 American Mineralogist, v.68, p.277-279), modified by Kock, M. (1999; http://www.min.uni-heidelberg.de/mkoch/).
DIC PFF TYPES	Dictionary table containing codes and explanations of different potential flowing feature types.
DIC REGION OF INTEREST	Dictionary table containing codes and explanations of the different "region of interest" types.
DIC REPORTING UNIT	Dictionary table containing codes and explanations of the reporting units.
DIC SUBSAMPLE TYPE	Dictionary table containing codes and explanations of different subsample types (core, polished thin section, etc.)

The list of PADAMOT data model entities is shown in Table 7, and the dictionary entities are shown in Table 8.

5.1.3.1 ENTITIES

The data model comprises 45 entities of which 29 are data tables and 16 are dictionary tables. The entities map logically to the categorisation of the summary data from the EQUIP/PADAMOT project. There are a few exceptions to this case, where either a broader or narrower categorisation was required to meet the requirements of a relational data model design.

The entities are described more fully in appendices 1 and 2.

5.1.3.2 PRIMARY AND FOREIGN KEYS

The data model adopts primary and foreign keys to allow for the unique identification of records and also the cross-referencing of records between the various entities within the model. The primary key is the key field(s) (column(s)) within an entity that identifies a record uniquely within the entity. The data model uses the locality identifier (LOCALITY_ID), sample identifier (SAMPLE_ID), a sequence number (SEQ_NUMBER) and other codified field names where required in defining primary and foreign keys on the entities.

Examples: - a locality is identified uniquely by LOCALITY_ID, a sample by SAMPLE_ID, but given that there could be more than one sample per locality a composite primary key of LOCALITY_ID and SAMPLE_ID will identify a record uniquely within the sample information table. The foreign key is the linkage field or attribute within a relation and the foreign key matches the primary key of the relation.

A full listing of primary and foreign keys can be found in Appendix 3.

5.1.3.3 UNIQUE IDENTIFICATION

The unique identification system incorporated within the database allows for easy storage of the summary data, identification and cross-referencing of information for a site and also between sites. Unique identification makes possible the implementation of separate tables for locality and corresponding sample records together with other characteristics as specified in the summary. Design of dictionary tables for specific properties of the data, such as minerals, chemical determinands, acronyms, lithology and reporting units was also possible.

- LOCALITY_ID helps locate a borehole uniquely;
- SAMPLE_ID locates a sample uniquely;
- SEQ_NUMBER helps locate a unique record within a table, where the LOCALITY_ID and SAMPLE_ID information is not sufficient to uniquely identify such a record;
- There will be greater flexibility in the identification of borehole and sample information;
- Auditing of borehole and sample information and their accompanying characteristics becomes much easier with standard or new data queries;
- Where data are to be added, either to tables or dictionaries, this will be easier and quicker.

5.1.3.4 SOME DESIGN ASSUMPTIONS

1. Data inserted into the database when implemented must belong to one of the three or four investigated sites and must have some locality record details;
2. Sample information will have corresponding locality information;
3. Details of analyses carried out on samples will also include locality and sample record details.

5.1.3.5 DATABASE CREATION

Once the data model has been designed a script in database definition language (DDL), a subset of structured query language (SQL), can be created rapidly. This is run within the database environment to produce the tables, keys and other database objects. The DDL is listed in Appendix 4.

5.1.4 Population of the database

The database was populated initially with summary data from the EQUIP project. Validation for the EQUIP data was extensive due to legacy issues. The data were standardized and exported from Microsoft Excel spreadsheets and Microsoft Access databases into temporary tables in a SQL Server database using database tools. A set of procedures was then used to validate the data in the temporary tables for data type, data length, primary keys (PK), foreign keys (FK), constraining dictionary values and default values. Transactional SQL routines were then used to migrate data from the temporary tables into a development version of the PADAMOT database, which was again validated and subsequently migrated to the live PADAMOT SQL Server database.

For the new PADAMOT data, Excel spreadsheet templates with defined data types, data lengths and dictionary values have been provided to the data custodians, recorders or interpreters to allow for standardization of data values at an early stage. Using database tools as above, the Excel spreadsheets are imported into a SQL Server database and validated against procedures using transactional SQL before migration to the live server. All data entries and updates are also logged in the database tables for auditing purposes.

5.2 DATABASE BROWSER APPLICATION

An important aim of this project is to make data gathered during its lifetime and that of the preceding EQUIP project available to the members of the project consortium. As described in Section 3, the decision was taken that data would be made available to the project partners via a web-based system. This would enable all of the partners to access data without the need for specialised or expensive software. To meet this purpose, a sophisticated but simple-to-use web-based application has been developed, which can be accessed from the PADAMOT web site.

5.2.1 Requirements

The general requirements of the application were determined at an early stage to be the following:

1. It should display data from the PADAMOT project database in a meaningful and useful format;
2. It should be web-based, running within a web browser with no requirement for additional or specialised software;
3. It should exist within the context of the PADAMOT web site, but during the lifetime of the project it should be accessible only to project partners;
4. It should be self-explanatory and simple to use;
5. It should take the form of a hierarchical browser, in which the user moves from one area of data to another by following clickable hyperlinks in a relatively closely-defined way, rather than being a forms-based query-authoring tool.

On examination and analysis of the data model (Section 5.1), it was determined that the principal modules that should be available within the application were the following:

1. A login module, which should control visitor access to the application;
2. An application home page, where the visitor can select the PADAMOT test site from which they wish to see data;
3. A “site” module, showing general data for a selected site (including palaeoclimatic data and site-specific paragenesis) as well as the list of localities (almost always boreholes) available at that site;

4. A "locality" module, showing general data for a selected locality as well as the list of available samples from that locality;
5. A "petrographic sample" module, showing data for a selected sample, which may include a text description, paragenesis scheme, and results of any chemical analyses performed on it, as well as the list of subsamples made from it;
6. A "petrographic subsample" module, showing data for a selected subsample, which may include petrography, and the results of any chemical and fluid inclusion analyses performed on it;
7. A "hydrochemical sample" module, showing data for a selected hydrochemical sample and the results of analyses performed on it;
8. An "image" module, displaying a selected image together with data about it;
9. A "fracture" module, showing information about a selected fracture.

It was determined that browsing would normally follow a reasonably well-defined path, for example: from the application home page, selecting one site (e.g. Sellafield), selecting one locality from that site (e.g. "BH10A"), selecting a petrographic sample from that locality (e.g. "B685"), and selecting a subsample from that sample (e.g. "B685/AW1").

5.2.2 Development

Following on from requirements identification, initial script development took place during the first quarter of 2003. From time to time the scripts were subject to informal review for style and functionality by other BGS project staff.

A thorough review of the database, database browser application, and web site was carried out at a meeting of Adrian Bath, Antoni Milodowski, Jeremy Giles, Jon Bouch, Martin Nayembil and Tim McCormick held at BGS on 22 July 2003. Several modifications and refinements were requested, and these were subsequently implemented.

The data browser application underwent review and was accepted by the BGS web site editor in late 2003. Version 1 of the database browser application (the version described here) went live on the BGS web site in January 2004.

5.2.3 Access

The PADAMOT database browser application is accessed from the project web site at http://www.bgs.ac.uk/padamot/. Clicking on the "Databases" hyperlink at the top right of the page takes the visitor to the login screen shown in Figure 7.

During the lifetime of the project, the database is available to project partners, using the username and password with which they have been supplied.

5.2.4 Operation

The scripts comprising the database browser application are listed in Table 9, and a functional diagram showing the operation of the application is shown in Figure 8. Screen grabs of the application in operation are reproduced in Appendix 6.

The script LOGIN.CFM generates a form in which the visitor supplies their username and password. On clicking the "Login Now" button, the script VERIFYLOGIN.CFM is run, which checks to see whether the supplied username and password are valid. If so, the visitor is admitted to the application and redirected automatically to DATAHOME.CFM, the application front page. Otherwise, the visitor is invited to try logging in again.

DATAHOME.CFM lists the sites in the database, and the visitor may click on a hyperlinked site name to choose one. This will cause them to be taken to SITE.CFM, which displays data describing the chosen site. By default, the list of localities (boreholes) at the site is displayed, but the visi-

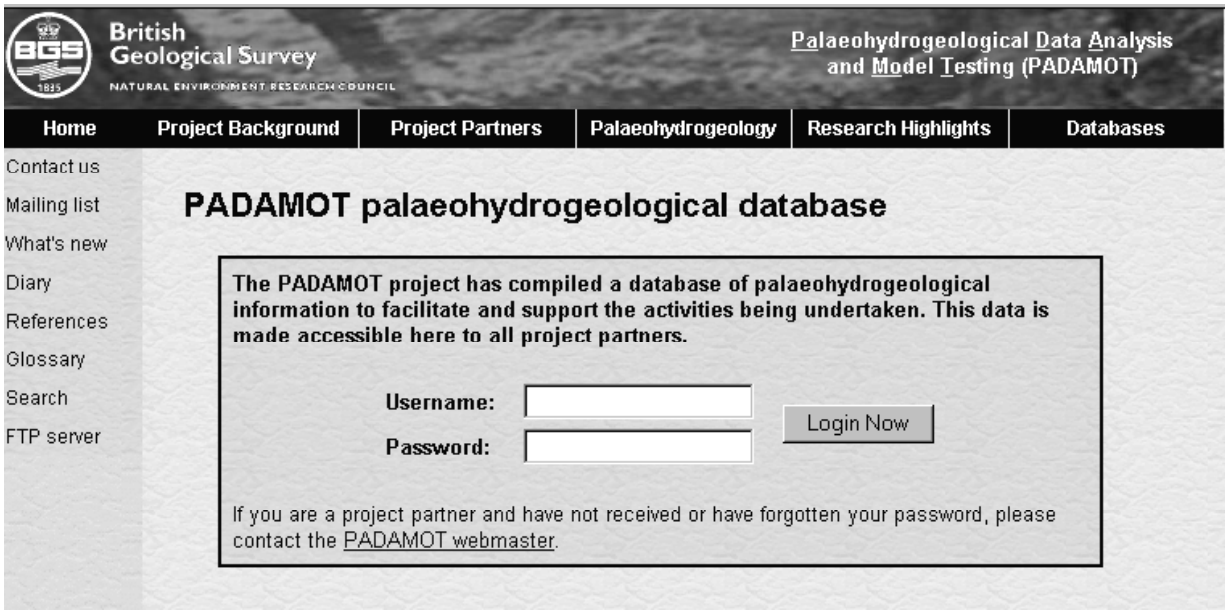


Figure 7 Login screen for the PADAMOT database browser application.

tor may click on the white hyperlinked “Map Data”, “Shallow Surface”, “Palaeoclimate”, and “Site Paragenesis” tabs to see these data if they are available. On the “Localities” tab, clicking on a hyperlinked Locality ID takes the visitor to LOCALITY.CFM.

LOCALITY.CFM displays data describing the chosen locality. As well as basic descriptive information about the locality, the lists of petrographic samples, hydrochemical samples, fractures, and images known for this locality are shown. To shorten download time, images are displayed as small thumbnails and a maximum of 10 are shown at a time.

If the visitor clicks on a hyperlinked Hydrochemical Sample Number on LOCALITY.CFM, they are taken to HYDROSAMP.CFM, which displays data describing the chosen hydrochemical sample, together with the results of any analyses carried out on it.

Back on LOCALITY.CFM, clicking on a hyperlinked Petrographic Sample ID takes the visitor to SAMPLE.CFM. As well as basic descriptive information about the sample, the lists of petrographic subsamples, fractures and images known for this sample are shown. There are also white hyperlinked tabs, which the visitor may click on to see additional data relating to the sample if available. The “Sample Summary” tab shows a text description of the sample. The “Sample Paragenesis” tab shows the paragenetic sequence. The “Sample Chemical Analyses” tab shows results of analyses carried out on the sample. On the “Sample Data” tab, clicking on a hyperlinked Subsample ID takes the visitor to SUBSAMPLE.CFM.

SUBSAMPLE.CFM shows descriptive information about the subsample, as well as a list of regions of interest on it, results of fluid inclusion analyses, fractures and images. There are two white hyperlinked tabs that lead to additional data. The “Subsample Petrography” tab shows a description of the petrography; the “Subsample Chemical Analyses” tab shows results of analyses carried out on the subsample.

On any of the scripts that list fractures, (LOCALITY.CFM, SAMPLE.CFM and SUBSAMPLE.CFM), clicking on the hyperlinked Fracture ID takes the visitor to FRACTURE.CFM. This shows information describing the fracture, and it is possible to follow hyperlinks to petrographic samples and subsamples on which the fracture occurs.

On any of the scripts that show image thumbnails, (LOCALITY.CFM, SAMPLE.CFM and SUBSAMPLE .CFM), clicking on the hyperlinked Image ID or on the thumbnail itself takes the visitor to IMAGE.CFM. This shows an enlarged version of the image and information about it.

Table 9 ColdFusion scripts making up the PADAMOT database browser application.

Script	Purpose
APPLICATION.CFM	Enables the application framework. This is a non-visible script, operating in the background to maintain application-wide variables and settings.
CHEM.CFM	Shows results of chemical analyses on a sample or subsample.
DATAHOME.CFM	The application "home page", which lists the sites.
FRACTURE.CFM	Shows data describing a fracture.
HYDROSAMP.CFM	Shows data describing a hydrochemical sample, and results of analyses on it.
IMAGE.CFM	Shows an image with data describing it.
LOCALITY.CFM	Shows data describing a locality, with lists of petrographic and hydrochemical samples, fractures, and images.
LOGIN.CFM	Login form on which the visitor can supply a username and password to be admitted to the application.
NIREXMAP.CFM	Map of NIREX deep boreholes.
SAMPLE.CFM	Shows data describing a petrographic sample, with lists of subsamples, fractures, and images.
SAMPLE_ PARAGENESIS.CFM	Shows paragenesis for a petrographic sample.
SAMPLE_ SUMMARY.CFM	Shows a text description for a petrographic sample.
SITE.CFM	Shows data describing a site, with (under tabs) lists of localities, maps, shallow surface, palaeoclimate and site paragenesis data.
SUBSAMPLE.CFM	Shows data describing a petrographic subsample, with data on fluid inclusions, fractures, and images.
SUBSAMPLE_ PET.CFM	Shows petrography data for a petrographic subsample.
VERIFYLOGIN.CFM	Checks the validity of the username and password supplied by the visitor. If they are invalid, the user is requested to log in again.

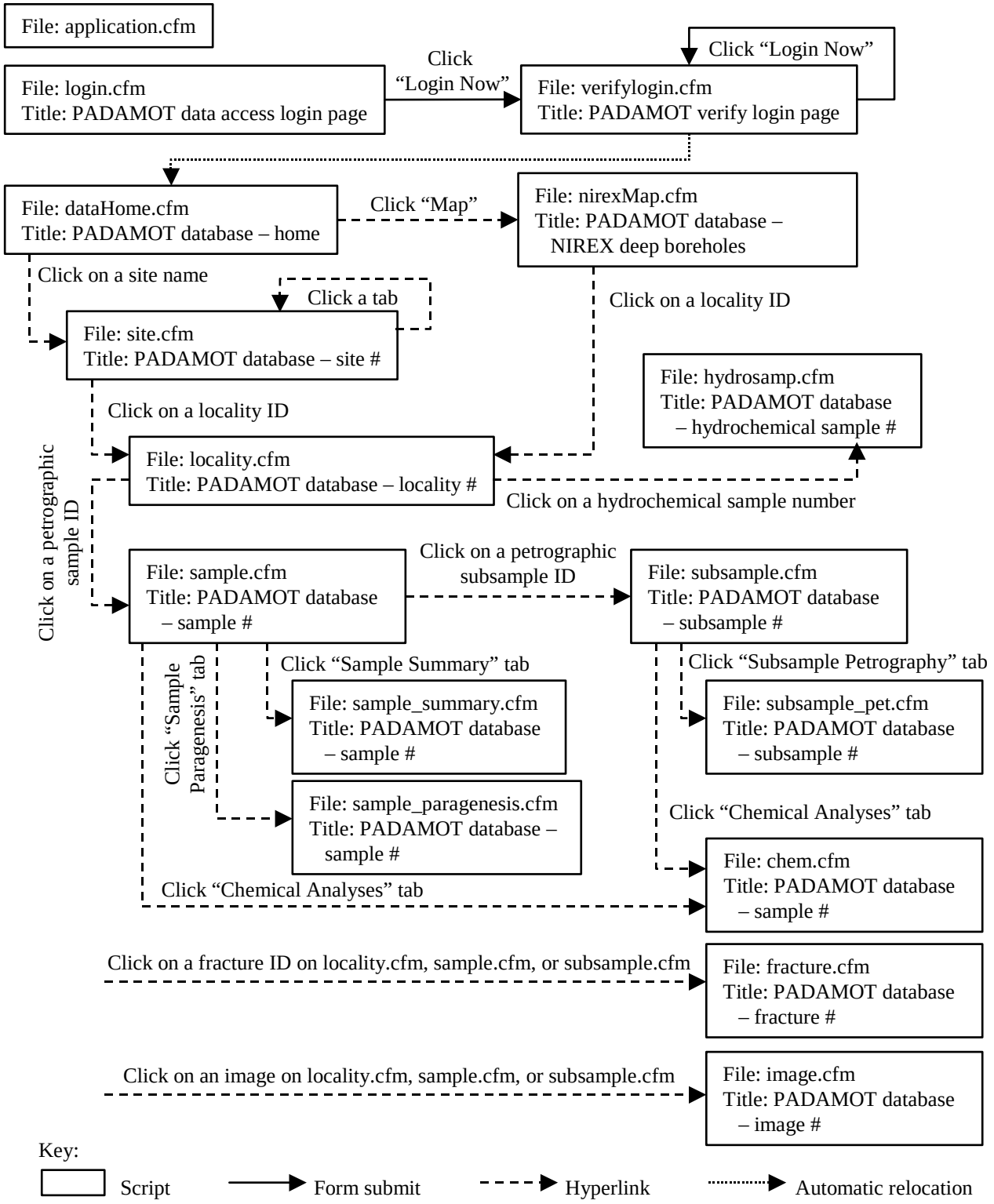


Figure 8 Functional diagram of the PADAMOT web database browser application.

Appendix 1 PADAMOT Entity Relationship Diagrams

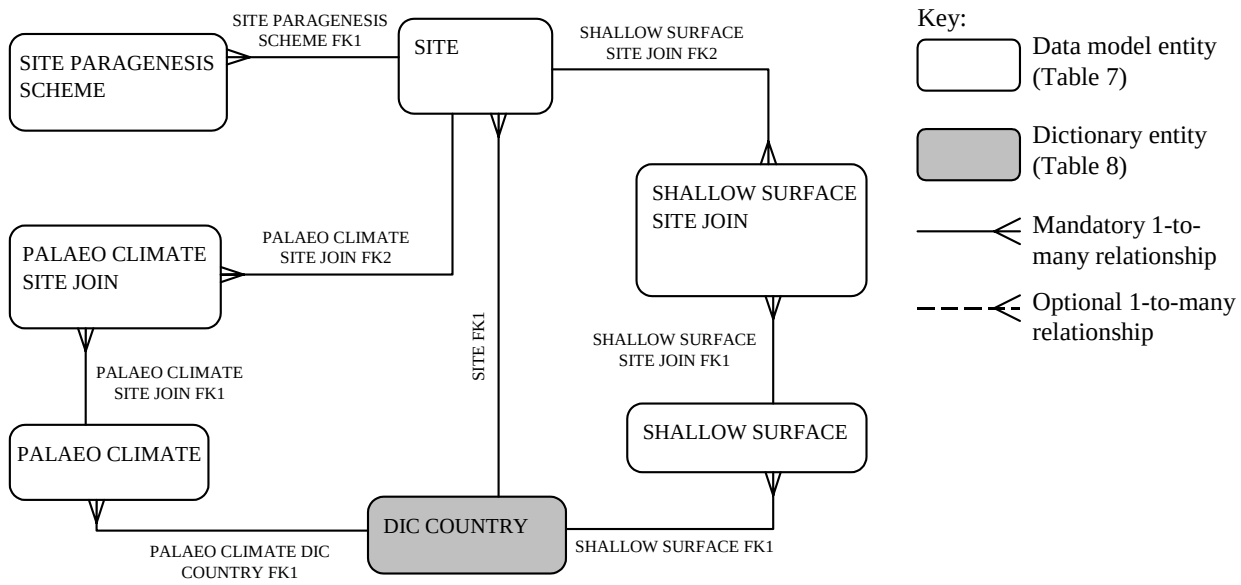


Figure 9 Entity-relationship diagram showing the database entities that hold site-specific data: SITE, SITE PARAGENESIS SCHEME, SHALLOW SURFACE, PALAEO CLIMATE and the dictionary DIC COUNTRY, and their relationships. Mandatory 1-to-many relationships are relationships in which the "many" side is a mandatory column; in optional 1-to-many relationships, the "many" side is an optional column.

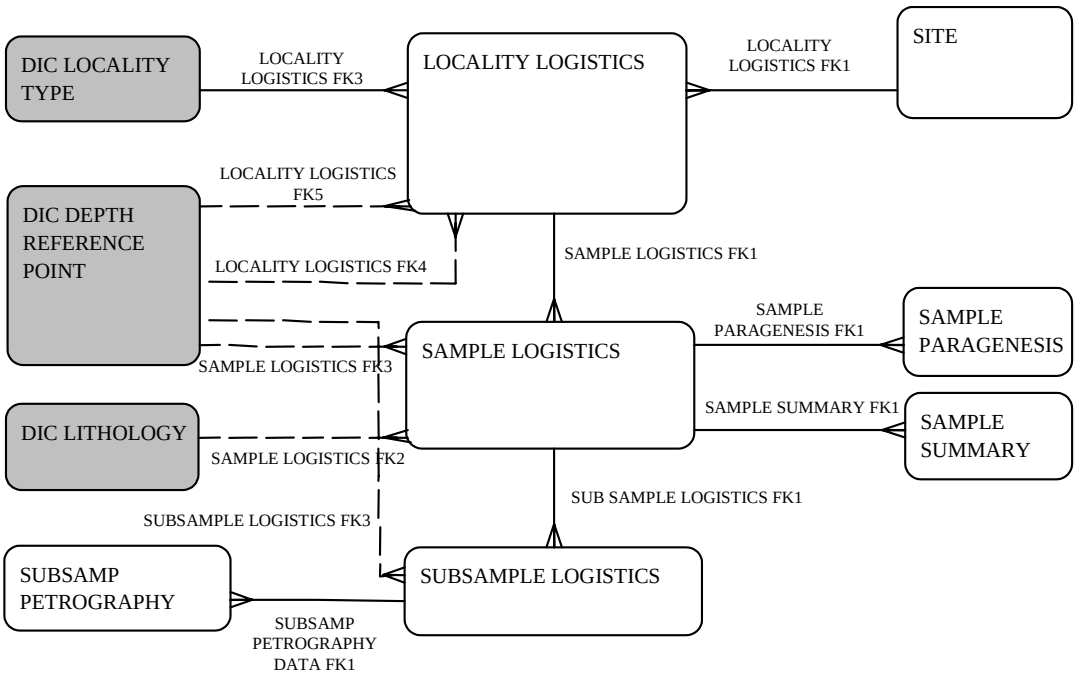


Figure 10 The entities that hold locality, petrographic sample, and petrographic subsample data: LOCALITY LOGISTICS, SAMPLE LOGISTICS, SAMPLE SUMMARY, SAMPLE PARAGENESIS, SUBSAMPLE LOGISTICS, and SUBSAMP PETROGRAPHY DATA, with associated dictionary entities and relationships. The SITE entity is also shown in Figure 9. Key as in Figure 9.

