The Recorder Project

Systems Analysis

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Environmental Information Management

The Recorder Project

Systems Analysis
Contents

1. Management Summary

The contract for the Recorder project systems analysis stages 1 - 3 was placed with C. Copp in the first week of November 1996 and the work carried out between November 1996 and March 1997. The objectives of the contract were to apply structured systems analysis techniques to:

- Describe the current and potential market for Recorder
- Document the biological records management requirements of the market
- Model the current data flow and highlight where problems occur within the present system
- Produce a logical model of the data that are being managed
- Enhance the model to address problems identified in Recorder's data model
- Document the main processes and functions to be included in the rebuild
- Produce and document a provisional relational model for the replacement of Recorder
- Propose business options for the rebuild of Recorder and note any technical implications of these options

Over the period of the analysis, 95 specially invited people, representing the broad span of professional and amateur interests, attended 12 consultation meetings and 30 more people contributed by letter, phone and email. In addition, 143 questionnaire returns from Recorder users produced great detail regarding the strengths and weaknesses of Recorder. This information was incorporated into a detailed Requirements Catalogue which is to be circulated for further comment.

Probably the clearest messages that came from the consultation meetings were:

- The importance of getting user-naturalists more confident with the product by providing them with reliable, easy-to-use software, good documentation, continued user support and training.
- The need to manage sampling and surveillance data, particularly relating to biotope change.
- The provision of streamlined methods for data input
- The need for a simpler approach to reporting and better connections to standard windows software.
- The importance of data transfer and the need to simplify the user processes involved
- The importance of maps and spatial access to data
- The importance of the included dictionaries, particularly the taxon and biotope dictionaries

The range and varied nature of different Recorder users and data sources meant that the standard process of creating Current System Data Flow Diagrams had to be heavily tailored to produce useful information. The focus was placed upon Local Records Centres and their contacts, because of the wide range of data that they process.

A more useful approach was found to be a broader analysis of information in biological records (based on the consultations, examination of existing recording media and database applications) in combination with logical data modelling. This involved a fundamental review of the way data recorded for different purposes relate to each other. In the process of this work a new modular, general model has been proposed which allows for the integration of data derived from different survey types including the earth sciences. The strength of the new model lies in its, recording module which centres on the concept of a recording sample which can link surveys, places, biotopes, taxa, physical data and specimens in any combination. This would, for instance, address the requirement for repeated sampling and surveillance data. It also holds out the potential for local records centres to integrate their biological and earth science records.

The modular nature of the whole model means that management of parts such as the taxon, biotope and stratigraphic dictionaries can be distributed and also specific applications could be built using only those modules required. The consultations served to confirm the great importance that all users place on the dictionaries and the need to continue support and development. The electronic dictionaries are a vital part of Recorder and form a core technology for the proposed National Biodiversity Network, for this reason, a consideration of electronic dictionaries has been undertaken in a separate report.

An analysis of the detailed requirements catalogue for different user types demonstrated that the current version of Recorder is actually trying to serve two or possibly three main market areas (large scale records collation, individual naturalists and recording scheme organisers) and these might be better served by developing individually tailored software based on a common data model. The newly developed, extended data model would also allow applications to be written for specific markets, not currently catered for by Recorder, such as specialist bird recording (ringing and nesting records) and ecological research.

A detailed relational analysis has been carried out and a provisional physical model is included in Annex 3. This model includes the tables and attributes (fields) necessary to include basic earth science data. As a check on the scope of the model, the existing Recorder database tables and fields have been mapped to the new model and are detailed in Annex 2. This would provide the basis for the data map which will be used in the migration of Recorder data to the new system. It is emphasised that the physical model presented in Annex 3 is only provisional, it is not yet the Required Data Model for the actual Recorder rebuild. The required model can only be produced once the actual business options for redevelopment are settled and when the model is re-assessed taking into account the strengths and restrictions arising from the selected technical options. Database design is an iterative process of consultation and refinement, this model provides the foundation for the next stage of the process which includes the actual application specification and design.

The final section of this report lists the business and technical options which might be appropriate for the further redevelopment of Recorder. These range from doing nothing, to highly ambitious InterNet-linked solutions. The consultant's preferred option is that, at this stage, there are probably two forms of Recorder which could be created that would address the needs of most actual and potential users. These would be a full records centre system and a smaller stand-alone user