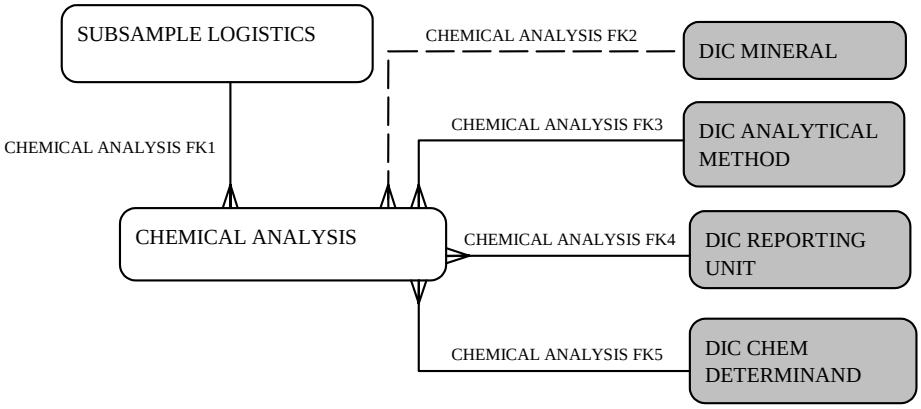


Figure 11 The CHEMICAL ANALYSIS entity, that holds data on chemical analyses, and its relationships. The SUBSAMPLE LOGISTICS entity is also shown in Figure 10. Key as in Figure 9.

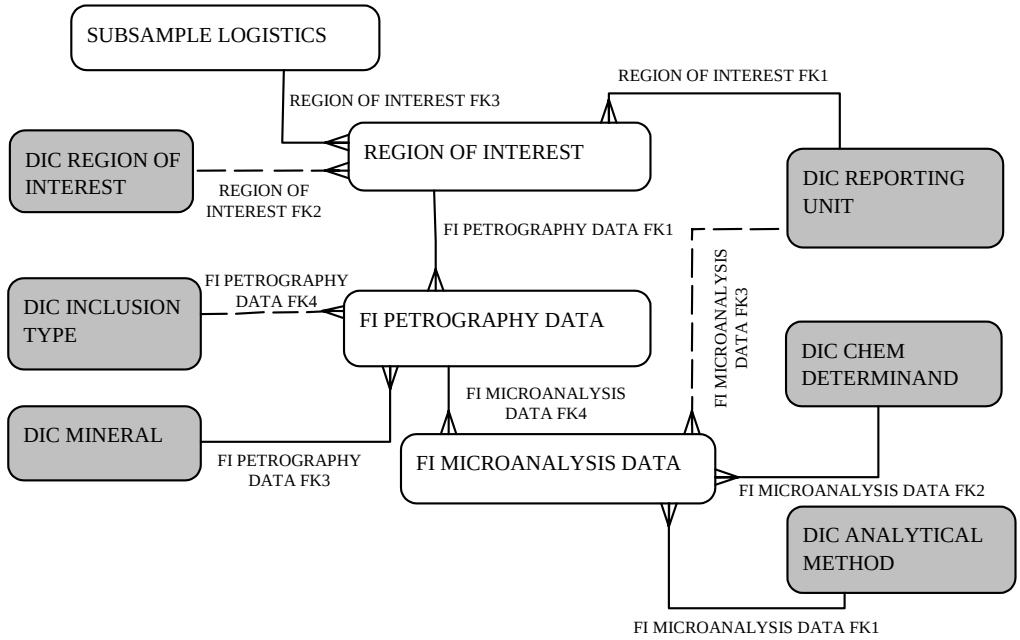


Figure 12 The entities that hold fluid inclusion data: REGION OF INTEREST, FI PETROGRAPHY DATA, and FI MICROANALYSIS DATA, with their associated dictionary entities and relationships. The SUBSAMPLE LOGISTICS entity is also shown in Figures 10 and 11. Key as in Figure 9.

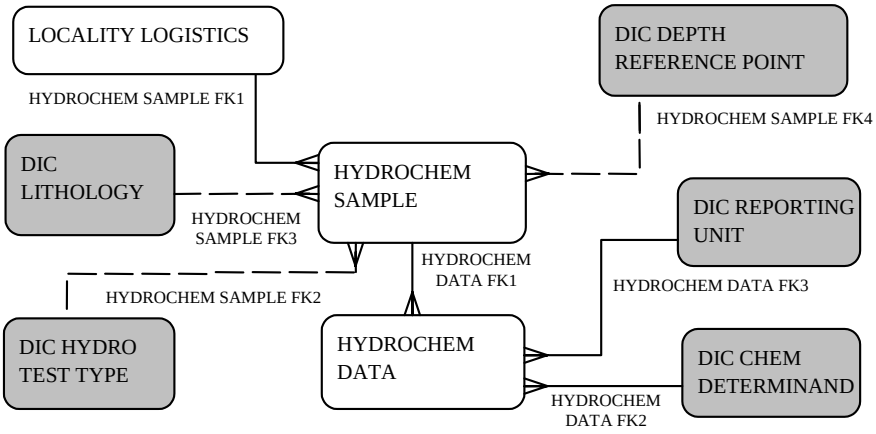


Figure 13 The entities that hold information on hydrochemical samples and analyses, HYDROCHEM SAMPLE and HYDROCHEM DATA, with their associated dictionaries and relationships. The LOCALITY LOGISTICS entity is also shown in Figure 10. Key as in Figure 9.

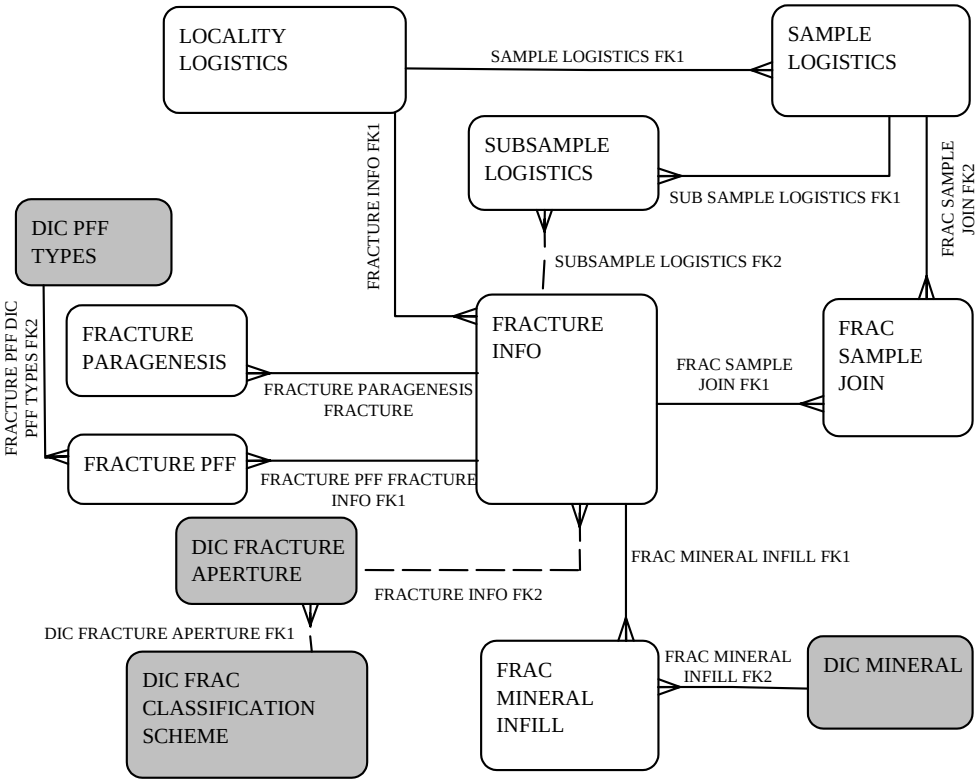


Figure 14 The entities that hold information about fractures, FRACTURE INFO, FRACTURE PARAGENESIS, FRACTURE PFF, and FRAC MINERAL INFILL, with their associated dictionaries and relationships. The LOCALITY LOGISTICS, SAMPLE LOGISTICS and SUBSAMPLE LOGISTICS entities are also shown in other figures. Key as in Figure 9.

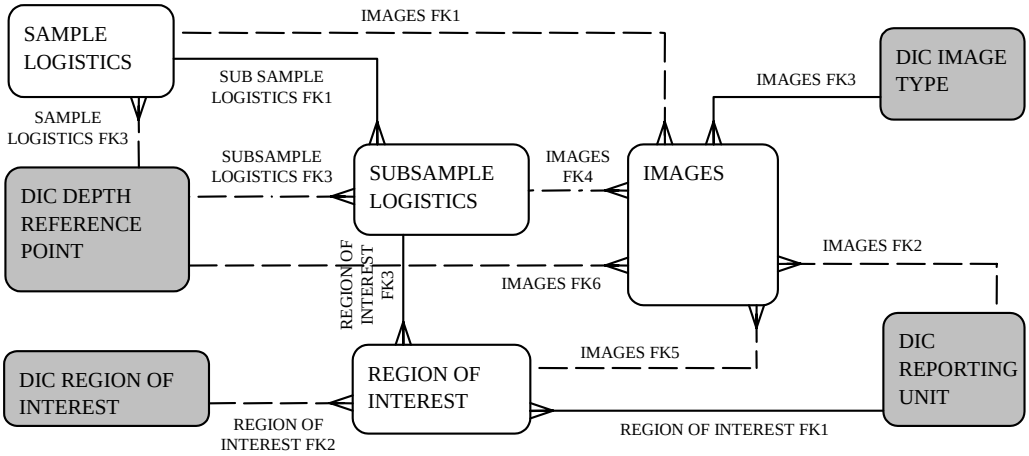


Figure 15 The IMAGES entity, which holds data on images, and its relationships. The SAMPLE LOGISTICS, SUBSAMPLE LOGISTICS and REGION OF INTEREST entities are also shown on other figures. Key as in Figure 9.

Appendix 2 PADAMOT Database Entities, Attributes and their Descriptions

Note: In addition to the attributes listed in the main table below, all tables ("entities") in the PADAMOT database include the following four audit fields:

Attribute Name	Attribute Description
USER ENTERED	The user ID of the user who entered the record.
DATE ENTERED	The date on which the record was entered.
USER UPDATED	The user ID of the user who last updated the record.
DATE UPDATED	The date on which the record was last updated.

Entity Name	Attribute Name	Attribute Description
ACRONYMS	GLOSSARY	The acronym.
ACRONYMS	TERMINOLOGY	Explanation of acronym.
ACRONYMS	CLASS KEY EXAMPLES	Key examples of acronym grouping or class.
CHEMICAL ANALYSIS	CHEM ID	Unique identifier – sequence generated.
CHEMICAL ANALYSIS	CHEM ANALYSIS NO	Unique identifier for an analysis.
CHEMICAL ANALYSIS	SAMPLE ID	Unique identifier of the sample.
CHEMICAL ANALYSIS	SUBSAMPLE ID	Unique identifier of the subsample.
CHEMICAL ANALYSIS	ROI ID	Identifier of the region of interest.
CHEMICAL ANALYSIS	MINERAL CODE	Dictionary code of the mineral species the analysis was conducted on.
CHEMICAL ANALYSIS	ANALYTICAL METHOD CODE	Unique identifier code of the analytical method.
CHEMICAL ANALYSIS	CHEM DET CODE	Unique identifier code of the chemical determinand analysed.
CHEMICAL ANALYSIS	CHEM DET VALUE	The numerical analytical result.
CHEMICAL ANALYSIS	REP UNIT CODE	Dictionary code for the reporting units for the result.
CHEMICAL ANALYSIS	OTHER INTERPRETATION	Other comments relating to the analysis, including interpretation relative to site/sample paragenetic scheme where possible.
CHEMICAL ANALYSIS	QUALIFIER	A qualifier for the chemical determinand value.
CHEMICAL ANALYSIS	CHM ANALY COMMENT	General comments field.
DIC ANALYTICAL METHOD	CODE	Unique identifying code.
DIC ANALYTICAL METHOD	DESCRIPTION	Explanation of the code.
DIC ANALYTICAL METHOD	TRANSLATION	Short explanation of the code.

Entity Name	Attribute Name	Attribute Description
DIC ANALYTICAL METHOD	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC CHEM DETERMINAND	CODE	Unique identifying code.
DIC CHEM DETERMINAND	DESCRIPTION	Explanation of the code.
DIC CHEM DETERMINAND	TRANSLATION	Short explanation of the code.
DIC CHEM DETERMINAND	REP UNIT CODE	Unique identifying code for the reporting unit.
DIC CHEM DETERMINAND	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC COUNTRY	CODE	Unique identifying code.
DIC COUNTRY	DESCRIPTION	Explanation of the code.
DIC COUNTRY	TRANSLATION	Short explanation of the code.
DIC COUNTRY	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC DEPTH REFERENCE POINT	CODE	Unique identifying code.
DIC DEPTH REFERENCE POINT	DESCRIPTION	Explanation of the code.
DIC DEPTH REFERENCE POINT	TRANSLATION	Short explanation of the code.
DIC DEPTH REFERENCE POINT	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC FRACTURE APERTURE	CODE	Unique identifying code.
DIC FRACTURE APERTURE	DESCRIPTION	Explanation of the code.
DIC FRACTURE APERTURE	TRANSLATION	Short explanation of the code.
DIC FRACTURE APERTURE	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC FRAC CLASSIFICATION SCHEME	CODE	Unique identifying code.
DIC FRAC CLASSIFICATION SCHEME	DESCRIPTION	Explanation of the code.
DIC FRAC CLASSIFICATION SCHEME	TRANSLATION	Short explanation of the code.
DIC FRAC CLASSIFICATION SCHEME	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC HYDRO TEST TYPE	CODE	Unique identifying code.
DIC HYDRO TEST TYPE	DESCRIPTION	Explanation of the code.
DIC HYDRO TEST TYPE	TRANSLATION	Short explanation of the code.
DIC HYDRO TEST TYPE	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).

Entity Name	Attribute Name	Attribute Description
DIC IMAGE TYPE	CODE	Unique identifying code.
DIC IMAGE TYPE	DESCRIPTION	Explanation of the code.
DIC IMAGE TYPE	TRANSLATION	Short explanation of the code.
DIC IMAGE TYPE	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC INCLUSION TYPE	CODE	Unique identifying code.
DIC INCLUSION TYPE	DESCRIPTION	Explanation of the code.
DIC INCLUSION TYPE	TRANSLATION	Short explanation of the code.
DIC INCLUSION TYPE	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC LITHOLOGY	CODE	Unique identifying code.
DIC LITHOLOGY	DESCRIPTION	Explanation of the code.
DIC LITHOLOGY	TRANSLATION	Short explanation of the code.
DIC LITHOLOGY	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC LOCALITY TYPE	CODE	Unique identifying code.
DIC LOCALITY TYPE	DESCRIPTION	Explanation of the code.
DIC LOCALITY TYPE	TRANSLATION	Short explanation of the code.
DIC LOCALITY TYPE	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC MINERAL	CODE	Unique identifying code.
DIC MINERAL	DESCRIPTION	Explanation of the code.
DIC MINERAL	TRANSLATION	Short explanation of the code.
DIC MINERAL	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC PFF TYPES	PFF TYPE CODE	Unique identifying code.
DIC PFF TYPES	MAIN POROSITY TYPE	Main porosity type.
DIC PFF TYPES	SECONDARY POROSITY TYPE	Secondary porosity type.
DIC PFF TYPES	DISTINGUISHING FEATURE	Text description of distinguishing features of the potential flowing feature.
DIC PFF TYPES	PFF TYP COMMENT	Comment.
DIC REGION OF INTEREST	CODE	Unique identifying code.
DIC REGION OF INTEREST	DESCRIPTION	Explanation of the code.
DIC REGION OF INTEREST	TRANSLATION	Short explanation of the code.
DIC REGION OF INTEREST	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).

Entity Name	Attribute Name	Attribute Description
DIC REPORTING UNIT	CODE	Unique identifying code.
DIC REPORTING UNIT	DESCRIPTION	Explanation of the code.
DIC REPORTING UNIT	TRANSLATION	Short explanation of the code.
DIC REPORTING UNIT	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
DIC SUBSAMPLE TYPE	CODE	Unique identifying code.
DIC SUBSAMPLE TYPE	DESCRIPTION	Explanation of the code.
DIC SUBSAMPLE TYPE	TRANSLATION	Short explanation of the code.
DIC SUBSAMPLE TYPE	CODE STATUS	Status of the dictionary code (e.g. obsolete, current).
FI MICROANALYSIS DATA	INCLUSION ID	Unique identifier of the fluid inclusion.
FI MICROANALYSIS DATA	ROI ID	The region of interest within which the fluid inclusion occurs.
FI MICROANALYSIS DATA	ANALYTICAL METHOD CODE	Dictionary code of the analytical method applied.
FI MICROANALYSIS DATA	CHEM DET CODE	Dictionary code for the chemical species or phase change measured (e.g. salinity or homogenisation temperature).
FI MICROANALYSIS DATA	CHEM DET VALUE	Value of the measured species concentration/phase change temperature.
FI MICROANALYSIS DATA	REP UNIT CODE	Dictionary code for the units of the measured species concentration/phase change temperature.
FI MICROANALYSIS DATA	FIMDATA COMMENT	General comments field.
FI PETROGRAPHY DATA	INCLUSION ID	Unique identifier of the fluid inclusion.
FI PETROGRAPHY DATA	ROI ID	The region of interest within which the fluid inclusion occurs.
FI PETROGRAPHY DATA	INCLUSION TYPE CODE	Dictionary code for the fluid inclusion type (a description of the phases contained within the inclusion; e.g. liquid + vapour, liquid only).
FI PETROGRAPHY DATA	HOST MINERAL CODE	Dictionary code for the fluid inclusion host mineral phase.
FI PETROGRAPHY DATA	FI SIZE	Diameter of the fluid inclusion in microns.
FI PETROGRAPHY DATA	GENERATION	The fluid inclusion generation (i.e. primary, pseudosecondary, secondary).
FI PETROGRAPHY DATA	RELATIVE AGE	Age/timing of the fluid inclusion relative to the site/sample paragenetic scheme.
FI PETROGRAPHY DATA	DEGREE OF FILL	Proportions of liquid/(liquid + vapour) of the fluid inclusion at room temperature.
FI PETROGRAPHY DATA	FIPDATA COMMENT	General comments field.
FRACTURE INFO	FRACTURE ID	Unique identifier for a fracture – sequence generated.

Entity Name	Attribute Name	Attribute Description
FRACTURE INFO	LOCALITY ID	Unique identifier for a locality (e.g. a borehole).
FRACTURE INFO	FRACTURE DESCRIPTION	Full description of the fracture.
FRACTURE INFO	DEPTH	Depth in the locality where fracture occurs (from core samples).
FRACTURE INFO	DEPTHREF PT CODE	Dictionary code for the depth referencing system used at the locality (e.g. m below ground level, core depth below RKB, etc.).
FRACTURE INFO	FRACTURE DIP	Dip value of a fracture.
FRACTURE INFO	FRACTURE DIP AZI	Dip azimuth of a fracture.
FRACTURE INFO	FRACTURE STRIKE	Strike of a fracture.
FRACTURE INFO	FRACTURE AP QUAL CODE	Qualifier for fracture aperture.
FRACTURE INFO	FRACTURE APERTURE VALUE	Width of a fracture.
FRACTURE INFO	DIP ORIENTATION TYPE	Type of dip orientation of fracture (e.g. true or apparent dip).
FRACTURE INFO	CLASSIFICATION SCHEME	The classification scheme used for fractures.
FRACTURE INFO	K VALUE	Fracture analysis - hydraulic conductivity value.
FRACTURE INFO	LOCAL CORE RUN NO	NIREX unique core run identifier for borehole core. A part of the NIREX fracture reference.
FRACTURE INFO	LOCAL DISCONTINUITY NO	Discontinuity number within a core run. Identifier is unique within a unique core run identifier. NIREX.
FRACTURE INFO	PARAGENETIC DESCRIP-TION	Details of the paragenetic sequence or history of the fracture sample.
FRACTURE INFO	MIN AGE OF INFILL	Probable minimum or end age of infill material.
FRACTURE INFO	MAX AGE OF INFILL	Probable maximum or start age of infill material.
FRACTURE INFO	MIN AGE UNCERTAINTY	Uncertainty on minimum age of infill.
FRACTURE INFO	MAX AGE UNCERTAINTY	Uncertainty on maximum age of infill.
FRACTURE INFO	FRAC INF COMMENT	General comments field.
FRACTURE PARAGENESIS	FRAC PARAGENETIC ID	Unique identifier for the fracture paragenesis – se-quence generated.
FRACTURE PARAGENESIS	FRACTURE ID	ID for the fracture.
FRACTURE PARAGENESIS	PARAGENETIC CODE	Paragenetic code for fracture (e.g. ME6A, ME6B, etc.).
FRACTURE PARAGENESIS	QUALIFIER	Paragenetic code qualifier.
FRACTURE PARAGENESIS	FRAC PARA COMMENT	General comments field.
FRACTURE PFF	PFF ID	Unique identifier for the potential flowing feature data – sequence generated.
FRACTURE PFF	FRACTURE ID	Unique identifier for the fracture.
FRACTURE PFF	PFF CODE	Dictionary code for the potential flowing feature.
FRACTURE PFF	PFF QUALIFIER	Qualifier for the potential flowing feature code.

Entity Name	Attribute Name	Attribute Description
FRACTURE PFF	FRAC PFF COMMENT	General comments field.
FRAC MINERAL INFILL	FEATURE INFILL ID	Unique identifier for the fracture infill – sequence generated.
FRAC MINERAL INFILL	FRACTURE ID	Unique identifier for the fracture.
FRAC MINERAL INFILL	MINERAL INFILL CODE	Dictionary code for the mineral infill.
FRAC MINERAL INFILL	QUALIFIER	Qualifier for the mineral infill.
FRAC MINERAL INFILL	FRAC MINFILL COMMENT	General comments field.
FRAC SAMPLE JOIN	FRACTURE ID	Unique identifier of the fracture.
FRAC SAMPLE JOIN	LOCALITY ID	Unique identifier of the locality.
FRAC SAMPLE JOIN	SAMPLE ID	Unique identifier of the source sample of the fracture.
FRAC SAMPLE JOIN	FRAC SJOIN COMMENT	General comments field.
HYDROCHEM DATA	LOCALITY ID	Unique identifier of the locality.
HYDROCHEM DATA	SAMPLE NUMBER	Unique identifier of the hydrochemical sample.
HYDROCHEM DATA	HYDRO DET CODE	Dictionary code for the chemical species measured.
HYDROCHEM DATA	HYDRO DET VALUE	The value of the measured species concentration/phase change temperature.
HYDROCHEM DATA	REP UNIT CODE	Dictionary code for the units of the measured species concentration/phase change temperature.
HYDROCHEM DATA	QUALIFIER	Qualifier for the hydro_det_value..
HYDROCHEM DATA	HYDATA COMMENT	General comments field.
HYDROCHEM SAMPLE	LOCALITY ID	Unique identifier of the locality.
HYDROCHEM SAMPLE	SAMPLE NUMBER	Unique identifier of the sample.
HYDROCHEM SAMPLE	GRDWATER SAMP ID	Unique identifier for the groundwater sample.
HYDROCHEM SAMPLE	START DATE	Date the analysis was started.
HYDROCHEM SAMPLE	LITHOLOGY CODE	Dictionary code for the lithology from which the analysed fluid was derived.
HYDROCHEM SAMPLE	HYDRO DEPTH TOP	Top depth for the sample.
HYDROCHEM SAMPLE	HYDRO DEPTH BASE	Bottom depth for the sample.
HYDROCHEM SAMPLE	HYDRO MID DEPTH	Mid depth for the sample.
HYDROCHEM SAMPLE	DEPTHREF PT CODE	Dictionary code for the depth referencing system used at the locality (e.g. m below ground level, core depth below RKB, etc.).
HYDROCHEM SAMPLE	HYDRO TEST TYPE	Dictionary code for the hydrochemical test type.
HYDROCHEM SAMPLE	HYSAMP COMMENT	General comments field.
IMAGES	IMAGE ID	Unique identifier of the image – sequence generated.

Entity Name	Attribute Name	Attribute Description
IMAGES	LOCALITY ID	Unique identifier of the locality the image is from.
IMAGES	SAMPLE ID	Unique identifier of the sample the image is from.
IMAGES	SUBSAMPLE ID	Subsample the image is from.
IMAGES	ROI ID	Region of interest the image is from.
IMAGES	IMAGE TYPE CODE	Dictionary code for the image type (e.g. plane polarised light, cathodoluminescence, etc.).
IMAGES	THUMBNAIL FILE	Filename of thumbnail version of image.
IMAGES	DOWNLOAD FILE	Filename of full version of image.
IMAGES	THUMBNAIL FILEPATH	Filepath to thumbnail version of image.
IMAGES	DOWNLOAD FILEPATH	Filepath to full version of image.
IMAGES	IMAGE DESCRIPTION	Full description of image.
IMAGES	FILM NO	Film number (for analogue images).
IMAGES	NEGATIVE NO	Negative number on a given film (for analogue images).
IMAGES	TAKEN BY	Who acquired the image.
IMAGES	DATE TAKEN	Date the image was acquired.
IMAGES	PHOTO TOP DEPTH	Top depth for the image. This relates primarily to core photographs without corresponding samples. For photographs of samples/subsamples, the depth information can be derived from the SAMPLE_LOGISTICS and SUBSAMPLE_LOGISTICS tables.
IMAGES	PHOTO BASE DEPTH	Bottom depth for the image. See photo_top_depth.
IMAGES	DEPTHREF PT CODE	Dictionary code for the depth referencing system used at the locality (e.g. m below ground level, core depth below RKB, etc.).
IMAGES	SCALE BAR	Length of any scale bar on the image.
IMAGES	FIELD OF VIEW	Field of view of the image.
IMAGES	FIELD OF VIEW UNIT	Units for field of view.
IMAGES	DATUM	Datum.
IMAGES	MICROSCOPE MAG	Magnification used to acquire the image. This only applies to photomicrographs and microchemical maps. Use of scale bars and field of view measurements is preferable to the use of magnification factors.
IMAGES	MICROSCOPE	Microscope name, type or specification.
IMAGES	ORIG MEDIA TYPE	Original media type.
IMAGES	IMAGE COMMENT	General comments field.
LOCALITY LOGISTICS	LOCALITY ID	Unique identifier of the locality.
LOCALITY LOGISTICS	SITE ID	Unique identifier of the site within which the locality occurs.
LOCALITY LOGISTICS	DEPTH	Total depth of the borehole, if applicable.

Entity Name	Attribute Name	Attribute Description
LOCALITY LOGISTICS	DEPTHREF PT CODE	Dictionary code for the depth referencing system used at the locality (e.g. m below ground level, core depth below RKB, etc.).
LOCALITY LOGISTICS	LOCALITY TYPE CODE	Dictionary code indicating whether the locality is a borehole, an outcrop or some other type.
LOCALITY LOGISTICS	MAP ID	Unique identifier of the most appropriate map showing the position of the locality.
LOCALITY LOGISTICS	X COORDINATE	X-coordinate for the locality.
LOCALITY LOGISTICS	Y COORDINATE	Y-coordinate for the locality.
LOCALITY LOGISTICS	XYCOORD SYS TYPE	The coordinate system for the X, Y, Z coordinates (latitude/longitude, UK National Grid, etc.).
LOCALITY LOGISTICS	Z COORDINATE	Z-coordinate for the locality.
LOCALITY LOGISTICS	Z COORD REF PT CODE	The coordinate system for the Z-coordinate.
LOCALITY LOGISTICS	HOST ORG WEBADDRS	Web address of the organization responsible for the locality.
LOCALITY LOGISTICS	LOC COMMENT	General comments field.
MAPS	MAP ID	Unique identifier number for the map.
MAPS	SITE ID	Unique identifier of the site to which the map relates.
MAPS	LOCATION	Place name for the area the map refers to.
MAPS	MAP NAME	Name of the map.
MAPS	MAP DESCRIPTION	A description of the map.
MAPS	SCALE	Scale of the map.
MAPS	MAP LINK	A link to the map.
MAPS	MAP COMMENT	General comments field.
PADAMOT MAILING	TITLE	Title of applicant.
PADAMOT MAILING	FIRSTNAME	First name of applicant.
PADAMOT MAILING	LASTNAME	Last name of applicant.
PADAMOT MAILING	ADD1	Address line 1.
PADAMOT MAILING	ADD2	Address line 2.
PADAMOT MAILING	ADD3	Address line 3.
PADAMOT MAILING	TOWN	Town or city.
PADAMOT MAILING	COUNTRY	Country.
PADAMOT MAILING	POSTCODE	Post code.
PADAMOT MAILING	EMAIL	Email address of applicant.
PADAMOT MAILING	NATURE	Nature of interest. One of: professional, academic, or amateur.
PADAMOT MAILING	INTERESTS	Text description of applicant's interest in the project.

Entity Name	Attribute Name	Attribute Description
PADAMOT REFERENCES	AUTHORS	Authors of publication.
PADAMOT REFERENCES	PUBYEAR	Year of publication.
PADAMOT REFERENCES	TITLE	Title of publication.
PADAMOT REFERENCES	REFERENCE	Journal, Proceedings, etc. details of publication.
PADAMOT REFERENCES	KEYWORDS	Keywords that help describe the subject covered by the publication.
PADAMOT REFERENCES	ABSTRACT	Abstract, overview or other summary of the publication.
PADAMOT REFERENCES	URL	URL if the publication is available online.
PADAMOT REFERENCES	SUB NAME	Name of person submitting the reference.
PADAMOT REFERENCES	SUB ORG	Organization of person submitting the reference.
PADAMOT REFERENCES	SUB EMAIL	Email address of person submitting the reference.
PADAMOT REFERENCES	VERIFIED	Has the table manager accepted this reference as appropriate to display on the project web site?
PALAEO CLIMATE	PALAEO CLIMATE ID	Unique identifier for the palaeoclimatic stage.
PALAEO CLIMATE	COUNTRY CODE	Dictionary code of the country that the palaeoclimate history relates to.
PALAEO CLIMATE	PALAEO AGE	Age of the palaeoclimatic stage (in years).
PALAEO CLIMATE	OXYGEN ISOTOPE STAGE	Oxygen isotope stage (OIS).
PALAEO CLIMATE	LOCAL NAME	Local name of the palaeoclimatic stage (e.g. Recent Holocene, Holocene Thermal Optimum, Early Holocene, etc.).
PALAEO CLIMATE	DESCRIPTION	Description of the palaeoclimatic stage.
PALAEO CLIMATE	MEAN ANNUAL TEMP BEST EST	Best-estimated mean annual temperature associated with the palaeoclimatic stage/substage.
PALAEO CLIMATE	MEAN ANNUAL TEMP UNCERTAINTY	Uncertainty of the estimated mean annual temperature associated with the palaeoclimatic stage/substage.
PALAEO CLIMATE	CLIMATE CLASS KOPPEN TREWARTHA	Climate class based on the Köppen Trewartha correlation.
PALAEO CLIMATE	CLIMATE CLASS WALTER	Climate class based on the Walter correlation.
PALAEO CLIMATE	BASIS	Basis of the palaeoclimatic stage.
PALAEO CLIMATE	PALAEOCLIMATE COMMENT	General comments field.
PALAEO CLIMATE SITE JOIN	PALAEO CLIMATE ID	Unique identifier for the palaeoclimatic stage.
PALAEO CLIMATE SITE JOIN	SITE ID	Unique identifier of the site that the palaeoclimatic stage data relate or refer to.
REGION OF INTEREST	ROI ID	Unique identifier of the region of interest.
REGION OF INTEREST	SUB SAMPLE ID	Unique identifier of the subsample within which the region of interest occurs.

Entity Name	Attribute Name	Attribute Description
REGION OF INTEREST	ROI TYPE CODE	Dictionary code for the region of interest type (e.g. area, line, point).
REGION OF INTEREST	X COORDINATE	X-coordinate defining the mid-point of the region of interest relative to reference marks on the sample surface (by default the bottom left corner of a sample is [0,0]).
REGION OF INTEREST	Y COORDINATE	Y-coordinate defining the mid-point of the region of interest relative to reference marks on the sample surface (by default the bottom left corner of a sample is [0,0]).
REGION OF INTEREST	WIDTH	Width/length of the region of interest.
REGION OF INTEREST	HEIGHT	Height of the region of interest.
REGION OF INTEREST	COORD UNIT CODE	Dictionary code for the units that the coordinate system uses (typically microns).
REGION OF INTEREST	ROI COMMENT	General comments field.
SAMPLE LOGISTICS	LOCALITY ID	Unique identifier of the locality from which the sample is derived.
SAMPLE LOGISTICS	SAMPLE ID	Unique identifier of the sample.
SAMPLE LOGISTICS	DEPTH TOP	Top depth of the sample.
SAMPLE LOGISTICS	DEPTH BASE	Bottom depth of the sample.
SAMPLE LOGISTICS	DEPTHREF PT CODE	Dictionary code for the depth referencing system used (e.g. m below ground level, core depth below RKB, etc.).
SAMPLE LOGISTICS	LITHOLOGY CODE	Dictionary code for the lithology of the sample.
SAMPLE LOGISTICS	LATEST CALCITE MORPHOLOGY	Text description of latest calcite morphology.
SAMPLE LOGISTICS	SAMPLED BY	User ID of the scientist who collected the sample.
SAMPLE LOGISTICS	SAMPLED DATE	Date the sample was collected.
SAMPLE LOGISTICS	SAMP COMMENT	General comments field.
SAMPLE PARAGENESIS	LOCALITY ID	Unique identifier for the locality from which the sample is derived.
SAMPLE PARAGENESIS	SAMPLE ID	Unique identifier of the sample.
SAMPLE PARAGENESIS	SAMPLE EVENT SEQUENCE	A numerical code placing each observation for a given sample into paragenetic order.
SAMPLE PARAGENESIS	SAMP PARAGENETIC SEQUENCE	The position and description of the indicated event within the general paragenetic scheme for the site (e.g. “ME9”). Use SITE PARAGENESIS SCHEME as a guide to the nomenclature for the paragenetic stages within a given site.
SAMPLE PARAGENESIS	RELATED SUBSAMP ID	Unique identifiers of subsamples relating to the paragenetic event.
SAMPLE PARAGENESIS	SAMP PARA COMMENT	General comments field.

Entity Name	Attribute Name	Attribute Description
SAMPLE SUMMARY	LOCALITY ID	Unique identifier for the locality from which the sample is derived.
SAMPLE SUMMARY	SAMPLE ID	Unique identifier of the sample.
SAMPLE SUMMARY	RELATED SUBSAMP ID	Unique identifiers of subsamples relating to this sample, for which the summary also applies.
SAMPLE SUMMARY	SAMPLE SUMMARY	Full description of sample. Sample descriptions extracted from (e.g.) NIREX reports.
SAMPLE SUMMARY	SAMP SUMM COMMENT	General comments field.
SHALLOW SURFACE	SHALLOW SURF ID	Unique identifier for the shallow surface information.
SHALLOW SURFACE	COUNTRY CODE	Dictionary code of the country for which the shallow surface information applies or was derived.
SHALLOW SURFACE	AGE	Age of the shallow surface stage (years).
SHALLOW SURFACE	DEPTH BELOW GROUND	Depth below ground of the stage/substage.
SHALLOW SURFACE	STAGE	Name of the shallow surface stage.
SHALLOW SURFACE	SUB STAGE	Name of the shallow surface sub-stage.
SHALLOW SURFACE	OXYGEN ISOTOPE STAGE	Oxygen isotope stage (OIS).
SHALLOW SURFACE	SHALLOW SURF COMMENT	General comments field.
SHALLOW SURFACE SITE JOIN	SHALLOW SURF ID	Unique identifier of the shallow surface stage/substage.
SHALLOW SURFACE SITE JOIN	SITE ID	Unique identifier of the site that the shallow surface stage/substage relates or refers to.
SITE	SITE ID	Unique identifier for the site.
SITE	SITE NAME	Name of the site (e.g. “Dounreay”).
SITE	COUNTRY CODE	Dictionary code for the country within which the site occurs.
SITE	DESCRIPTION	Brief description of the site.
SITE	SITE COMMENT	General comments field.
SITE PARAGENESIS SCHEME	SITE ID	Unique identifier of the site.
SITE PARAGENESIS SCHEME	PARAGENETIC CODE	Shorthand code for the paragenetic stage (e.g. ME1, ME2, etc.).
SITE PARAGENESIS SCHEME	DESCRIPTION	Description of the key features of the paragenetic stage.
SITE PARAGENESIS SCHEME	DOMINANT MINERAL	The main mineral(s) associated with the paragenetic stage.
SITE PARAGENESIS SCHEME	SITE PARA COMMENT	General comments field.
STAFF DETAIL	USER ID	Unique identifier for a staff member (preferably the first part of an email address).

Entity Name	Attribute Name	Attribute Description
STAFF DETAIL	SITE ID	Site ID of the site that the staff member belongs to.
STAFF DETAIL	USER TITLE	Title of staff member.
STAFF DETAIL	USER FIRSTNAME	First name of staff member.
STAFF DETAIL	USER LASTNAME	Last name of staff member.
STAFF DETAIL	EMAIL	Email address of staff member.
STAFF DETAIL	ADDRESS	Full address of staff member.
STAFF DETAIL	PHONE	Telephone number of staff member.
STAFF DETAIL	COUNTRY CODE	Dictionary code of country of staff member.
SUBSAMPLE LOGISTICS	SUBSAMPLE ID	Unique identifier of the subsample.
SUBSAMPLE LOGISTICS	LOCALITY ID	Unique identifier of the locality from which the sample is derived.
SUBSAMPLE LOGISTICS	SAMPLE ID	Unique identifier of the parent sample.
SUBSAMPLE LOGISTICS	SUBSAMPLE TYPE CODE	Dictionary code for the subsample type (e.g. polished thin section, fluid inclusion wafer, etc.).
SUBSAMPLE LOGISTICS	FRACTURE ID	Unique identifier of the fracture or feature from which the subsample is derived.
SUBSAMPLE LOGISTICS	SUBSAMPLE INDEX	The iterations of the subsample – NIREX Index.
SUBSAMPLE LOGISTICS	DEPTHREF PT CODE	Dictionary code for the depth referencing system used (e.g. m below ground level, core depth below RKB, etc.).
SUBSAMPLE LOGISTICS	SUBSAMP DEPTH	Depth of the subsample. This should be within the range covered by the top and bottom depth of the parent sample.
SUBSAMPLE LOGISTICS	SAMPLED BY	User ID of the scientist who made the subsample.
SUBSAMPLE LOGISTICS	SAMPLED DATE	When the subsample was made.
SUBSAMPLE LOGISTICS	SUBSAMP COMMENT	General comments field.
SUBSAMP PETROGRAPHY DATA	SUBSAMPLE ID	Unique identifier of the subsample.
SUBSAMP PETROGRAPHY DATA	EVENT ID	A numerical code placing each observation for a given subsample into paragenetic order. This code does not necessarily relate directly to the codes used to describe general paragenetic sequence for a site (as used in the SITE PARAGENESIS SCHEME table).
SUBSAMP PETROGRAPHY DATA	DESCRIPTION	Description of the key features for the individual event. Could be very specific, or very general.
SUBSAMP PETROGRAPHY DATA	MIN CHARACTERISATION	A summary of the minerals present within the described event.
SUBSAMP PETROGRAPHY DATA	GRDWATER ZONE	Groundwater zone where the event occurs.
SUBSAMP PETROGRAPHY DATA	CRYSTAL MORPHOLOGY	Morphology of the crystals. This field most specifically applies to “late-stage” calcites.

Entity Name	Attribute Name	Attribute Description
SUBSAMP PETROGRAPHY DATA	CRYSTAL SIZE	Sizes of the crystals. This field most specifically applies to “late-stage” calcites.
SUBSAMP PETROGRAPHY DATA	COLOUR	Colour of the crystals. This field most specifically applies to “late-stage” calcites.
SUBSAMP PETROGRAPHY DATA	SITE PARAGENETIC POSTN	Position of the described event within the general paragenetic scheme for the site (e.g. “ME9”). Use SITE PARAGENESIS SCHEME as a guide to the nomenclature for paragenetic stages within a given site.
SUBSAMP PETROGRAPHY DATA	MIN AGE OF INFILL	Minimum age of the described event.
SUBSAMP PETROGRAPHY DATA	MAX AGE OF INFILL	Maximum age of the described event.
SUBSAMP PETROGRAPHY DATA	MIN AGE UNCERTAINTY	Uncertainty associated with the minimum age estimate.
SUBSAMP PETROGRAPHY DATA	MAX AGE UNCERTAINTY	Uncertainty associated with the maximum age estimate.
SUBSAMP PETROGRAPHY DATA	AUTHOR	Person who provided the petrography.
SUBSAMP PETROGRAPHY DATA	SUBSAMP PET COMMENT	General comments field.

Appendix 3 PADAMOT Database Primary and Foreign Key Constraints

Entity Name	Constraint Name	Constraint Type	Columns
ACRONYMS	ACRONYMS PK	Primary key	GLOSSARY
CHEMICAL ANALYSIS	CHEMICAL ANALYSIS PK	Primary key	CHEM ID
CHEMICAL ANALYSIS	CHEMICAL ANALYSIS FK1	Foreign key	SUBSAMPLE ID references SUBSAMPLE LOGISTICS . SUBSAMPLE ID
CHEMICAL ANALYSIS	CHEMICAL ANALYSIS FK2	Foreign key	MINERAL CODE references DIC MINERAL . CODE
CHEMICAL ANALYSIS	CHEMICAL ANALYSIS FK3	Foreign key	ANALYTICAL METHOD CODE references DIC ANALYTICAL METHOD . CODE
CHEMICAL ANALYSIS	CHEMICAL ANALYSIS FK4	Foreign key	REP UNIT CODE references DIC REPORTING UNIT . CODE
CHEMICAL ANALYSIS	CHEMICAL ANALYSIS FK5	Foreign key	CHEM DET CODE references DIC CHEM DETERMINAND . CODE
DIC ANALYTICAL METHOD	DIC ANALYTICAL METHOD PK	Primary key	CODE
DIC CHEM DETERMINAND	DIC CHEM DETERMINAND PK	Primary key	CODE
DIC COUNTRY	DIC COUNTRY PK	Primary key	CODE
DIC DEPTH REFERENCE POINT	DIC DEPTH REFERENCE POINT PK	Primary key	CODE
DIC FRACTURE APERTURE	DIC FRACTURE APERTURE PK	Primary key	CODE
DIC FRACTURE APERTURE	DIC FRACTURE APERTURE FK1	Foreign key	CLASSIFICATION SCHEME references DIC FRAC CLASSIFICATION SCHEME . CODE
DIC FRAC CLASSIFICATION SCHEME	DIC FRAC CLASSIFICATN SCH PK	Primary key	CODE
DIC HYDRO TEST TYPE	DIC HYDRO TEST TYPE PK	Primary key	CODE
DIC IMAGE TYPE	DIC IMAGE TYPE PK	Primary key	CODE
DIC INCLUSION TYPE	DIC INCLUSION TYPE PK	Primary key	CODE
DIC LITHOLOGY	DIC LITHOLOGY PK	Primary key	CODE
DIC LOCALITY TYPE	DIC LOCALITY TYPE PK	Primary key	CODE
DIC MINERAL	DIC MINERAL PK	Primary key	CODE
DIC PFF TYPES	DIC PFF TYPES PK	Primary key	PFF TYPE CODE
DIC REGION OF INTEREST	DIC REGION OF INTEREST PK	Primary key	CODE
DIC REPORTING UNIT	DIC REPORTING UNIT PK	Primary key	CODE
DIC SUBSAMPLE TYPE	PK DIC SAMPLE TYPE	Primary key	CODE

Entity Name	Constraint Name	Constraint Type	Columns
FI MICROANALYSIS DATA	FI MICROANALYSIS DATA PK	Primary key	INCLUSION ID, ROI ID, ANALYTICAL METHOD CODE, CHEM DET CODE
FI MICROANALYSIS DATA	FI MICROANALYSIS DATA FK1	Foreign key	ANALYTICAL METHOD CODE references DIC ANALYTICAL METHOD . CODE
FI MICROANALYSIS DATA	FI MICROANALYSIS DATA FK2	Foreign key	CHEM DET CODE references DIC CHEM DETERMINAND . CODE
FI MICROANALYSIS DATA	FI MICROANALYSIS DATA FK3	Foreign key	REP UNIT CODE references DIC REPORTING UNIT . CODE
FI MICROANALYSIS DATA	FI MICROANALYSIS DATA FK4	Foreign key	INCLUSION ID references FI PETROGRAPHY DATA . INCLUSION ID
FI PETROGRAPHY DATA	FI PETROGRAPHY DATA PK	Primary key	INCLUSION ID, ROI ID
FI PETROGRAPHY DATA	FI PETROGRAPHY DATA FK1	Foreign key	ROI ID references REGION OF INTEREST . ROI ID
FI PETROGRAPHY DATA	FI PETROGRAPHY DATA FK3	Foreign key	HOST MINERAL CODE references DIC MINERAL . CODE
FI PETROGRAPHY DATA	FI PETROGRAPHY DATA FK4	Foreign key	INCLUSION TYPE CODE references DIC INCLUSION TYPE . CODE
FRACTURE INFO	FRACTURE INFO PK	Primary key	FRACTURE ID
FRACTURE INFO	FRACTURE INFO FK1	Foreign key	LOCALITY ID references LOCALITY LOGISTICS . LOCALITY ID
FRACTURE INFO	FRACTURE INFO FK2	Foreign key	FRACTURE AP QUAL CODE references DIC FRACTURE APERTURE . CODE
FRACTURE INFO	FRACTURE INFO FK4	Foreign key	DEPTHREF PT CODE references DIC DEPTH REFERENCE POINT . CODE
FRACTURE PARAGENESIS	FRACTURE PARAGENESIS PK	Primary key	FRAC PARAGENETIC ID
FRACTURE PARAGENESIS	FRACTURE PARAGENESIS FRACTURE	Foreign key	FRACTURE ID references FRACTURE INFO . FRACTURE ID
FRACTURE PFF	FRACTURE PFF PK	Primary key	PFF ID
FRACTURE PFF	FRACTURE PFF DIC PFF TYPES FK2	Foreign key	PFF CODE references DIC PFF TYPES . PFF TYPE CODE
FRACTURE PFF	FRACTURE PFF FRACTURE INFO FK1	Foreign key	FRACTURE ID references FRACTURE INFO . FRACTURE ID
FRAC MINERAL INFILL	FRAC MINERAL INFILL PK	Primary key	FEATURE INFILL ID
FRAC MINERAL INFILL	FRAC MINERAL INFILL FK1	Foreign key	FRACTURE ID references FRACTURE INFO . FRACTURE ID
FRAC MINERAL INFILL	FRAC MINERAL INFILL FK2	Foreign key	MINERAL INFILL CODE references DIC MINERAL . CODE
FRAC SAMPLE JOIN	FRAC SAMPLE JOIN PK	Primary key	FRACTURE ID, LOCALITY ID, SAMPLE ID
FRAC SAMPLE JOIN	FRAC SAMPLE JOIN FK1	Foreign key	FRACTURE ID references FRACTURE INFO . FRACTURE ID
FRAC SAMPLE JOIN	FRAC SAMPLE JOIN FK2	Foreign key	LOCALITY ID references SAMPLE LOGISTICS . LOCALITY ID

Entity Name	Constraint Name	Constraint Type	Columns
HYDROCHEM DATA	HYDROCHEM DATA PK	Primary key	LOCALITY ID, SAMPLE NUMBER, HYDRO DET CODE
HYDROCHEM DATA	HYDROCHEM DATA FK1	Foreign key	LOCALITY ID references HYDROCHEM SAMPLE . LOCALITY ID
HYDROCHEM DATA	HYDROCHEM DATA FK2	Foreign key	HYDRO DET CODE references DIC CHEM DETERMINAND . CODE
HYDROCHEM DATA	HYDROCHEM DATA FK3	Foreign key	REP UNIT CODE references DIC REPORTING UNIT . CODE
HYDROCHEM SAMPLE	HYDROCHEM SAMPLE PK	Primary key	LOCALITY ID, SAMPLE NUMBER
HYDROCHEM SAMPLE	HYDROCHEM SAMPLE FK1	Foreign key	LOCALITY ID references LOCALITY LOGISTICS . LOCALITY ID
HYDROCHEM SAMPLE	HYDROCHEM SAMPLE FK2	Foreign key	HYDRO TEST TYPE references DIC HYDRO TEST TYPE . CODE
HYDROCHEM SAMPLE	HYDROCHEM SAMPLE FK3	Foreign key	LITHOLOGY CODE references DIC LITHOLOGY . CODE
HYDROCHEM SAMPLE	HYDROCHEM SAMPLE FK4	Foreign key	DEPTHREF PT CODE references DIC DEPTH REFERENCE POINT . CODE
IMAGES	IMAGES PK	Primary key	IMAGE ID
IMAGES	IMAGES FK1	Foreign key	LOCALITY ID references SAMPLE LOGISTICS . LOCALITY ID
IMAGES	IMAGES FK2	Foreign key	FIELD OF VIEW UNIT references DIC REPORTING UNIT . CODE
IMAGES	IMAGES FK3	Foreign key	IMAGE TYPE CODE references DIC IMAGE TYPE . CODE
IMAGES	IMAGES FK4	Foreign key	SUBSAMPLE ID references SUBSAMPLE LOGISTICS . SUBSAMPLE ID
IMAGES	IMAGES FK5	Foreign key	ROI ID references REGION OF INTEREST . ROI ID
IMAGES	IMAGES FK6	Foreign key	DEPTHREF PT CODE references DIC DEPTH REFERENCE POINT . CODE
LOCALITY LOGISTICS	LOCALITY LOGISTICS PK	Primary key	LOCALITY ID
LOCALITY LOGISTICS	LOCALITY LOGISTICS FK1	Foreign key	SITE ID references SITE . SITE ID
LOCALITY LOGISTICS	LOCALITY LOGISTICS FK2	Foreign key	MAP ID references MAPS . MAP ID
LOCALITY LOGISTICS	LOCALITY LOGISTICS FK3	Foreign key	LOCALITY TYPE CODE references DIC LOCALITY TYPE . CODE
LOCALITY LOGISTICS	LOCALITY LOGISTICS FK4	Foreign key	DEPTHREF PT CODE references DIC DEPTH REFERENCE POINT . CODE
LOCALITY LOGISTICS	LOCALITY LOGISTICS FK5	Foreign key	Z COORD REF PT CODE references DIC DEPTH REFERENCE POINT . CODE
MAPS	MAPS PK	Primary key	MAP ID
MAPS	MAPS FK1	Foreign key	SITE ID references SITE . SITE ID
PALAEO CLIMATE	PALAEO CLIMATE PK	Primary key	PALAEO CLIMATE ID
PALAEO CLIMATE	PALAEO CLIMATE DIC COUNTRY FK1	Foreign key	COUNTRY CODE references DIC COUNTRY . CODE

Entity Name	Constraint Name	Constraint Type	Columns
PALAEO CLIMATE SITE JOIN	PALAEO CLIMATE SITE JOIN PK	Primary key	PALAEO CLIMATE ID, SITE ID
PALAEO CLIMATE SITE JOIN	PALAEO CLIMATE SITE JOIN FK1	Foreign key	PALAEO CLIMATE ID references PALAEO CLIMATE . PALAEO CLIMATE ID
PALAEO CLIMATE SITE JOIN	PALAEO CLIMATE SITE JOIN FK2	Foreign key	SITE ID references SITE . SITE ID
REGION OF INTEREST	REGION OF INTEREST PK	Primary key	ROI ID
REGION OF INTEREST	REGION OF INTEREST FK1	Foreign key	COORD UNIT CODE references DIC REPORTING UNIT . CODE
REGION OF INTEREST	REGION OF INTEREST FK2	Foreign key	ROI TYPE CODE references DIC REGION OF INTEREST . CODE
REGION OF INTEREST	REGION OF INTEREST FK3	Foreign key	SUB SAMPLE ID references SUBSAMPLE LOGISTICS . SUBSAMPLE ID
SAMPLE LOGISTICS	SAMPLE LOGISTICS PK	Primary key	LOCALITY ID, SAMPLE ID
SAMPLE LOGISTICS	SAMPLE LOGISTICS FK1	Foreign key	LOCALITY ID references LOCALITY LOGISTICS . LOCALITY ID
SAMPLE LOGISTICS	SAMPLE LOGISTICS FK2	Foreign key	LITHOLOGY CODE references DIC LITHOLOGY . CODE
SAMPLE LOGISTICS	SAMPLE LOGISTICS FK3	Foreign key	DEPTHREF PT CODE references DIC DEPTH REFERENCE POINT . CODE
SAMPLE LOGISTICS	SAMPLE LOGISTICS FK4	Foreign key	SAMPLED BY references STAFF DETAIL . USER ID
SAMPLE PARAGENESIS	SAMPLE PARAGENESIS PK	Primary key	LOCALITY ID, SAMPLE ID, SAMPLE EVENT SEQUENCE
SAMPLE PARAGENESIS	SAMPLE PARAGENESIS FK1	Foreign key	LOCALITY ID references SAMPLE LOGISTICS . LOCALITY ID
SAMPLE SUMMARY	SAMPLE SUMMARY PK	Primary key	LOCALITY ID, SAMPLE ID
SAMPLE SUMMARY	SAMPLE SUMMARY FK1	Foreign key	LOCALITY ID references SAMPLE LOGISTICS . LOCALITY ID SAMPLE ID references SAMPLE LOGISTICS . SAMPLE ID
SHALLOW SURFACE	SHALLOW SURFACE PK	Primary key	SHALLOW SURF ID
SHALLOW SURFACE	SHALLOW SURFACE FK1	Foreign key	COUNTRY CODE references DIC COUNTRY . CODE
SHALLOW SURFACE SITE JOIN	SHALLOW SURFACE SITE JOIN PK	Primary key	SHALLOW SURF ID, SITE ID
SHALLOW SURFACE SITE JOIN	SHALLOW SURFACE SITE JOIN FK1	Foreign key	SHALLOW SURF ID references SHALLOW SURFACE . SHALLOW SURF ID
SHALLOW SURFACE SITE JOIN	SHALLOW SURFACE SITE JOIN FK2	Foreign key	SITE ID references SITE . SITE ID
SITE	SITE PK	Primary key	SITE ID
SITE	SITE FK1	Foreign key	COUNTRY CODE references DIC COUNTRY . CODE
SITE PARAGENESIS	SITE PARAGENESIS	Primary key	SITE ID, PARAGENETIC CODE

Entity Name	Constraint Name	Constraint Type	Columns
SCHEME	SCHEME PK		
SITE PARAGENESIS SCHEME	SITE PARAGENESIS SCHEME FK1	Foreign key	SITE ID references SITE . SITE ID
STAFF DETAIL	STAFF DETAIL PK	Primary key	USER ID
STAFF DETAIL	STAFF DETAIL FK1	Foreign key	SITE ID references SITE . SITE ID
STAFF DETAIL	STAFF DETAIL FK2	Foreign key	COUNTRY CODE references DIC COUNTRY . CODE
SUBSAMPLE LOGISTICS	SUB SAMPLE LOGISTICS PK	Primary key	SUBSAMPLE ID
SUBSAMPLE LOGISTICS	SUB SAMPLE LOGISTICS FK1	Foreign key	LOCALITY ID references SAMPLE LOGISTICS . LOCALITY ID SAMPLE ID references SAMPLE LOGISTICS . SAMPLE ID
SUBSAMPLE LOGISTICS	SUBSAMPLE LOGISTICS FK2	Foreign key	FRACTURE ID references FRACTURE INFO . FRACTURE ID
SUBSAMPLE LOGISTICS	SUBSAMPLE LOGISTICS FK3	Foreign key	DEPTHREF PT CODE references DIC DEPTH REFERENCE POINT . CODE
SUBSAMPLE LOGISTICS	SUBSAMPLE LOGISTICS FK4	Foreign key	SUBSAMPLE TYPE CODE references DIC SUBSAMPLE TYPE . CODE
SUBSAMPLE LOGISTICS	SUBSAMPLE LOGISTICS FK5	Foreign key	SAMPLED BY references STAFF DETAIL . USER ID
SUBSAMP PETROGRAPHY DATA	SUBSAMP PETROGRAPHY DATA PK	Primary key	SUBSAMPLE ID, EVENT ID
SUBSAMP PETROGRAPHY DATA	SUBSAMP PETROGRAPHY DATA FK1	Foreign key	SUBSAMPLE ID references SUBSAMPLE LOGISTICS . SUBSAMPLE ID
SUBSAMP PETROGRAPHY DATA	SUBSAMP PETROGRAPHY DATA FK2	Foreign key	AUTHOR references STAFF DETAIL . USER ID

Appendix 4 Database Definition Language (DDL) for Database Creation

```
CREATE TABLE DIC_ANALYTICAL_METHOD
 (CODE VARCHAR(20) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE STAFF_DETAIL
 (USER_ID VARCHAR2(10) NOT NULL
 ,SITE_ID NUMBER(8)
 ,USER_TITLE VARCHAR2(20)
 ,USER_FIRSTNAME VARCHAR2(50) NOT NULL
 ,USER_LASTNAME VARCHAR2(50) NOT NULL
 ,EMAIL VARCHAR2(50)
 ,ADDRESS VARCHAR2(100)
 ,PHONE VARCHAR2(20)
 ,COUNTRY_CODE VARCHAR2(20)
 ,USER_ENTERED VARCHAR2(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR2(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SAMPLE_LOGISTICS
 (LOCALITY_ID VARCHAR(10) NOT NULL
 ,SAMPLE_ID VARCHAR(10) NOT NULL
 ,DEPTH_TOP NUMBER(7,2)
 ,DEPTH_BASE NUMBER(7,2)
 ,DEPTHREF_PT_CODE VARCHAR(10)
 ,LITHOLOGY_CODE VARCHAR(6)
 ,LATEST_CALCITE_MORPHOLOGY VARCHAR(60)
 ,SAMPLED_BY VARCHAR(10)
 ,SAMPLED_DATE DATE
```

```
 ,SAMP_COMMENT VARCHAR(2000)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE FRACTURE_PARAGENESIS
 (FRAC_PARAGENETIC_ID NUMBER(8) NOT NULL
 ,FRACTURE_ID NUMBER(8) NOT NULL
 ,PARAGENETIC_CODE VARCHAR(6) NOT NULL
 ,QUALIFIER VARCHAR(10)
 ,FRAC_PARA_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_CHEM_DETERMINAND
 (CODE VARCHAR(30) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,REP_UNIT_CODE VARCHAR(4)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE FRAC_SAMPLE_JOIN
 (FRACTURE_ID NUMBER(8) NOT NULL
 ,LOCALITY_ID VARCHAR(10) NOT NULL
 ,SAMPLE_ID VARCHAR(10) NOT NULL
 ,FRAC_SJOIN_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_LOCALITY_TYPE
```

```
 (CODE VARCHAR(10) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SHALLOW_SURFACE
 (SHALLOW_SURF_ID NUMBER(8) NOT NULL
 ,COUNTRY_CODE VARCHAR(20) NOT NULL
 ,AGE VARCHAR(15)
 ,DEPTH_BELOW_GROUND VARCHAR(20)
 ,STAGE VARCHAR(15)
 ,SUB_STAGE VARCHAR(50)
 ,OXYGEN_ISOTOPE_STAGE VARCHAR(15)
 ,SHALLOW_SURF_COMMENT VARCHAR(3000)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SAMPLE_SUMMARY
 (LOCALITY_ID VARCHAR(10) NOT NULL
 ,SAMPLE_ID VARCHAR(10) NOT NULL
 ,RELATED_SUBSAMP_ID VARCHAR(50)
 ,SAMPLE_SUMMARY VARCHAR2(240)
 ,SAMP_SUMM_COMMENT VARCHAR2(240)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name()
 ,DATE_ENTERED DATE DEFAULT getdate()
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE FRACTURE_INFO
 (FRACTURE_ID NUMBER(8) NOT NULL
 ,LOCALITY_ID VARCHAR(10) NOT NULL
 ,FRACTURE_DESCRIPTION VARCHAR(50)
 ,DEPTH NUMBER
 ,DEPTHREF_PT_CODE VARCHAR(10)
```

```
 ,FRACTURE_DIP VARCHAR(20)
 ,FRACTURE_DIP_AZI VARCHAR(20)
 ,FRACTURE_STRIKE NUMBER
 ,FRACTURE_AP_QUAL_CODE VARCHAR(2)
 ,FRACTURE_APERTURE_VALUE VARCHAR(10)
 ,DIP_ORIENTATION_TYPE VARCHAR(3)
 ,CLASSIFICATION_SCHEME VARCHAR(10)
 ,K_VALUE NUMBER
 ,LOCAL_CORE_RUN_NO VARCHAR(15)
 ,LOCAL_DISCONTINUITY_NO VARCHAR(15)
 ,PARAGENETIC_DESCRIPTION VARCHAR(50)
 ,MIN_AGE_OF_INFILL VARCHAR(50)
 ,MAX_AGE_OF_INFILL VARCHAR(50)
 ,MIN_AGE_UNCERTAINTY CHAR(1)
 ,MAX_AGE_UNCERTAINTY CHAR(1)
 ,FRAC_INF_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_LITHOLOGY
 (CODE VARCHAR(6) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SHALLOW_SURFACE_SITE_JOIN
 (SHALLOW_SURF_ID NUMBER(8) NOT NULL
 ,SITE_ID NUMBER(8) NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SITE_PARAGENESIS_SCHEME
```

```
 (SITE_ID NUMBER(8) NOT NULL
 ,PARAGENETIC_CODE VARCHAR(50) NOT NULL
 ,DESCRIPTION VARCHAR(2000)
 ,DOMINANT_MINERAL VARCHAR(255)
 ,SITE_PARA_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name()
 ,DATE_ENTERED DATE DEFAULT getdate()
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_INCLUSION_TYPE
 (CODE VARCHAR(10) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_REGION_OF_INTEREST
 (CODE VARCHAR(10) NOT NULL
 ,DESCRIPTION VARCHAR(400) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_REPORTING_UNIT
 (CODE VARCHAR(6) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )
```

```
CREATE TABLE IMAGES
 (IMAGE_ID VARCHAR2(240) NOT NULL
 ,LOCALITY_ID VARCHAR(10)
 ,SAMPLE_ID VARCHAR(10)
 ,SUBSAMPLE_ID VARCHAR(20)
 ,ROI_ID VARCHAR(15)
 ,IMAGE_TYPE_CODE VARCHAR(6) NOT NULL
 ,THUMBNAIL_FILE VARCHAR(50)
 ,DOWNLOAD_FILE VARCHAR(50)
 ,THUMBNAIL_FILEPATH VARCHAR(200)
 ,DOWNLOAD_FILEPATH VARCHAR(200)
 ,IMAGE_DESCRIPTION VARCHAR(1000)
 ,FILM_NO VARCHAR(50)
 ,NEGATIVE_NO VARCHAR(5)
 ,TAKEN_BY VARCHAR(50)
 ,DATE_TAKEN DATE
 ,PHOTO_TOP_DEPTH NUMBER
 ,PHOTO_BASE_DEPTH NUMBER
 ,DEPTHREF_PT_CODE VARCHAR(10)
 ,SCALE_BAR VARCHAR(50)
 ,FIELD_OF_VIEW VARCHAR(50)
 ,FIELD_OF_VIEW_UNIT VARCHAR(6)
 ,DATUM VARCHAR(15)
 ,MICROSCOPE_MAG VARCHAR(9)
 ,MICROSCOPE VARCHAR(15)
 ,ORIG_MEDIA_TYPE VARCHAR(15)
 ,IMAGE_COMMENT VARCHAR(400)
 ,USER_ENTERED VARCHAR(50) DEFAULT user_name()
 ,DATE_ENTERED DATE DEFAULT getdate()
 ,USER_UPDATED VARCHAR(50)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_FRACTURE_APERTURE
 (CODE VARCHAR(2) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,CLASSIFICATION_SCHEME VARCHAR(10)
 ,COUNTRY_CODE VARCHAR(6)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
```

```
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_HYDRO_TEST_TYPE
 (CODE VARCHAR(6) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SUBSAMPLE_LOGISTICS
 (SUBSAMPLE_ID VARCHAR2(20) NOT NULL
 ,LOCALITY_ID VARCHAR2(10) NOT NULL
 ,SAMPLE_ID VARCHAR2(10) NOT NULL
 ,SUBSAMPLE_TYPE_CODE VARCHAR2(1)
 ,FRACTURE_ID VARCHAR2(240)
 ,SUBSAMPLE_INDEX VARCHAR2(240)
 ,DEPTHREF_PT_CODE VARCHAR2(10)
 ,SUBSAMP_DEPTH NUMBER
 ,SAMPLED_BY VARCHAR2(10)
 ,SAMPLED_DATE DATE
 ,SUBSAMP_COMMENT VARCHAR2(2000)
 ,USER_ENTERED VARCHAR2(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR2(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE REGION_OF_INTEREST
 (ROI_ID VARCHAR(15) NOT NULL
 ,SUB_SAMPLE_ID VARCHAR(20) NOT NULL
 ,ROI_TYPE_CODE VARCHAR(10)
 ,X_COORDINATE NUMBER
 ,Y_COORDINATE NUMBER
 ,WIDTH NUMBER
 ,HEIGHT NUMBER
 ,COORD_UNIT_CODE CHAR(2) NOT NULL
 ,ROI_COMMENT VARCHAR(400)
```

```
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_FRAC_CLASSIFICATION_SCHEME
 (CODE VARCHAR(10) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,COUNTRY_CODE VARCHAR(10)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE FRACTURE_PFF
 (PFF_ID NUMBER(8) NOT NULL
 ,FRACTURE_ID NUMBER(8) NOT NULL
 ,PFF_CODE VARCHAR(5) NOT NULL
 ,PFF_QUALIFIER VARCHAR(2)
 ,FRAC_PFF_COMMENT VARCHAR(50)
 ,USER_ENETERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE MAPS
 (MAP_ID VARCHAR2(240) NOT NULL
 ,SITE_ID VARCHAR2(240) NOT NULL
 ,LOCATION VARCHAR(30) NOT NULL
 ,MAP_NAME VARCHAR(40) NOT NULL
 ,MAP_DESCRIPTION VARCHAR(255) NOT NULL
 ,SCALE VARCHAR(25) NOT NULL
 ,MAP_LINK VARCHAR(25)
 ,MAP_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) NOT NULL
 ,DATE_ENTERED DATE NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
```

```
 )

CREATE TABLE PALAEO_CLIMATE_SITE_JOIN
 (PALAEO_CLIMATE_ID NUMBER(8) NOT NULL
 ,SITE_ID NUMBER(8) NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SUBSAMP_PETROGRAPHY_DATA
 (SUBSAMPLE_ID VARCHAR2(20) NOT NULL
 ,EVENT_ID VARCHAR2(5) NOT NULL
 ,DESCRIPTION VARCHAR2(2000)
 ,MIN_CHARACTERISATION VARCHAR2(400)
 ,GRDWATER_ZONE VARCHAR2(20)
 ,CRYSTAL_MORPHOLOGY VARCHAR2(50)
 ,CRYSTAL_SIZE VARCHAR2(20)
 ,COLOUR VARCHAR2(10)
 ,SITE_PARAGENETIC_POSTN VARCHAR2(400)
 ,MIN_AGE_OF_INFILL VARCHAR2(50)
 ,MAX_AGE_OF_INFILL VARCHAR2(50)
 ,MIN_AGE_UNCERTAINTY CHAR(1)
 ,MAX_AGE_UNCERTAINTY CHAR(1)
 ,AUTHOR VARCHAR2(10)
 ,SUBSAMP_PET_COMMENT VARCHAR2(400)
 ,USER_ENTERED VARCHAR2(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR2(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_MINERAL
 (CODE VARCHAR(40) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )
```

```
CREATE TABLE HYDROCHEM_DATA
 (LOCALITY_ID VARCHAR(10) NOT NULL
 ,SAMPLE_NUMBER VARCHAR(20) NOT NULL
 ,HYDRO_DET_CODE VARCHAR(30) NOT NULL
 ,HYDRO_DET_VALUE NUMBER NOT NULL
 ,REP_UNIT_CODE VARCHAR(6) NOT NULL
 ,QUALIFIER CHAR(1)
 ,HYDATA_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE LOCALITY_LOGISTICS
 (LOCALITY_ID VARCHAR(10) NOT NULL
 ,SITE_ID VARCHAR2(240) NOT NULL
 ,DEPTH NUMBER(7,2)
 ,DEPTHREF_PT_CODE VARCHAR(10)
 ,LOCALITY_TYPE_CODE VARCHAR(10) NOT NULL
 ,MAP_ID VARCHAR2(240)
 ,X_COORDINATE NUMBER(12,2)
 ,Y_COORDINATE NUMBER(12,2)
 ,XYCOORD_SYS_TYPE VARCHAR(25)
 ,Z_COORDINATE NUMBER(12,2)
 ,Z_COORD_REF_PT_CODE VARCHAR(10)
 ,HOST_ORG_WEBADDRS VARCHAR(255)
 ,LOC_COMMENT VARCHAR(500)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_COUNTRY
 (CODE VARCHAR(20) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
```

```
 ,DATE_UPDATED DATE
 )

CREATE TABLE SITE
 (SITE_ID NUMBER(8) NOT NULL
 ,SITE_NAME VARCHAR(68) NOT NULL
 ,COUNTRY_CODE VARCHAR(20) NOT NULL
 ,DESCRIPTION VARCHAR(500)
 ,SITE_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_IMAGE_TYPE
 (CODE VARCHAR(6) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE FI_PETROGRAPHY_DATA
 (INCLUSION_ID NUMBER NOT NULL
 ,ROI_ID VARCHAR(15) NOT NULL
 ,INCLUSION_TYPE_CODE VARCHAR(10)
 ,HOST_MINERAL_CODE VARCHAR(40) NOT NULL
 ,FI_SIZE VARCHAR(10)
 ,GENERATION VARCHAR(20)
 ,RELATIVE_AGE VARCHAR(15)
 ,DEGREE_OF_FILL INTEGER
 ,FIPDATA_COMMENT VARCHAR(400)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name()
 ,DATE_ENTERED DATE DEFAULT getdate()
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE CHEMICAL_ANALYSIS
```

```
 (CHEM_ID NUMBER NOT NULL
 ,CHEM_ANALYSIS_NO NUMBER NOT NULL
 ,SAMPLE_ID VARCHAR2(10) NOT NULL
 ,SUBSAMPLE_ID VARCHAR2(20) NOT NULL
 ,ROI_ID VARCHAR(10)
 ,MINERAL_CODE VARCHAR2(40)
 ,ANALYTICAL_METHOD_CODE VARCHAR2(20) NOT NULL
 ,CHEM_DET_CODE VARCHAR2(30) NOT NULL
 ,CHEM_DET_VALUE NUMBER(7,2) NOT NULL
 ,REP_UNIT_CODE VARCHAR2(6) NOT NULL
 ,OTHER_INTERPRETATION VARCHAR2(255)
 ,QUALIFIER CHAR(1)
 ,CHM_ANALY_COMMENT VARCHAR2(400)
 ,USER_ENTERED VARCHAR2(10) NOT NULL
 ,DATE_ENTERED DATE NOT NULL
 ,USER_UPDATED VARCHAR2(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_PFF_TYPES
 (PFF_TYPE_CODE VARCHAR(5) NOT NULL
 ,MAIN_POROSITY_TYPE VARCHAR(50)
 ,SECONDARY_POROSITY_TYPE VARCHAR(50)
 ,DISTINGUISHING_FEATURE VARCHAR(500)
 ,PFF_TYP_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT suser_sname() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE SAMPLE_PARAGENESIS
 (LOCALITY_ID VARCHAR(10) NOT NULL
 ,SAMPLE_ID VARCHAR(10) NOT NULL
 ,SAMPLE_EVENT_SEQUENCE VARCHAR2(240) NOT NULL
 ,SAMP_PARAGENETIC_SEQUENCE VARCHAR(400) NOT NULL
 ,RELATED_SUBSAMP_ID VARCHAR(50)
 ,SAMP_PARA_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )
```

```
CREATE TABLE HYDROCHEM_SAMPLE
 (LOCALITY_ID VARCHAR(10) NOT NULL
 ,SAMPLE_NUMBER VARCHAR(20) NOT NULL
 ,GRDWATER_SAMP_ID VARCHAR(10)
 ,START_DATE DATE
 ,LITHOLOGY_CODE VARCHAR(6)
 ,HYDRO_DEPTH_TOP NUMBER(7,2)
 ,HYDRO_DEPTH_BASE NUMBER(7,2)
 ,HYDRO_MID_DEPTH NUMBER(7,2)
 ,DEPTHREF_PT_CODE VARCHAR(10)
 ,HYDRO_TEST_TYPE VARCHAR(6)
 ,HYSAMP_COMMENT VARCHAR(255)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE ACRONYMS
 (GLOSSARY VARCHAR2(25) NOT NULL
 ,TERMINOLOGY VARCHAR2(255) NOT NULL
 ,CLASS_KEY_EXAMPLES VARCHAR2(255)
 ,USER_ENTERED VARCHAR2(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR2(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_DEPTH_REFERENCE_POINT
 (CODE VARCHAR(10) NOT NULL
 ,DESCRIPTION VARCHAR(255) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C NOT NULL
 ,COUNTRY_CODE VARCHAR(10)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE FRAC_MINERAL_INFILL
 (FEATURE_INFILL_ID NUMBER(8) NOT NULL
```

```
 ,FRACTURE_ID NUMBER(8) NOT NULL
 ,MINERAL_INFILL_CODE VARCHAR(40) NOT NULL
 ,QUALIFIER VARCHAR(10)
 ,FRAC_MINFILL_COMMENT CHAR(10)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE PALAEO_CLIMATE
 (PALAEO_CLIMATE_ID NUMBER(8) NOT NULL
 ,COUNTRY_CODE VARCHAR(20) NOT NULL
 ,PALAEO_AGE VARCHAR(10) NOT NULL
 ,OXYGEN_ISOTOPE_STAGE VARCHAR(5)
 ,LOCAL_NAME VARCHAR(255)
 ,DESCRIPTION VARCHAR(255)
 ,MEAN_ANNUAL_TEMP_BEST_EST VARCHAR(3)
 ,MEAN_ANNUAL_TEMP_UNCERTAINTY VARCHAR(10)
 ,CLIMATE_CLASS_KOPPEN_TREWARTHA VARCHAR(20)
 ,CLIMATE_CLASS_WALTER VARCHAR(20)
 ,BASIS VARCHAR(500)
 ,PALAEOCLIMATE_COMMENT VARCHAR(1000)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE DIC_SUBSAMPLE_TYPE
 (CODE VARCHAR(1) NOT NULL
 ,DESCRIPTION VARCHAR(400) NOT NULL
 ,TRANSLATION VARCHAR(50)
 ,CODE_STATUS CHAR(1) DEFAULT C
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name() NOT NULL
 ,DATE_ENTERED DATE DEFAULT getdate() NOT NULL
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

CREATE TABLE FI_MICROANALYSIS_DATA
 (INCLUSION_ID NUMBER NOT NULL
 ,ROI_ID VARCHAR(15) NOT NULL
```

```
 ,ANALYTICAL_METHOD_CODE VARCHAR(20) NOT NULL
 ,CHEM_DET_CODE VARCHAR(30) NOT NULL
 ,CHEM_DET_VALUE VARCHAR(10)
 ,REP_UNIT_CODE VARCHAR(6)
 ,FIMDATA_COMMENT VARCHAR(400)
 ,USER_ENTERED VARCHAR(10) DEFAULT user_name()
 ,DATE_ENTERED DATE DEFAULT getdate()
 ,USER_UPDATED VARCHAR(10)
 ,DATE_UPDATED DATE
 )

ALTER TABLE DIC_ANALYTICAL_METHOD
 ADD (CONSTRAINT DIC_ANALYTICAL_METHOD_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE STAFF_DETAIL
 ADD (CONSTRAINT STAFF_DETAIL_PK PRIMARY KEY
  (USER_ID))
/

ALTER TABLE SAMPLE_LOGISTICS
 ADD (CONSTRAINT SAMPLE_LOGISTICS_PK PRIMARY KEY
  (LOCALITY_ID
  ,SAMPLE_ID))
/

ALTER TABLE FRACTURE_PARAGENESIS
 ADD (CONSTRAINT FRACTURE_PARAGENESIS_PK PRIMARY KEY
  (FRAC_PARAGENETIC_ID))
/

ALTER TABLE DIC_CHEM_DETERMINAND
 ADD (CONSTRAINT DIC_CHEM_DETERMINAND_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE FRAC_SAMPLE_JOIN
 ADD (CONSTRAINT FRAC_SAMPLE_JOIN_PK PRIMARY KEY
  (FRACTURE_ID
  ,LOCALITY_ID
  ,SAMPLE_ID))
/
```

```
ALTER TABLE DIC_LOCALITY_TYPE
 ADD (CONSTRAINT DIC_LOCALITY_TYPE_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE SHALLOW_SURFACE
 ADD (CONSTRAINT SHALLOW_SURFACE_PK PRIMARY KEY
  (SHALLOW_SURF_ID))
/

ALTER TABLE SAMPLE_SUMMARY
 ADD (CONSTRAINT SAMPLE_SUMMARY_PK PRIMARY KEY
  (LOCALITY_ID
  ,SAMPLE_ID))
/

ALTER TABLE FRACTURE_INFO
 ADD (CONSTRAINT FRACTURE_INFO_PK PRIMARY KEY
  (FRACTURE_ID))
/

ALTER TABLE DIC_LITHOLOGY
 ADD (CONSTRAINT DIC_LITHOLOGY_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE SHALLOW_SURFACE_SITE_JOIN
 ADD (CONSTRAINT SHALLOW_SURFACE_SITE_JOIN_PK PRIMARY KEY
  (SHALLOW_SURF_ID
  ,SITE_ID))
/

ALTER TABLE SITE_PARAGENESIS_SCHEME
 ADD (CONSTRAINT SITE_PARAGENESIS_SCHEME_PK PRIMARY KEY
  (SITE_ID
  ,PARAGENETIC_CODE))
/

ALTER TABLE DIC_INCLUSION_TYPE
 ADD (CONSTRAINT DIC_INCLUSION_TYPE_PK PRIMARY KEY
  (CODE))
/
```

```
ALTER TABLE DIC_REGION_OF_INTEREST
 ADD (CONSTRAINT DIC_REGION_OF_INTEREST_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE DIC_REPORTING_UNIT
 ADD (CONSTRAINT DIC_REPORTING_UNIT_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE IMAGES
 ADD (CONSTRAINT IMAGES_PK PRIMARY KEY
  (IMAGE_ID))
/

ALTER TABLE DIC_FRACTURE_APERTURE
 ADD (CONSTRAINT DIC_FRACTURE_APERTURE_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE DIC_HYDRO_TEST_TYPE
 ADD (CONSTRAINT DIC_HYDRO_TEST_TYPE_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE SUBSAMPLE_LOGISTICS
 ADD (CONSTRAINT SUB_SAMPLE_LOGISTICS_PK PRIMARY KEY
  (SUBSAMPLE_ID))
/

ALTER TABLE REGION_OF_INTEREST
 ADD (CONSTRAINT REGION_OF_INTEREST_PK PRIMARY KEY
  (ROI_ID))
/

ALTER TABLE DIC_FRAC_CLASSIFICATION_SCHEME
 ADD (CONSTRAINT DIC_FRAC_CLASSIFICATN_SCH_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE FRACTURE_PFF
 ADD (CONSTRAINT FRACTURE_PFF_PK PRIMARY KEY
```

```
  (PFF_ID))
/

ALTER TABLE MAPS
 ADD (CONSTRAINT MAPS_PK PRIMARY KEY
  (MAP_ID))
/

ALTER TABLE PALAEO_CLIMATE_SITE_JOIN
 ADD (CONSTRAINT PALAEO_CLIMATE_SITE_JOIN_PK PRIMARY KEY
  (PALAEO_CLIMATE_ID
  ,SITE_ID))
/

ALTER TABLE SUBSAMP_PETROGRAPHY_DATA
 ADD (CONSTRAINT SUBSAMP_PETROGRAPHY_DATA_PK PRIMARY KEY
  (SUBSAMPLE_ID
  ,EVENT_ID))
/

ALTER TABLE DIC_MINERAL
 ADD (CONSTRAINT DIC_MINERAL_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE HYDROCHEM_DATA
 ADD (CONSTRAINT HYDROCHEM_DATA_PK PRIMARY KEY
  (LOCALITY_ID
  ,SAMPLE_NUMBER
  ,HYDRO_DET_CODE))
/

ALTER TABLE LOCALITY_LOGISTICS
 ADD (CONSTRAINT BOREHOLE_LOGISTICS_PK PRIMARY KEY
  (LOCALITY_ID))
/

ALTER TABLE DIC_COUNTRY
 ADD (CONSTRAINT DIC_COUNTRY_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE SITE
```

```
 ADD (CONSTRAINT SITE_PK PRIMARY KEY
  (SITE_ID))
/

ALTER TABLE DIC_IMAGE_TYPE
 ADD (CONSTRAINT DIC_IMAGE_TYPE_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE FI_PETROGRAPHY_DATA
 ADD (CONSTRAINT FI_PETROGRAPHY_DATA_PK PRIMARY KEY
  (INCLUSION_ID
  ,ROI_ID))
/

ALTER TABLE CHEMICAL_ANALYSIS
 ADD (CONSTRAINT CHEMICAL_ANALYSIS_PK PRIMARY KEY
  (CHEM_ID))
/

ALTER TABLE DIC_PFF_TYPES
 ADD (CONSTRAINT DIC_PFF_TYPES_PK PRIMARY KEY
  (PFF_TYPE_CODE))
/

ALTER TABLE SAMPLE_PARAGENESIS
 ADD (CONSTRAINT SAMPLE_PARAGENESIS_PK PRIMARY KEY
  (LOCALITY_ID
  ,SAMPLE_ID
  ,SAMPLE_EVENT_SEQUENCE))
/

ALTER TABLE HYDROCHEM_SAMPLE
 ADD (CONSTRAINT HYDROCHEM_SAMPLE_PK PRIMARY KEY
  (LOCALITY_ID
  ,SAMPLE_NUMBER))
/

ALTER TABLE ACRONYMS
 ADD (CONSTRAINT ACRONYMS_PK PRIMARY KEY
  (GLOSSARY))
/
```

```
ALTER TABLE DIC_DEPTH_REFERENCE_POINT
 ADD (CONSTRAINT DIC_DEPTH_REFERENCE_POINT_PK PRIMARY KEY
  (CODE))
/

ALTER TABLE FRAC_MINERAL_INFILL
 ADD (CONSTRAINT FRAC_MINERAL_INFILL_PK PRIMARY KEY
  (FEATURE_INFILL_ID))
/

ALTER TABLE PALAEO_CLIMATE
 ADD (CONSTRAINT PALAEO_CLIMATE_PK PRIMARY KEY
  (PALAEO_CLIMATE_ID))
/

ALTER TABLE DIC_SUBSAMPLE_TYPE
 ADD (CONSTRAINT PK_DIC_SAMPLE_TYPE PRIMARY KEY
  (CODE))
/

ALTER TABLE FI_MICROANALYSIS_DATA
 ADD (CONSTRAINT FI_MICROANALYSIS_DATA_PK PRIMARY KEY
  (INCLUSION_ID
  ,ROI_ID
  ,ANALYTICAL_METHOD_CODE
  ,CHEM_DET_CODE))
/

ALTER TABLE FRACTURE_PARAGENESIS
 ADD (CONSTRAINT FRACTURE_PARAGENESIS_U1 UNIQUE
  (FRACTURE_ID
  ,PARAGENETIC_CODE))
/

ALTER TABLE FRACTURE_PFF
 ADD (CONSTRAINT FRACTURE_PFF_U1 UNIQUE
  (FRACTURE_ID
  ,PFF_CODE))
/

ALTER TABLE CHEMICAL_ANALYSIS
 ADD (CONSTRAINT CHEMICAL_ANALYSIS_UK1 UNIQUE
  (CHEM_ANALYSIS_NO
```

```
  ,SAMPLE_ID
  ,SUBSAMPLE_ID
  ,ANALYTICAL_METHOD_CODE
  ,CHEM_DET_CODE))
/


ALTER TABLE FRAC_MINERAL_INFILL
 ADD (CONSTRAINT FRAC_MINERAL_INFILL_U1 UNIQUE
  (FRACTURE_ID
  ,MINERAL_INFILL_CODE))
/


ALTER TABLE DIC_ANALYTICAL_METHOD
 ADD  (CONSTRAINT  DIC_ANALYTICAL_METHOD_CK1  CHECK  ([code_status]  =  'C'  or
[CODE_STATUS] = 'O'))
/


ALTER TABLE DIC_CHEM_DETERMINAND
 ADD  (CONSTRAINT  DIC_CHEM_DETERMINAND_CK1  CHECK  ([code_status]  =  'C'  or
[CODE_STATUS] = 'O'))
/


ALTER TABLE DIC_LOCALITY_TYPE
 ADD (CONSTRAINT DIC_LOCALITY_TYPE_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS]
= 'O'))
/


ALTER TABLE FRACTURE_INFO
 ADD (CONSTRAINT FRACTURE_INFO_CK1 CHECK ([DIP_ORIENTATION_TYPE] = 'TRUE'
or [DIP_ORIENTATION_TYPE] = 'APPARENT'))
/


ALTER TABLE DIC_LITHOLOGY
 ADD (CONSTRAINT DIC_LITHOLOGY_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS] =
'O'))
/


ALTER TABLE DIC_INCLUSION_TYPE
 ADD (CONSTRAINT DIC_INCLUSION_TYPE_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS]
= 'O'))
/


ALTER TABLE DIC_REGION_OF_INTEREST
 ADD  (CONSTRAINT  DIC_REGION_OF_INTEREST_CK1  CHECK  ([code_status]  =  'C'  or
[CODE_STATUS] = 'O'))
```

```
/


ALTER TABLE DIC_REPORTING_UNIT
 ADD (CONSTRAINT DIC_REPORTING_UNIT_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS]
= 'O'))
/


ALTER TABLE DIC_FRACTURE_APERTURE
 ADD (CONSTRAINT DIC_FRACTURE_APERTURE_CK1 CHECK ([code_status] = 'C' or
[CODE_STATUS] = 'O'))
/


ALTER TABLE DIC_HYDRO_TEST_TYPE
 ADD (CONSTRAINT DIC_HYDRO_TEST_TYPE_CK1 CHECK ([code_status] = 'C' or
[CODE_STATUS] = 'O'))
/


ALTER TABLE DIC_FRAC_CLASSIFICATION_SCHEME
 ADD (CONSTRAINT DIC_FRAC_CLASSIFICATN_SCH_CK1 CHECK ([code_status] = 'C' or
[CODE_STATUS] = 'O'))
/


ALTER TABLE DIC_MINERAL
 ADD (CONSTRAINT DIC_MINERAL_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS] =
'O'))
/


ALTER TABLE DIC_COUNTRY
 ADD (CONSTRAINT DIC_COUNTRY_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS] =
'O'))
/


ALTER TABLE DIC_IMAGE_TYPE
 ADD (CONSTRAINT DIC_IMAGE_TYPE_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS] =
'O'))
/


ALTER TABLE DIC_DEPTH_REFERENCE_POINT
 ADD (CONSTRAINT DIC_DEPTH_REFERENCE_POINT_CK1 CHECK ([code_status] = 'C' or
[CODE_STATUS] = 'O'))
/


ALTER TABLE DIC_SUBSAMPLE_TYPE
 ADD (CONSTRAINT DIC_SUBSAMPLE_TYPE_CK1 CHECK ([code_status] = 'C' or [CODE_STATUS]
= 'O'))
/
```

```
ALTER TABLE STAFF_DETAIL ADD (CONSTRAINT
 STAFF_DETAIL_FK1 FOREIGN KEY
  (SITE_ID) REFERENCES SITE
  (SITE_ID))
/

ALTER TABLE STAFF_DETAIL ADD (CONSTRAINT
 STAFF_DETAIL_FK2 FOREIGN KEY
  (COUNTRY_CODE) REFERENCES DIC_COUNTRY
  (CODE))
/

ALTER TABLE SAMPLE_LOGISTICS ADD (CONSTRAINT
 SAMPLE_LOGISTICS_FK1 FOREIGN KEY
  (LOCALITY_ID) REFERENCES LOCALITY_LOGISTICS
  (LOCALITY_ID))
/

ALTER TABLE SAMPLE_LOGISTICS ADD (CONSTRAINT
 SAMPLE_LOGISTICS_FK4 FOREIGN KEY
  (SAMPLED_BY) REFERENCES STAFF_DETAIL
  (USER_ID))
/

ALTER TABLE SAMPLE_LOGISTICS ADD (CONSTRAINT
 SAMPLE_LOGISTICS_FK3 FOREIGN KEY
  (DEPTHREF_PT_CODE) REFERENCES DIC_DEPTH_REFERENCE_POINT
  (CODE))
/

ALTER TABLE SAMPLE_LOGISTICS ADD (CONSTRAINT
 SAMPLE_LOGISTICS_FK2 FOREIGN KEY
  (LITHOLOGY_CODE) REFERENCES DIC_LITHOLOGY
  (CODE))
/

ALTER TABLE FRACTURE_PARAGENESIS ADD (CONSTRAINT
 FRACTURE_PARAGENESIS_FRACTURE_ FOREIGN KEY
  (FRACTURE_ID) REFERENCES FRACTURE_INFO
  (FRACTURE_ID))
/
```

```
ALTER TABLE FRAC_SAMPLE_JOIN ADD (CONSTRAINT
 FRAC_SAMPLE_JOIN_FK1 FOREIGN KEY
  (FRACTURE_ID) REFERENCES FRACTURE_INFO
  (FRACTURE_ID))
/

ALTER TABLE FRAC_SAMPLE_JOIN ADD (CONSTRAINT
 FRAC_SAMPLE_JOIN_FK2 FOREIGN KEY
  (LOCALITY_ID
  ,SAMPLE_ID) REFERENCES SAMPLE_LOGISTICS
  (LOCALITY_ID
  ,SAMPLE_ID))
/

ALTER TABLE SHALLOW_SURFACE ADD (CONSTRAINT
 SHALLOW_SURFACE_FK1 FOREIGN KEY
  (COUNTRY_CODE) REFERENCES DIC_COUNTRY
  (CODE))
/

ALTER TABLE SAMPLE_SUMMARY ADD (CONSTRAINT
 SAMPLE_SUMMARY_FK1 FOREIGN KEY
  (LOCALITY_ID
  ,SAMPLE_ID) REFERENCES SAMPLE_LOGISTICS
  (LOCALITY_ID
  ,SAMPLE_ID))
/

ALTER TABLE FRACTURE_INFO ADD (CONSTRAINT
 FRACTURE_INFO_FK2 FOREIGN KEY
  (FRACTURE_AP_QUAL_CODE) REFERENCES DIC_FRACTURE_APERTURE
  (CODE))
/

ALTER TABLE FRACTURE_INFO ADD (CONSTRAINT
 FRACTURE_INFO_FK1 FOREIGN KEY
  (LOCALITY_ID) REFERENCES LOCALITY_LOGISTICS
  (LOCALITY_ID))
/

ALTER TABLE FRACTURE_INFO ADD (CONSTRAINT
 FRACTURE_INFO_FK4 FOREIGN KEY
  (DEPTHREF_PT_CODE) REFERENCES DIC_DEPTH_REFERENCE_POINT
```

```
  (CODE))
/

ALTER TABLE SHALLOW_SURFACE_SITE_JOIN ADD (CONSTRAINT
 SHALLOW_SURFACE_SITE_JOIN_FK1 FOREIGN KEY
  (SHALLOW_SURF_ID) REFERENCES SHALLOW_SURFACE
  (SHALLOW_SURF_ID))
/

ALTER TABLE SHALLOW_SURFACE_SITE_JOIN ADD (CONSTRAINT
 SHALLOW_SURFACE_SITE_JOIN_FK2 FOREIGN KEY
  (SITE_ID) REFERENCES SITE
  (SITE_ID))
/

ALTER TABLE SITE_PARAGENESIS_SCHEME ADD (CONSTRAINT
 SITE_PARAGENESIS_SCHEME_FK1 FOREIGN KEY
  (SITE_ID) REFERENCES SITE
  (SITE_ID))
/

ALTER TABLE IMAGES ADD (CONSTRAINT
 IMAGES_FK2 FOREIGN KEY
  (FIELD_OF_VIEW_UNIT) REFERENCES DIC_REPORTING_UNIT
  (CODE))
/

ALTER TABLE IMAGES ADD (CONSTRAINT
 IMAGES_FK4 FOREIGN KEY
  (SUBSAMPLE_ID) REFERENCES SUBSAMPLE_LOGISTICS
  (SUBSAMPLE_ID))
/

ALTER TABLE IMAGES ADD (CONSTRAINT
 IMAGES_FK6 FOREIGN KEY
  (DEPTHREF_PT_CODE) REFERENCES DIC_DEPTH_REFERENCE_POINT
  (CODE))
/

ALTER TABLE IMAGES ADD (CONSTRAINT
 IMAGES_FK5 FOREIGN KEY
  (ROI_ID) REFERENCES REGION_OF_INTEREST
  (ROI_ID))
```

```
/

ALTER TABLE IMAGES ADD (CONSTRAINT
 IMAGES_FK3 FOREIGN KEY
  (IMAGE_TYPE_CODE) REFERENCES DIC_IMAGE_TYPE
  (CODE))
/

ALTER TABLE IMAGES ADD (CONSTRAINT
 IMAGES_FK1 FOREIGN KEY
  (LOCALITY_ID
  ,SAMPLE_ID) REFERENCES SAMPLE_LOGISTICS
  (LOCALITY_ID
  ,SAMPLE_ID))
/

ALTER TABLE DIC_FRACTURE_APERTURE ADD (CONSTRAINT
 DIC_FRACTURE_APERTURE_FK1 FOREIGN KEY
  (CLASSIFICATION_SCHEME) REFERENCES DIC_FRAC_CLASSIFICATION_SCHEME
  (CODE))
/

ALTER TABLE SUBSAMPLE_LOGISTICS ADD (CONSTRAINT
 SUBSAMPLE_LOGISTICS_FK2 FOREIGN KEY
  (FRACTURE_ID) REFERENCES FRACTURE_INFO
  (FRACTURE_ID))
/

ALTER TABLE SUBSAMPLE_LOGISTICS ADD (CONSTRAINT
 SUB_SAMPLE_LOGISTICS_FK1 FOREIGN KEY
  (LOCALITY_ID
  ,SAMPLE_ID) REFERENCES SAMPLE_LOGISTICS
  (LOCALITY_ID
  ,SAMPLE_ID))
/

ALTER TABLE SUBSAMPLE_LOGISTICS ADD (CONSTRAINT
 SUBSAMPLE_LOGISTICS_FK3 FOREIGN KEY
  (DEPTHREF_PT_CODE) REFERENCES DIC_DEPTH_REFERENCE_POINT
  (CODE))
/

ALTER TABLE SUBSAMPLE_LOGISTICS ADD (CONSTRAINT
```

```
 SUBSAMPLE_LOGISTICS_FK5 FOREIGN KEY
  (SAMPLED_BY) REFERENCES STAFF_DETAIL
  (USER_ID))
/

ALTER TABLE SUBSAMPLE_LOGISTICS ADD (CONSTRAINT
 SUBSAMPLE_LOGISTICS_FK4 FOREIGN KEY
  (SUBSAMPLE_TYPE_CODE) REFERENCES DIC_SUBSAMPLE_TYPE
  (CODE))
/

ALTER TABLE REGION_OF_INTEREST ADD (CONSTRAINT
 REGION_OF_INTEREST_FK1 FOREIGN KEY
  (COORD_UNIT_CODE) REFERENCES DIC_REPORTING_UNIT
  (CODE))
/

ALTER TABLE REGION_OF_INTEREST ADD (CONSTRAINT
 REGION_OF_INTEREST_FK3 FOREIGN KEY
  (SUB_SAMPLE_ID) REFERENCES SUBSAMPLE_LOGISTICS
  (SUBSAMPLE_ID))
/

ALTER TABLE REGION_OF_INTEREST ADD (CONSTRAINT
 REGION_OF_INTEREST_FK2 FOREIGN KEY
  (ROI_TYPE_CODE) REFERENCES DIC_REGION_OF_INTEREST
  (CODE))
/

ALTER TABLE FRACTURE_PFF ADD (CONSTRAINT
 FRACTURE_PFF_FRACTURE_INFO_FK1 FOREIGN KEY
  (FRACTURE_ID) REFERENCES FRACTURE_INFO
  (FRACTURE_ID))
/

ALTER TABLE FRACTURE_PFF ADD (CONSTRAINT
 FRACTURE_PFF_DIC_PFF_TYPES_FK2 FOREIGN KEY
  (PFF_CODE) REFERENCES DIC_PFF_TYPES
  (PFF_TYPE_CODE))
/

ALTER TABLE MAPS ADD (CONSTRAINT
 MAPS_FK1 FOREIGN KEY
```

```
  (SITE_ID) REFERENCES SITE
  (SITE_ID))
/

ALTER TABLE PALAEO_CLIMATE_SITE_JOIN ADD (CONSTRAINT
 PALAEO_CLIMATE_SITE_JOIN_FK2 FOREIGN KEY
  (SITE_ID) REFERENCES SITE
  (SITE_ID))
/

ALTER TABLE PALAEO_CLIMATE_SITE_JOIN ADD (CONSTRAINT
 PALAEO_CLIMATE_SITE_JOIN_FK1 FOREIGN KEY
  (PALAEO_CLIMATE_ID) REFERENCES PALAEO_CLIMATE
  (PALAEO_CLIMATE_ID))
/

ALTER TABLE SUBSAMP_PETROGRAPHY_DATA ADD (CONSTRAINT
 SUBSAMP_PETROGRAPHY_DATA_FK2 FOREIGN KEY
  (AUTHOR) REFERENCES STAFF_DETAIL
  (USER_ID))
/

ALTER TABLE SUBSAMP_PETROGRAPHY_DATA ADD (CONSTRAINT
 SUBSAMP_PETROGRAPHY_DATA_FK1 FOREIGN KEY
  (SUBSAMPLE_ID) REFERENCES SUBSAMPLE_LOGISTICS
  (SUBSAMPLE_ID))
/

ALTER TABLE HYDROCHEM_DATA ADD (CONSTRAINT
 HYDROCHEM_DATA_FK2 FOREIGN KEY
  (HYDRO_DET_CODE) REFERENCES DIC_CHEM_DETERMINAND
  (CODE))
/

ALTER TABLE HYDROCHEM_DATA ADD (CONSTRAINT
 HYDROCHEM_DATA_FK1 FOREIGN KEY
  (LOCALITY_ID
  ,SAMPLE_NUMBER) REFERENCES HYDROCHEM_SAMPLE
  (LOCALITY_ID
  ,SAMPLE_NUMBER))
/

ALTER TABLE HYDROCHEM_DATA ADD (CONSTRAINT
```

```
 HYDROCHEM_DATA_FK3 FOREIGN KEY
  (REP_UNIT_CODE) REFERENCES DIC_REPORTING_UNIT
  (CODE))
/

ALTER TABLE LOCALITY_LOGISTICS ADD (CONSTRAINT
 LOCALITY_LOGISTICS_FK1 FOREIGN KEY
  (SITE_ID) REFERENCES SITE
  (SITE_ID))
/

ALTER TABLE LOCALITY_LOGISTICS ADD (CONSTRAINT
 LOCALITY_LOGISTICS_FK5 FOREIGN KEY
  (Z_COORD_REF_PT_CODE) REFERENCES DIC_DEPTH_REFERENCE_POINT
  (CODE))
/

ALTER TABLE LOCALITY_LOGISTICS ADD (CONSTRAINT
 LOCALITY_LOGISTICS_FK3 FOREIGN KEY
  (LOCALITY_TYPE_CODE) REFERENCES DIC_LOCALITY_TYPE
  (CODE))
/

ALTER TABLE LOCALITY_LOGISTICS ADD (CONSTRAINT
 LOCALITY_LOGISTICS_FK4 FOREIGN KEY
  (DEPTHREF_PT_CODE) REFERENCES DIC_DEPTH_REFERENCE_POINT
  (CODE))
/

ALTER TABLE LOCALITY_LOGISTICS ADD (CONSTRAINT
 LOCALITY_LOGISTICS_FK2 FOREIGN KEY
  (MAP_ID) REFERENCES MAPS
  (MAP_ID))
/

ALTER TABLE SITE ADD (CONSTRAINT
 SITE_FK1 FOREIGN KEY
  (COUNTRY_CODE) REFERENCES DIC_COUNTRY
  (CODE))
/

ALTER TABLE FI_PETROGRAPHY_DATA ADD (CONSTRAINT
 FI_PETROGRAPHY_DATA_FK1 FOREIGN KEY
```

```
  (ROI_ID) REFERENCES REGION_OF_INTEREST
  (ROI_ID))
/

ALTER TABLE FI_PETROGRAPHY_DATA ADD (CONSTRAINT
 FI_PETROGRAPHY_DATA_FK3 FOREIGN KEY
  (INCLUSION_TYPE_CODE) REFERENCES DIC_INCLUSION_TYPE
  (CODE))
/

ALTER TABLE FI_PETROGRAPHY_DATA ADD (CONSTRAINT
 FI_PETROGRAPHY_DATA_FK2 FOREIGN KEY
  (HOST_MINERAL_CODE) REFERENCES DIC_MINERAL
  (CODE))
/

ALTER TABLE CHEMICAL_ANALYSIS ADD (CONSTRAINT
 CHEMICAL_ANALYSIS_FK4 FOREIGN KEY
  (REP_UNIT_CODE) REFERENCES DIC_REPORTING_UNIT
  (CODE))
/

ALTER TABLE CHEMICAL_ANALYSIS ADD (CONSTRAINT
 CHEMICAL_ANALYSIS_FK5 FOREIGN KEY
  (CHEM_DET_CODE) REFERENCES DIC_CHEM_DETERMINAND
  (CODE))
/

ALTER TABLE CHEMICAL_ANALYSIS ADD (CONSTRAINT
 CHEMICAL_ANALYSIS_FK1 FOREIGN KEY
  (SUBSAMPLE_ID) REFERENCES SUBSAMPLE_LOGISTICS
  (SUBSAMPLE_ID))
/

ALTER TABLE CHEMICAL_ANALYSIS ADD (CONSTRAINT
 CHEMICAL_ANALYSIS_FK3 FOREIGN KEY
  (ANALYTICAL_METHOD_CODE) REFERENCES DIC_ANALYTICAL_METHOD
  (CODE))
/

ALTER TABLE CHEMICAL_ANALYSIS ADD (CONSTRAINT
 CHEMICAL_ANALYSIS_FK2 FOREIGN KEY
  (MINERAL_CODE) REFERENCES DIC_MINERAL
```

```
  (CODE))
/

ALTER TABLE SAMPLE_PARAGENESIS ADD (CONSTRAINT
 SAMPLE_PARAGENESIS_FK1 FOREIGN KEY
  (LOCALITY_ID
  ,SAMPLE_ID) REFERENCES SAMPLE_LOGISTICS
  (LOCALITY_ID
  ,SAMPLE_ID))
/

ALTER TABLE HYDROCHEM_SAMPLE ADD (CONSTRAINT
 HYDROCHEM_SAMPLE_FK3 FOREIGN KEY
  (LITHOLOGY_CODE) REFERENCES DIC_LITHOLOGY
  (CODE))
/

ALTER TABLE HYDROCHEM_SAMPLE ADD (CONSTRAINT
 HYDROCHEM_SAMPLE_FK2 FOREIGN KEY
  (HYDRO_TEST_TYPE) REFERENCES DIC_HYDRO_TEST_TYPE
  (CODE))
/

ALTER TABLE HYDROCHEM_SAMPLE ADD (CONSTRAINT
 HYDROCHEM_SAMPLE_FK4 FOREIGN KEY
  (DEPTHREF_PT_CODE) REFERENCES DIC_DEPTH_REFERENCE_POINT
  (CODE))
/

ALTER TABLE HYDROCHEM_SAMPLE ADD (CONSTRAINT
 HYDROCHEM_SAMPLE_FK1 FOREIGN KEY
  (LOCALITY_ID) REFERENCES LOCALITY_LOGISTICS
  (LOCALITY_ID))
/

ALTER TABLE FRAC_MINERAL_INFILL ADD (CONSTRAINT
 FRAC_MINERAL_INFILL_FK2 FOREIGN KEY
  (MINERAL_INFILL_CODE) REFERENCES DIC_MINERAL
  (CODE))
/

ALTER TABLE FRAC_MINERAL_INFILL ADD (CONSTRAINT
 FRAC_MINERAL_INFILL_FK1 FOREIGN KEY
```

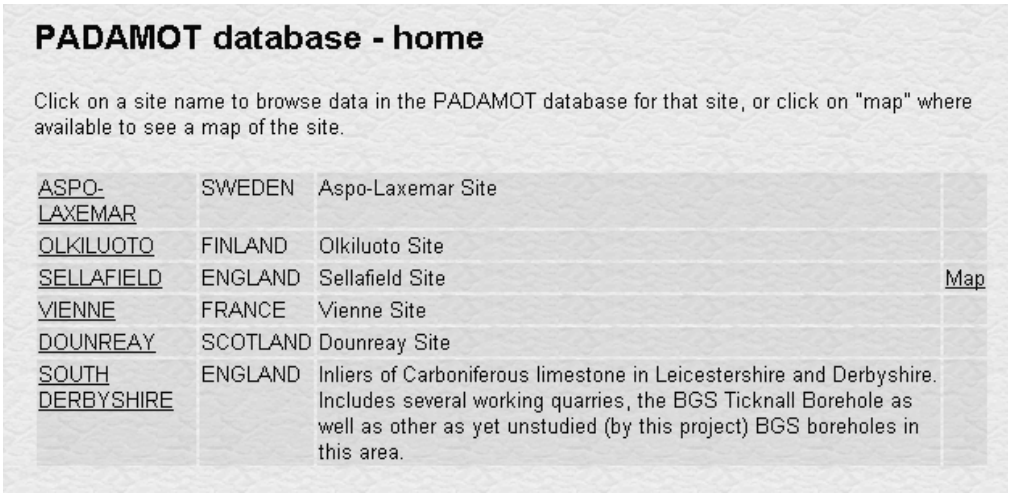
```
  (FRACTURE_ID) REFERENCES FRACTURE_INFO
  (FRACTURE_ID))
/

ALTER TABLE PALAEO_CLIMATE ADD (CONSTRAINT
 PALAEO_CLIMATE_DIC_COUNTRY_FK1 FOREIGN KEY
  (COUNTRY_CODE) REFERENCES DIC_COUNTRY
  (CODE))
/

ALTER TABLE FI_MICROANALYSIS_DATA ADD (CONSTRAINT
 FI_MICROANALYSIS_DATA_FK4 FOREIGN KEY
  (INCLUSION_ID
  ,ROI_ID) REFERENCES FI_PETROGRAPHY_DATA
  (INCLUSION_ID
  ,ROI_ID))
/

ALTER TABLE FI_MICROANALYSIS_DATA ADD (CONSTRAINT
 FI_MICROANALYSIS_DATA_FK3 FOREIGN KEY
  (REP_UNIT_CODE) REFERENCES DIC_REPORTING_UNIT
  (CODE))
/

ALTER TABLE FI_MICROANALYSIS_DATA ADD (CONSTRAINT
 FI_MICROANALYSIS_DATA_FK2 FOREIGN KEY
  (CHEM_DET_CODE) REFERENCES DIC_CHEM_DETERMINAND
  (CODE))
/

ALTER TABLE FI_MICROANALYSIS_DATA ADD (CONSTRAINT
 FI_MICROANALYSIS_DATA_FK1 FOREIGN KEY
  (ANALYTICAL_METHOD_CODE) REFERENCES DIC_ANALYTICAL_METHOD
  (CODE))
/
```

Appendix 5 Data Browser Application Scripts

Script Name	Title of Generated Web Page	Expected Arguments
APPLICATION.CFM	<No title>	<No arguments>
CHEM.CFM	PADAMOT database – sample #	EITHER url.host_locality_id, url.sample_id OR url.host_sample_id, url.subsample_id
DATAHOME.CFM	PADAMOT database – home	<No arguments>
FRACTURE.CFM	PADAMOT database – fracture #	url.fracture_id
HYDROSAMP.CFM	PADAMOT database – hydro-chemical sample #	url.locality_id, url.sample_number
IMAGE.CFM	PADAMOT database – image #	url.image_id AND ONE OF THE FOLLOWING: url.locality_id OR url.sample_id OR url.subsample_id
LOCALITY.CFM	PADAMOT database – locality #	url.site_id, url.locality_id, url.image_page
LOGIN.CFM	PADAMOT data access login page	<No arguments>
NIREXMAP.CFM	PADAMOT database – NIREX deep boreholes	<No arguments>
SAMPLE.CFM	PADAMOT database – sample #	url.locality_id, url.sample_id, url.image_page
SAMPLE_PARAGENESIS.CFM	PADAMOT database – sample #	url.locality_id, url.sample_id
SAMPLE_SUMMARY.CFM	PADAMOT database – sample #	url.locality_id, url.sample_id
SITE.CFM	PADAMOT database – site #	url.site, url.show
SUBSAMPLE.CFM	PADAMOT database – subsam-ple #	url.sample_id, url.subsample_id, url.image_page
SUBSAMPLE_PET.CFM	PADAMOT database – subsam-ple #	url.sample_id, url.subsample_id
VERIFYLOGIN.CFM	PADAMOT verify login page	form.PADAMOTuser, form.PADAMOTpass

Note: # is replaced with the identification number of a sample, fracture, image, locality, etc in the script titles.

Appendix 6 Screen Grabs of the Database Browser Application in Operation



PADAMOT database - home

Click on a site name to browse data in the PADAMOT database for that site, or click on "map" where available to see a map of the site.

ASPO-LAXEMAR	SWEDEN	Aspo-Laxemar Site	
OLKILUOTO	FINLAND	Olkiluoto Site	
SELLAFIELD	ENGLAND	Sellafield Site	Map
VIENNE	FRANCE	Vienne Site	
DOUNREAY	SCOTLAND	Dounreay Site	
SOUTH DERBYSHIRE	ENGLAND	Inliers of Carboniferous limestone in Leicestershire and Derbyshire. Includes several working quarries, the BGS Ticknall Borehole as well as other as yet unstudied (by this project) BGS boreholes in this area.	

Figure 16 Part of DATAHOME.CFM, the database browser application home page.

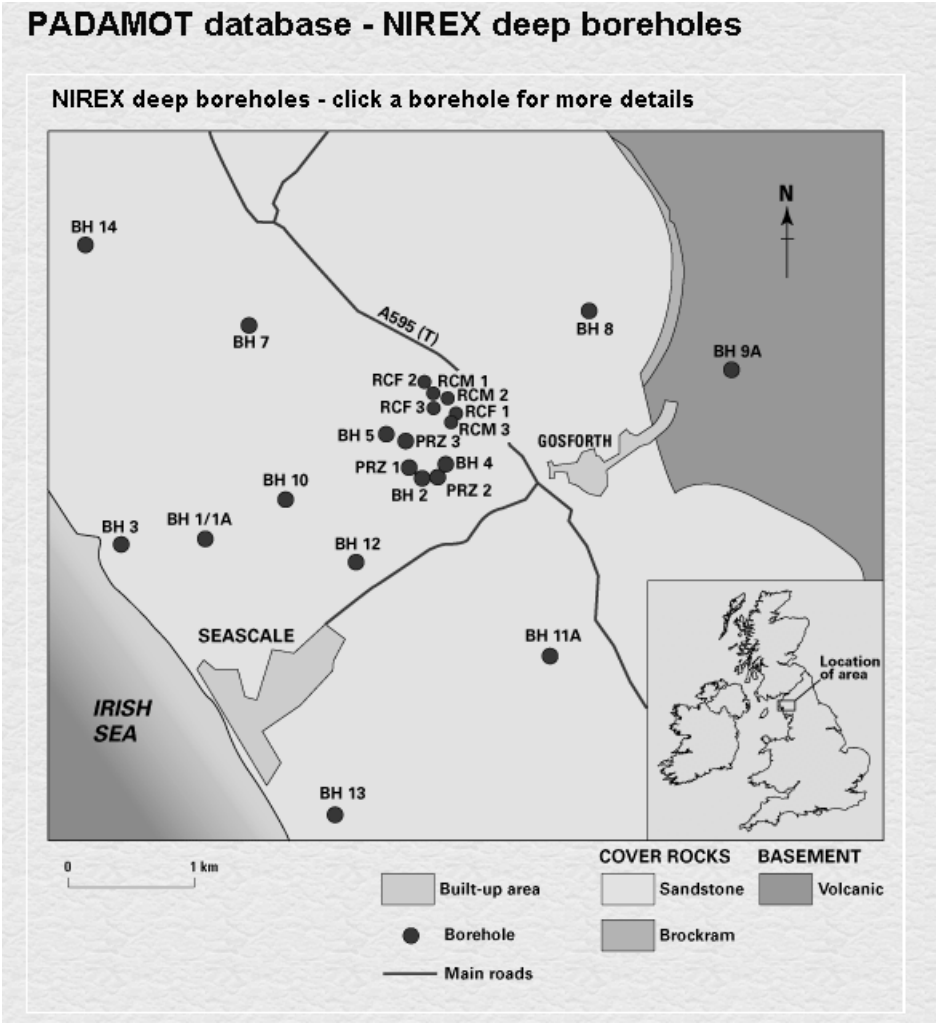
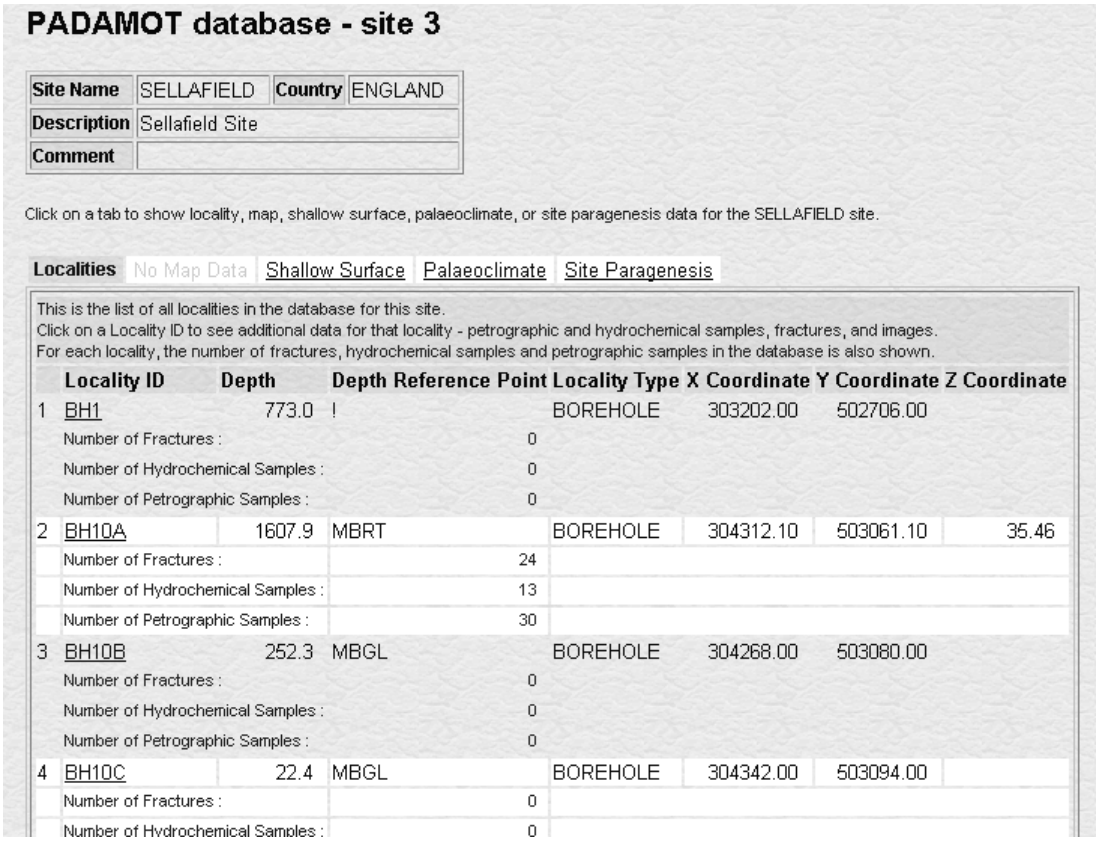


Figure 17 Data about a site. Part of NIREXMAP.CFM, the map of NIREX deep boreholes. Clicking on one of the localities takes the user to data for that locality.



PADAMOT database - site 3

Site Name	SELLAFIELD	Country	ENGLAND
Description	Sellafield Site		
Comment			

Click on a tab to show locality, map, shallow surface, palaeoclimate, or site paragenesis data for the SELLAFIELD site.

Localities | No Map Data | Shallow Surface | Palaeoclimate | Site Paragenesis

This is the list of all localities in the database for this site.
Click on a Locality ID to see additional data for that locality - petrographic and hydrochemical samples, fractures, and images.
For each locality, the number of fractures, hydrochemical samples and petrographic samples in the database is also shown.

	Locality ID	Depth	Depth Reference Point	Locality Type	X Coordinate	Y Coordinate	Z Coordinate
1	BH1	773.0	!	BOREHOLE	303202.00	502706.00	
	Number of Fractures :		0				
	Number of Hydrochemical Samples :		0				
	Number of Petrographic Samples :		0				
2	BH10A	1607.9	MBRT	BOREHOLE	304312.10	503061.10	35.46
	Number of Fractures :		24				
	Number of Hydrochemical Samples :		13				
	Number of Petrographic Samples :		30				
3	BH10B	252.3	MBGL	BOREHOLE	304268.00	503080.00	
	Number of Fractures :		0				
	Number of Hydrochemical Samples :		0				
	Number of Petrographic Samples :		0				
4	BH10C	22.4	MBGL	BOREHOLE	304342.00	503094.00	
	Number of Fractures :		0				
	Number of Hydrochemical Samples :		0				

Figure 18 Data about a site. Part of SITE.CFM, showing the list of localities at the Sellafield site.

PADAMOT database - site 3

Site Name	SELLAFIELD	Country	ENGLAND
Description	Sellafield Site		
Comment			

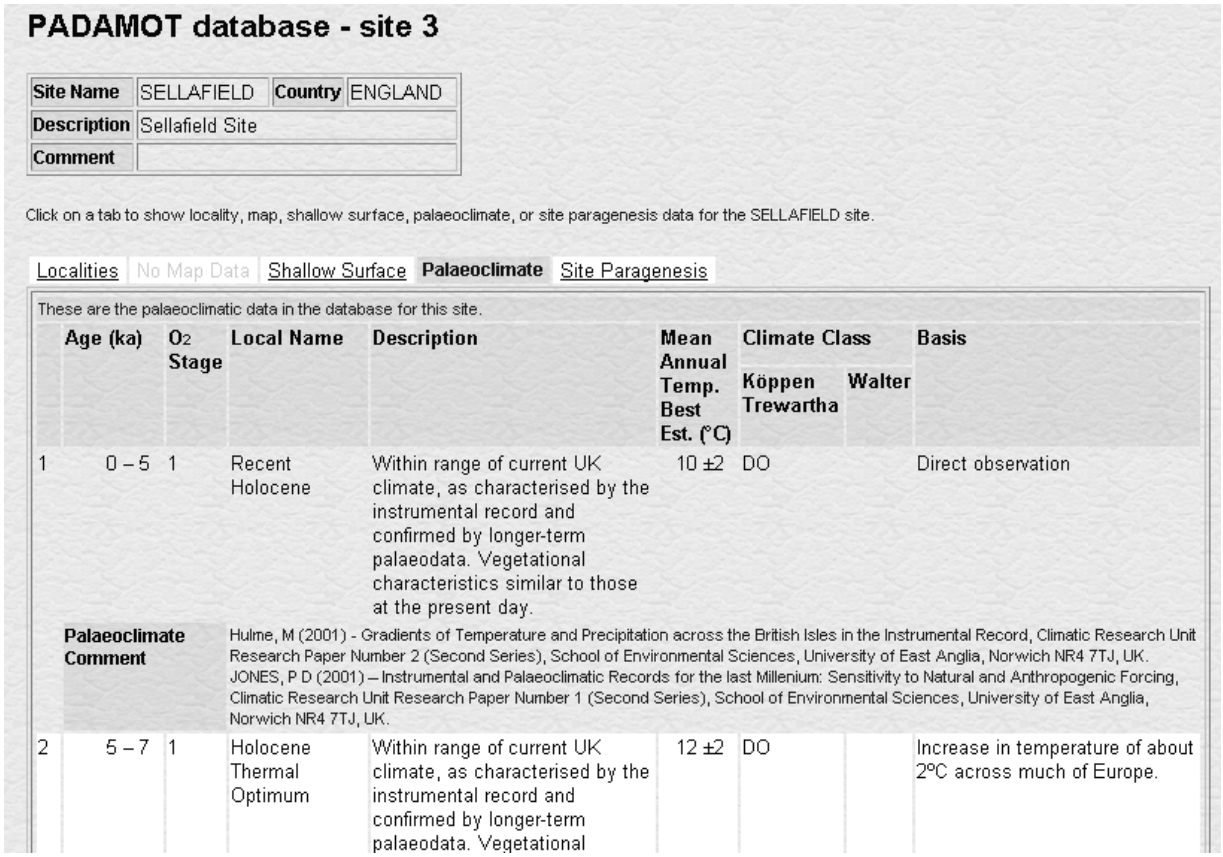
Click on a tab to show locality, map, shallow surface, palaeoclimate, or site paragenesis data for the SELLAFIELD site.

Localities | No Map Data | **Shallow Surface** | Palaeoclimate | Site Paragenesis

These are the shallow surface data in the database for this site.

	Age (ka)	Depth Below Ground (m)	Stage	Detail	O_2 Stage	Shallow Surface Comment
1	10-0		Flandrian		1	Also known as the Holocene
2	26-10		Devensian	Late	2	All ages are 14C values. The Middle Devensian includes the Upton Warren interstadial complex, whereas the Chelford interstadial is located in the Early Devensian at about 60 ka BP.
3	50-26		Devensian	Middle	3	All ages are 14C values. The Middle Devensian includes the Upton Warren interstadial complex, whereas the Chelford interstadial is located in the Early Devensian at about 60 ka BP.
4	Before 50		Devensian	Early	5d-3	All ages are 14C values. The Middle Devensian includes the Upton Warren interstadial complex, whereas the Chelford interstadial is located in the Early Devensian at about 60 ka BP.
5	124		Ipswichian		5e	Central estimate of age. Duration estimated at 10 to 15 ka.
6	160		Wolstonian	Ridgacre Formation Kidderminster Member	6	Overall period covered was 270 to 130 ka BP, estimated from graphical information. Note that the Wolstonian type location is now considered to be pre-Hoxnian and has been correlated with the Lowestoft Formation. The only lithostratigraphical evidence adduced to support a post-Hoxnian, but pre-Ipswichian, glaciation of East Anglia comes from the Nar Valley in Norfolk. This evidence includes gravels interpreted as outwash deposits, but no tills.
7	~200		Wolstonian	Strensham Court Bed	7	Overall period covered was 270 to 130 ka BP, estimated from graphical information. Note that the Wolstonian type location is now considered to be pre-Hoxnian and has been correlated

Figure 19 Data about a site. Part of SITE.CFM, showing shallow surface data for the Sellafield site.



PADAMOT database - site 3

Site Name	SELLAFIELD	Country	ENGLAND
Description	Sellafield Site		
Comment			

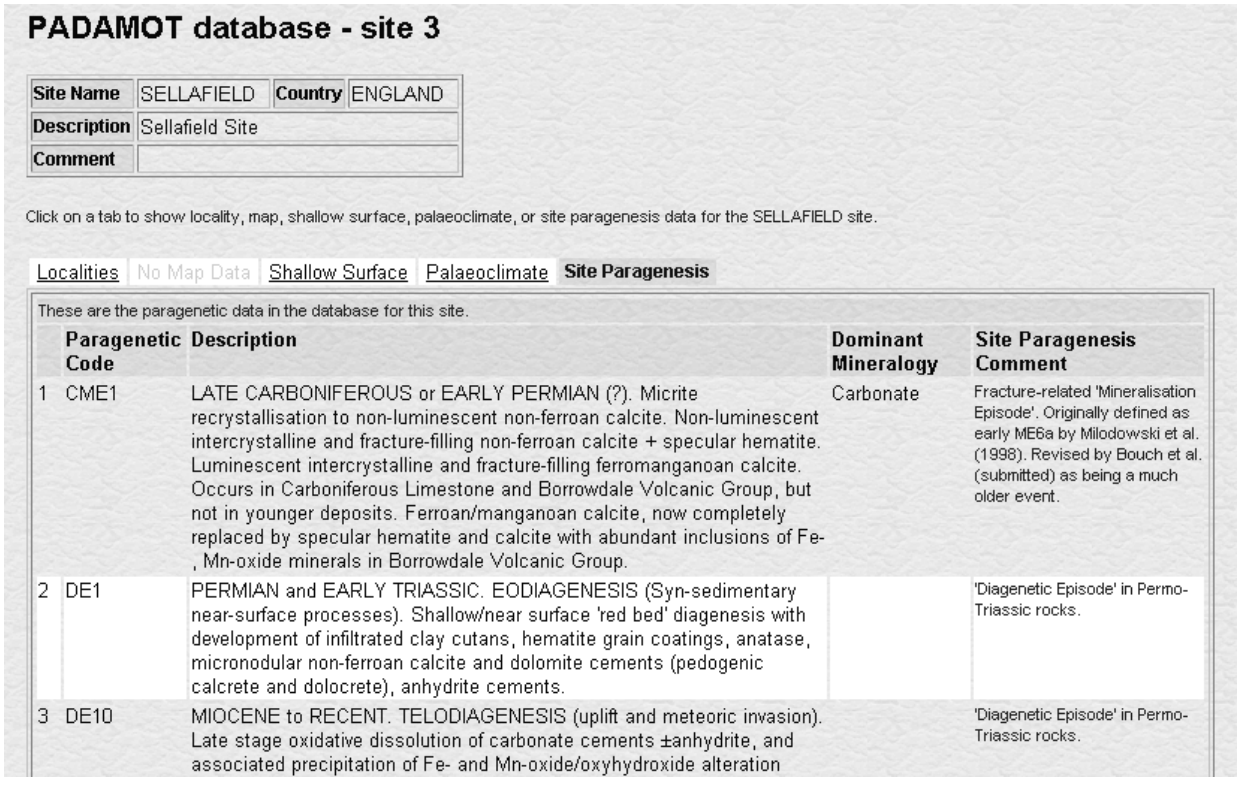
Click on a tab to show locality, map, shallow surface, palaeoclimate, or site paragenesis data for the SELLAFIELD site.

Localities | No Map Data | Shallow Surface | **Palaeoclimate** | Site Paragenesis

These are the palaeoclimatic data in the database for this site.

	Age (ka)	O_2 Stage	Local Name	Description	Mean Annual Temp. Best Est. (°C)	Climate Class: Köppen Trewartha	Climate Class: Walter	Basis
1	0 – 5	1	Recent Holocene	Within range of current UK climate, as characterised by the instrumental record and confirmed by longer-term palaeodata. Vegetational characteristics similar to those at the present day.	10 ±2	DO		Direct observation
	Palaeoclimate Comment		Hulme, M (2001) - Gradients of Temperature and Precipitation across the British Isles in the Instrumental Record, Climatic Research Unit Research Paper Number 2 (Second Series), School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK. JONES, P D (2001) – Instrumental and Palaeoclimatic Records for the last Millenium: Sensitivity to Natural and Anthropogenic Forcing, Climatic Research Unit Research Paper Number 1 (Second Series), School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK.				
2	5 – 7	1	Holocene Thermal Optimum	Within range of current UK climate, as characterised by the instrumental record and confirmed by longer-term palaeodata. Vegetational	12 ±2	DO		Increase in temperature of about 2ºC across much of Europe.

Figure 20 Data about a site. Part of SITE.CFM, showing palaeoclimate data for the Sellafield site.



PADAMOT database - site 3

Site Name	SELLAFIELD	Country	ENGLAND
Description	Sellafield Site		
Comment			

Click on a tab to show locality, map, shallow surface, palaeoclimate, or site paragenesis data for the SELLAFIELD site.

Localities | No Map Data | Shallow Surface | Palaeoclimate | **Site Paragenesis**

These are the paragenetic data in the database for this site.

	Paragenetic Code	Description	Dominant Mineralogy	Site Paragenesis Comment
1	CME1	LATE CARBONIFEROUS or EARLY PERMIAN (?). Micrite recrystallisation to non-luminescent non-ferroan calcite. Non-luminescent intercrystalline and fracture-filling non-ferroan calcite + specular hematite. Luminescent intercrystalline and fracture-filling ferromanganoan calcite. Occurs in Carboniferous Limestone and Borrowdale Volcanic Group, but not in younger deposits. Ferroan/manganoan calcite, now completely replaced by specular hematite and calcite with abundant inclusions of Fe-, Mn-oxide minerals in Borrowdale Volcanic Group.	Carbonate	Fracture-related 'Mineralisation Episode'. Originally defined as early ME6a by Milodowski et al. (1998). Revised by Bouch et al. (submitted) as being a much older event.
2	DE1	PERMIAN and EARLY TRIASSIC. EODIAGENESIS (Syn-sedimentary near-surface processes). Shallow/near surface 'red bed' diagenesis with development of infiltrated clay cutans, hematite grain coatings, anatase, micronodular non-ferroan calcite and dolomite cements (pedogenic calcrete and dolocrete), anhydrite cements.		'Diagenetic Episode' in Permo-Triassic rocks.
3	DE10	MIOCENE to RECENT. TELODIAGENESIS (uplift and meteoric invasion). Late stage oxidative dissolution of carbonate cements ±anhydrite, and associated precipitation of Fe- and Mn-oxide/oxyhydroxide alteration		'Diagenetic Episode' in Permo-Triassic rocks.

Figure 21 Data about a site. Part of SITE.CFM showing site paragenesis data for the Sellafield site.

PADAMOT database - locality BH10A

Site Name	SELLAFIELD	**Country**	ENGLAND
Description	Sellafield Site		
Comment			

These are data for one locality. Scroll down to see petrographic samples, hydrochemical samples, fractures, and images from this locality.

Locality ID	BH10A	**Depth**	1607.9	**Depth Reference Point**	MBRT METRES BELOW ROTARY TABLE
Locality Type	BOREHOLE	**Map ID**			
X Coordinate	304312.10	**Y Coordinate**	503061.10	**Z Coordinate**	35.46
XY Coordinate System	BRITISH NATIONAL GRID	**Z Coordinate Reference**		**Host Organization**	www.nirex.co.uk
Comment					

Petrographic Samples from Locality BH10A

This is the list of all petrographic samples in the database for this locality.
Click on a Sample ID to see additional data for that sample - description, subsamples, fractures, and fluid inclusions.

	Sample ID	Depth Top	Depth Base	Depth Reference Point	Host	Latest Calcite Morphology
1	B683	319.6	319.8	MBOD	ST BEES SANDSTONE	C-AXIS FLATTENED
2	B685	362.2	362.4	MBOD	ST BEES SANDSTONE	!
3	B689	522.8	523.3	MBOD	ST BEES SANDSTONE	C-AXIS FLATTENED
4	B691	558.6	558.9	MBOD	ST BEES SANDSTONE	C-AXIS FLATTENED
5	B694	572.2	572.5	MBOD	ST BEES SANDSTONE	INTERMEDIATE C-AXIS FLATTENED TO EQUANT

Figure 22 Data about a locality. Part of LOCALITY.CFM, showing petrographic samples from locality BH10A, Sellafield.

PADAMOT database - sample MPLH876

Site Name	DOUNREAY	**Country**	SCOTLAND
Description	Dounreay Site		
Comment			

Locality ID	NDN1	**Depth**	1327.1 MBKB	**Locality Type**	BOREHOLE
X Coordinate	298589.00	**Y Coordinate**	966923.00	**Z Coordinate**	

These are data for one petrographic sample. Click on a tab to see sample data, text summary, paragenesis, or chemical analyses.
Alternatively, scroll down to see petrographic subsamples, fractures, and images.

Sample Data | No Sample Summary | No Sample Paragenesis | No Sample Chemical Analyses

Sample ID	MPLH876	**Depth Top**	1105.1	**Depth Base**	1105.5	**Depth Reference Point**	MBRT METRES BELOW ROTARY TABLE
Host	MOINE			**Latest Calcite Morphology**	C-AXIS ELONGATE. ASPECT RATIO 2:1 c:a		
Sampled By	JONATHAN BOUCH [JBOUCH]					**Sampled Date**	01-Jun-02
Comment							

Petrographic Subsamples from Sample MPLH876

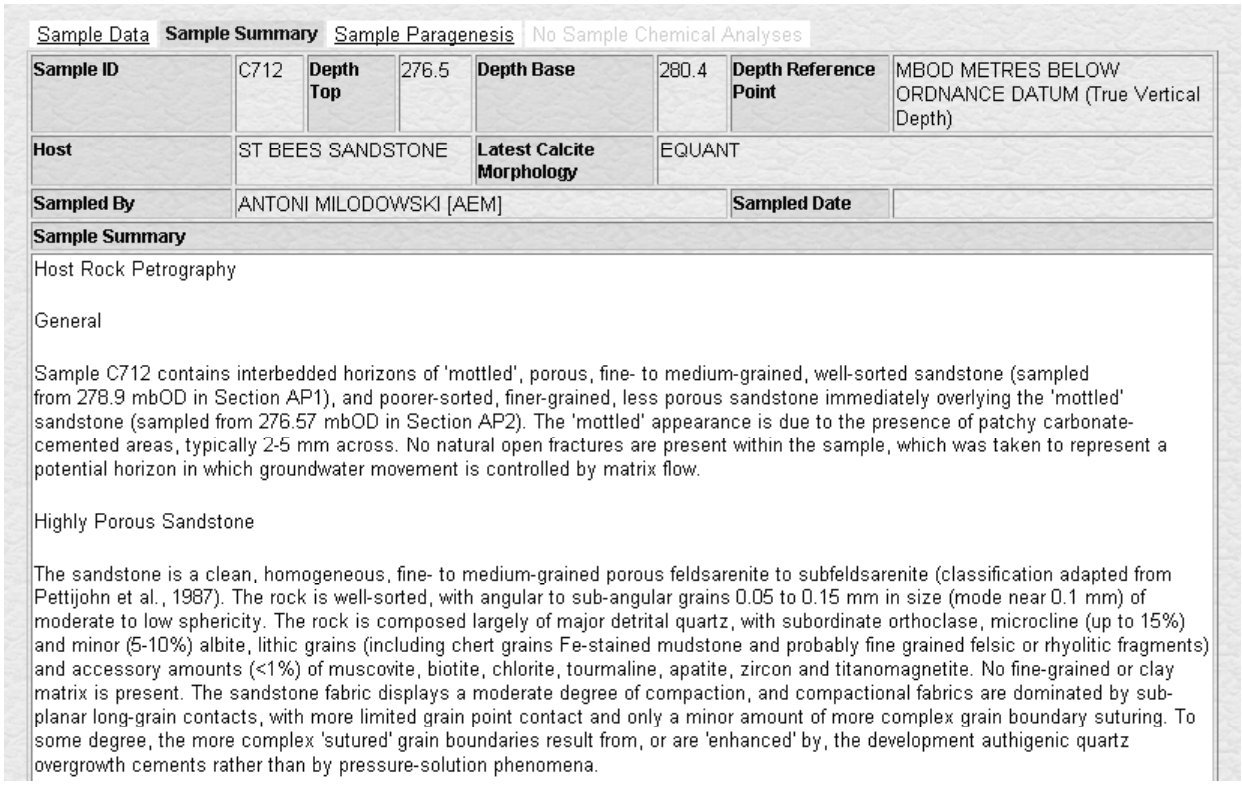
This is the list of all subsamples from this petrographic sample in the database.
Click on a Subsample ID to see additional data for that subsample - fractures, fluid inclusions.

	Subsample ID	Subsample Type	Fracture ID	Subsample Depth	Depth Reference Point
1	MPLH876/P01	POLISHED THIN-SECTION		1105.0	MBKB
2	MPLH876/S01	SEM STUB		1105.0	MBKB

Fractures on Sample MPLH876

NONE

Figure 23 Data about a petrographic sample. Part of SAMPLE.CFM, showing subsamples available for sample MPLH876 from the Dounreay site.



Sample Data | **Sample Summary** | Sample Paragenesis | No Sample Chemical Analyses

Sample ID	C712	**Depth Top**	276.5	**Depth Base**	280.4	**Depth Reference Point**	MBOD METRES BELOW ORDNANCE DATUM (True Vertical Depth)
Host	ST BEES SANDSTONE			**Latest Calcite Morphology**	EQUANT		
Sampled By	ANTONI MILODOWSKI [AEM]					**Sampled Date**	

Sample Summary

Host Rock Petrography

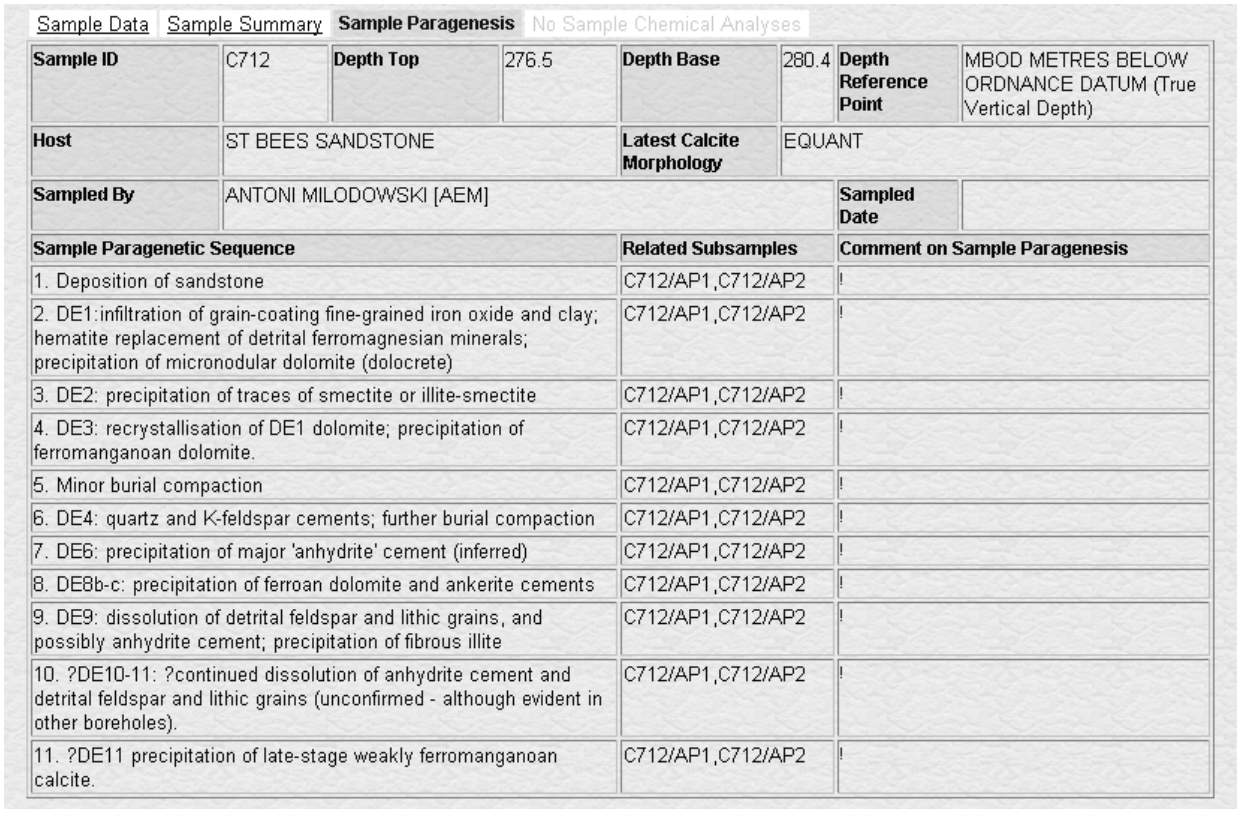
General

Sample C712 contains interbedded horizons of 'mottled', porous, fine- to medium-grained, well-sorted sandstone (sampled from 278.9 mbOD in Section AP1), and poorer-sorted, finer-grained, less porous sandstone immediately overlying the 'mottled' sandstone (sampled from 276.57 mbOD in Section AP2). The 'mottled' appearance is due to the presence of patchy carbonate-cemented areas, typically 2-5 mm across. No natural open fractures are present within the sample, which was taken to represent a potential horizon in which groundwater movement is controlled by matrix flow.

Highly Porous Sandstone

The sandstone is a clean, homogeneous, fine- to medium-grained porous feldsarenite to subfeldsarenite (classification adapted from Pettijohn et al., 1987). The rock is well-sorted, with angular to sub-angular grains 0.05 to 0.15 mm in size (mode near 0.1 mm) of moderate to low sphericity. The rock is composed largely of major detrital quartz, with subordinate orthoclase, microcline (up to 15%) and minor (5-10%) albite, lithic grains (including chert grains Fe-stained mudstone and probably fine grained felsic or rhyolitic fragments) and accessory amounts (<1%) of muscovite, biotite, chlorite, tourmaline, apatite, zircon and titanomagnetite. No fine-grained or clay matrix is present. The sandstone fabric displays a moderate degree of compaction, and compactional fabrics are dominated by sub-planar long-grain contacts, with more limited grain point contact and only a minor amount of more complex grain boundary suturing. To some degree, the more complex 'sutured' grain boundaries result from, or are 'enhanced' by, the development authigenic quartz overgrowth cements rather than by pressure-solution phenomena.

Figure 24 Data about a petrographic sample. Part of SAMPLE_SUMMARY.CFM showing a description of sample C712 from the Sellafield site.

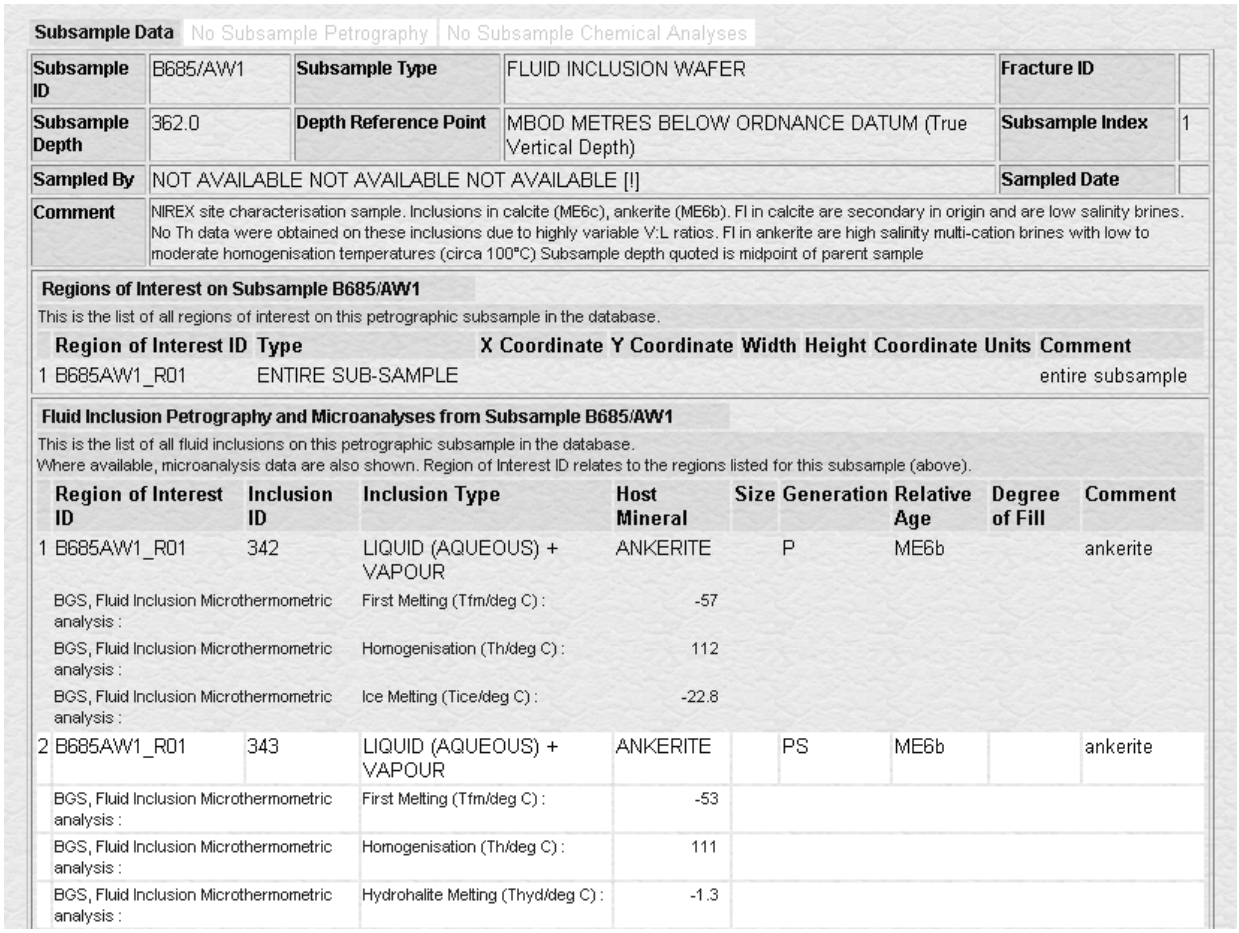


Sample Data | Sample Summary | **Sample Paragenesis** | No Sample Chemical Analyses

Sample ID	C712	**Depth Top**	276.5	**Depth Base**	280.4	**Depth Reference Point**	MBOD METRES BELOW ORDNANCE DATUM (True Vertical Depth)
Host	ST BEES SANDSTONE			**Latest Calcite Morphology**	EQUANT		
Sampled By	ANTONI MILODOWSKI [AEM]					**Sampled Date**	

Sample Paragenetic Sequence	**Related Subsamples**	**Comment on Sample Paragenesis**
1. Deposition of sandstone	C712/AP1,C712/AP2	!
2. DE1:infiltration of grain-coating fine-grained iron oxide and clay; hematite replacement of detrital ferromagnesian minerals; precipitation of micronodular dolomite (dolocrete)	C712/AP1,C712/AP2	!
3. DE2: precipitation of traces of smectite or illite-smectite	C712/AP1,C712/AP2	!
4. DE3: recrystallisation of DE1 dolomite; precipitation of ferromanganoan dolomite.	C712/AP1,C712/AP2	!
5. Minor burial compaction	C712/AP1,C712/AP2	!
6. DE4: quartz and K-feldspar cements; further burial compaction	C712/AP1,C712/AP2	!
7. DE6: precipitation of major 'anhydrite' cement (inferred)	C712/AP1,C712/AP2	!
8. DE8b-c: precipitation of ferroan dolomite and ankerite cements	C712/AP1,C712/AP2	!
9. DE9: dissolution of detrital feldspar and lithic grains, and possibly anhydrite cement; precipitation of fibrous illite	C712/AP1,C712/AP2	!
10. ?DE10-11: ?continued dissolution of anhydrite cement and detrital feldspar and lithic grains (unconfirmed - although evident in other boreholes).	C712/AP1,C712/AP2	!
11. ?DE11 precipitation of late-stage weakly ferromanganoan calcite.	C712/AP1,C712/AP2	!

Figure 25 Data about a petrographic sample. Part of SAMPLE_PARAGENESIS, showing paragenetic data for sample C712.



Subsample Data | No Subsample Petrography | No Subsample Chemical Analyses

Subsample ID	B685/AW1	**Subsample Type**	FLUID INCLUSION WAFER	**Fracture ID**	
Subsample Depth	362.0	**Depth Reference Point**	MBOD METRES BELOW ORDNANCE DATUM (True Vertical Depth)	**Subsample Index**	1
Sampled By	NOT AVAILABLE NOT AVAILABLE NOT AVAILABLE [!]			**Sampled Date**	
Comment	NIREX site characterisation sample. Inclusions in calcite (ME6c), ankerite (ME6b). FI in calcite are secondary in origin and are low salinity brines. No Th data were obtained on these inclusions due to highly variable V:L ratios. FI in ankerite are high salinity multi-cation brines with low to moderate homogenisation temperatures (circa 100°C) Subsample depth quoted is midpoint of parent sample				

Regions of Interest on Subsample B685/AW1

This is the list of all regions of interest on this petrographic subsample in the database.

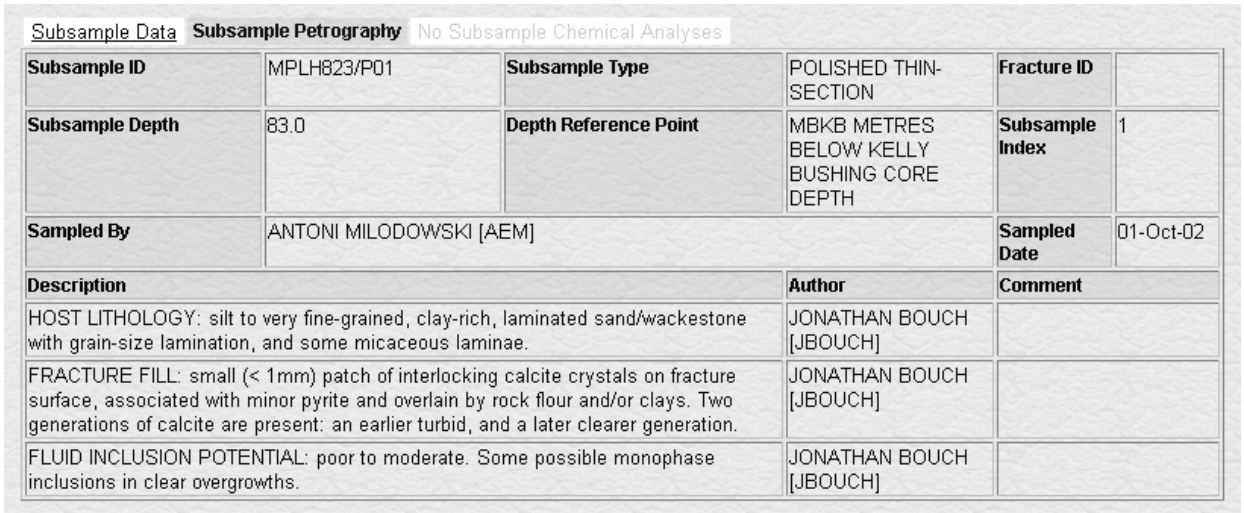
	Region of Interest ID	Type	X Coordinate	Y Coordinate	Width	Height	Coordinate Units	Comment
1	B685AW1_R01	ENTIRE SUB-SAMPLE						entire subsample

Fluid Inclusion Petrography and Microanalyses from Subsample B685/AW1

This is the list of all fluid inclusions on this petrographic subsample in the database.
Where available, microanalysis data are also shown. Region of Interest ID relates to the regions listed for this subsample (above).

	Region of Interest ID	Inclusion ID	Inclusion Type	Host Mineral	Size	Generation	Relative Age	Degree of Fill	Comment
1	B685AW1_R01	342	LIQUID (AQUEOUS) + VAPOUR	ANKERITE		P	ME6b		ankerite
	BGS, Fluid Inclusion Microthermometric analysis :		First Melting (Tfm/deg C) :	-57					
	BGS, Fluid Inclusion Microthermometric analysis :		Homogenisation (Th/deg C) :	112					
	BGS, Fluid Inclusion Microthermometric analysis :		Ice Melting (Tice/deg C) :	-22.8					
2	B685AW1_R01	343	LIQUID (AQUEOUS) + VAPOUR	ANKERITE		PS	ME6b		ankerite
	BGS, Fluid Inclusion Microthermometric analysis :		First Melting (Tfm/deg C) :	-53					
	BGS, Fluid Inclusion Microthermometric analysis :		Homogenisation (Th/deg C) :	111					
	BGS, Fluid Inclusion Microthermometric analysis :		Hydrohalite Melting (Thyd/deg C) :	-1.3					

Figure 26 Data about a petrographic subsample. Part of SUBSAMPLE.CFM showing regions of interest and fluid inclusion analyses on a subsample from the Sellafield site.

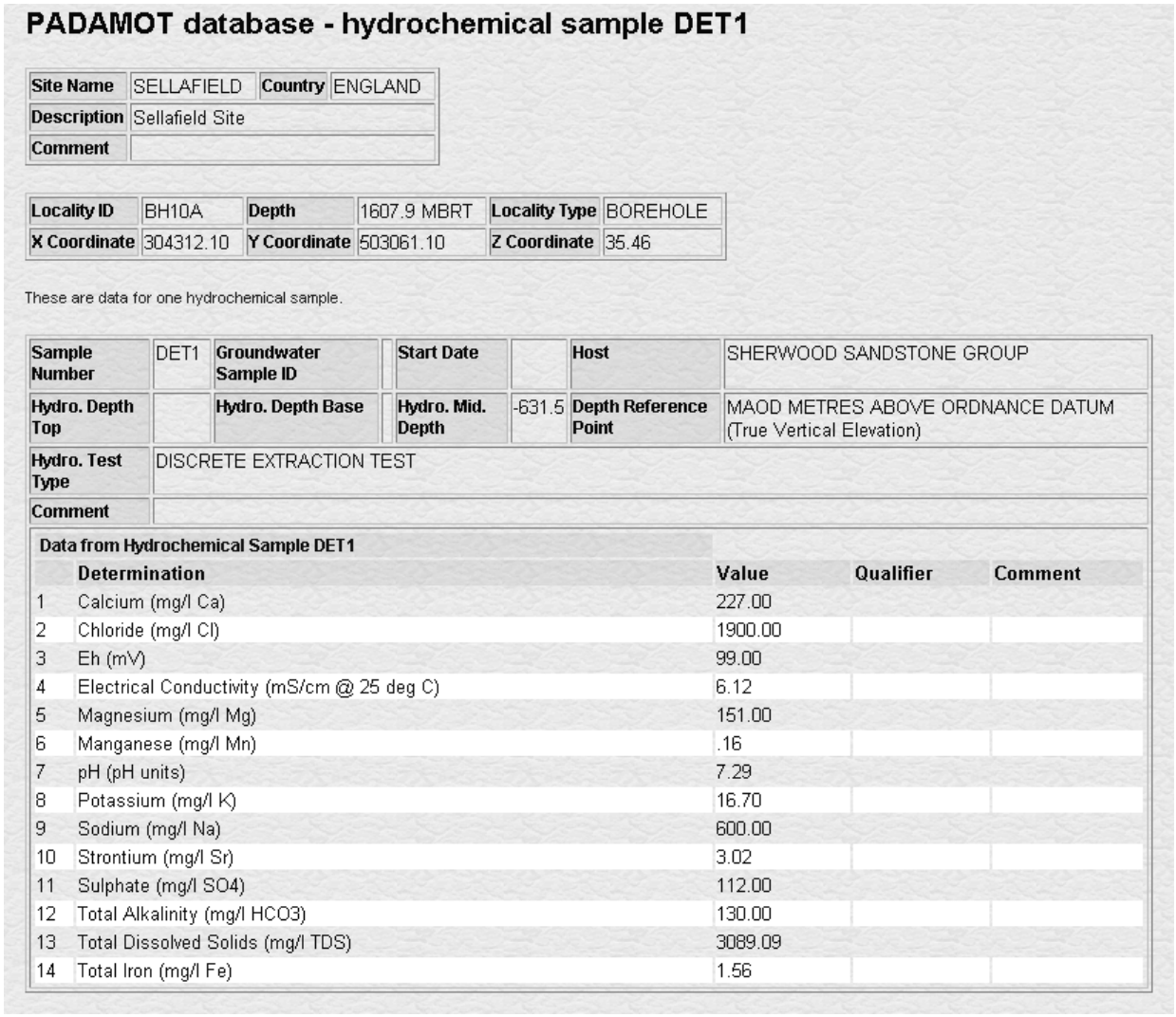


Subsample Data | **Subsample Petrography** | No Subsample Chemical Analyses

Subsample ID	MPLH823/P01	**Subsample Type**	POLISHED THIN-SECTION	**Fracture ID**	
Subsample Depth	83.0	**Depth Reference Point**	MBKB METRES BELOW KELLY BUSHING CORE DEPTH	**Subsample Index**	1
Sampled By	ANTONI MILODOWSKI [AEM]			**Sampled Date**	01-Oct-02

Description	Author	Comment
HOST LITHOLOGY: silt to very fine-grained, clay-rich, laminated sand/wackestone with grain-size lamination, and some micaceous laminae.	JONATHAN BOUCH [JBOUCH]	
FRACTURE FILL: small (< 1mm) patch of interlocking calcite crystals on fracture surface, associated with minor pyrite and overlain by rock flour and/or clays. Two generations of calcite are present: an earlier turbid, and a later clearer generation.	JONATHAN BOUCH [JBOUCH]	
FLUID INCLUSION POTENTIAL: poor to moderate. Some possible monophase inclusions in clear overgrowths.	JONATHAN BOUCH [JBOUCH]	

Figure 27 Data about a petrographic subsample. Part of SUBSAMPLE_PET.CFM, showing petrographic data for subsample MPLH823/PO1.



PADAMOT database - hydrochemical sample DET1

Site Name	SELLAFIELD	**Country**	ENGLAND
Description	Sellafield Site		
Comment			

Locality ID	BH10A	**Depth**	1607.9 MBRT	**Locality Type**	BOREHOLE
X Coordinate	304312.10	**Y Coordinate**	503061.10	**Z Coordinate**	35.46

These are data for one hydrochemical sample.

Sample Number	DET1	**Groundwater Sample ID**		**Start Date**		**Host**	SHERWOOD SANDSTONE GROUP
Hydro. Depth Top		**Hydro. Depth Base**		**Hydro. Mid. Depth**	-631.5	**Depth Reference Point**	MAOD METRES ABOVE ORDNANCE DATUM (True Vertical Elevation)
Hydro. Test Type	DISCRETE EXTRACTION TEST						
Comment							

Data from Hydrochemical Sample DET1

	Determination	Value	Qualifier	Comment
1	Calcium (mg/l Ca)	227.00		
2	Chloride (mg/l Cl)	1900.00		
3	Eh (mV)	99.00		
4	Electrical Conductivity (mS/cm @ 25 deg C)	6.12		
5	Magnesium (mg/l Mg)	151.00		
6	Manganese (mg/l Mn)	.16		
7	pH (pH units)	7.29		
8	Potassium (mg/l K)	16.70		
9	Sodium (mg/l Na)	600.00		
10	Strontium (mg/l Sr)	3.02		
11	Sulphate (mg/l SO4)	112.00		
12	Total Alkalinity (mg/l HCO3)	130.00		
13	Total Dissolved Solids (mg/l TDS)	3089.09		
14	Total Iron (mg/l Fe)	1.56		

Figure 28 Data about a hydrochemical sample. HYDROSAMP.CFM showing hydrochemical data for sample DET1 from locality BH10A at the Sellafield site.

These are data for one fracture. Scroll down to see petrographic samples and subsamples on which this fracture occurs.

Fracture ID	384	**Fracture Description**			
Depth		**Depth Reference Point**			
Fracture Dip	UNKNOWN	**Fracture Dip Azimuth**	UNKNOWN	**Fracture Strike**	
Fracture Aperture	OPEN(>2.0mm)	**Fracture Aperture Value**	3	**Dip Orientation Type**	
Classification Scheme		**k Value**			
Local Core Run No.	UNKNOWN	**Local Discontinuity No**	UNKNOWN		
Petrographic Description					
Min. Age of Infill		**Min. Age Uncertainty**			
Max. Age of Infill		**Max. Age Uncertainty**			
Comment					

Fracture Mineral Infill

NOT AVAILABLE

Fracture Potential Flowing Feature (PFF)

NOT AVAILABLE

Petrographic Samples on which this Fracture Occurs

This is the list of petrographic samples on which this fracture occurs.
Click on a Sample ID to see additional data for that sample - description, subsamples, fractures, fluid inclusions.

	Sample ID	Depth Top	Depth Base	Depth Reference Point	Host	Latest Calcite Morphology
1	B683	319.6	319.8	MBOD	ST BEES SANDSTONE	C-AXIS FLATTENED

Petrographic Subsamples on which this Fracture Occurs

NONE

Figure 29 Data about a fracture. FRACTURE.CFM showing data describing a fracture from the Sellafield site.

Locality ID	BH10A	**Depth**	1607.9 MBRT	**Locality Type**	BOREHOLE
X Coordinate	304312.10	**Y Coordinate**	503061.10	**Z Coordinate**	35.46

Sample ID	B689	**Depth Top**	522.8 MBOD	**Depth Base**	523.3 MBOD
Host	ST BEES SANDSTONE			**Latest Calcite Morphology**	C-AXIS FLATTENED

Subsample ID	B689/AP1	**Subsample Type**	POLISHED THIN-SECTION
Fracture ID		**Subsample Depth**	523.0

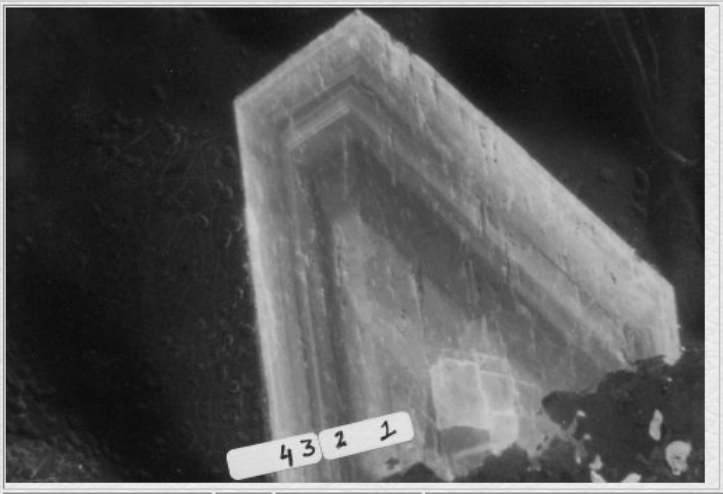


Image Description

Image ID	42	**Image Type**	COLD CATHODOLUMINESCENCE (OPTICAL)				
Film No.	F222	**Negative No.**	23	**Taken By**		**Date Taken**	
Photo Top Depth		**Photo Base Depth**		**Depth Reference Point**			
Scale Bar		**Field of View**		**Datum**			
Microscope Magnification		**Microscope**	35mm/CL	**Original Media Type**	35mm		
Comment							

Figure 30 Data about an image. Part of IMAGE.CFM showing a cathodoluminescence image of a subsample from a locality at the Sellafield site.

Glossary

Term	Explanation
ColdFusion	A technology that provides functionality to a web site additional to what can be achieved with HTML. In particular it allows a visitor to interact with a remote database.
DDL	Database Definition Language, the scripting language used to define a database.
EQUIP	Evidence from Quaternary Infills and Palaeohydrogeology.
HTML	Hypertext Mark-up Language, a scripting language used to write web pages.
JavaScript	A scripting language that provides functionality to a web page additional to what can be achieved with HTML.
PADAMOT	Palaeohydrogeological Data Analysis and Model Testing.
SQL	Structured Query Language, the scripting language used to interact with a database.
WP3	PADAMOT Work Package 3.

References

Most of the references listed below are held in the Library of the British Geological Survey at Keyworth, Nottingham. Copies of the references may be purchased from the Library subject to the current copyright legislation.

BATH, A, MILODOWSKI, A, RUOTSALAINEN, P, TULLBORG, E-L, CORTÉS RUIZ, A, and ARANYOSSY, J-F (2000). Evidence from mineralogy and geochemistry for the evolution of groundwater systems during the Quaternary for use in radioactive waste repository assessment (EQUIP Project). Final Report, Contract No FI4W-CT96-0031. EC-DG Research (Nuclear Fission and Radiation Protection), Report EUR 19613EN. 157pp. Nuclear Science and Technology Series, European Commission, Luxembourg.

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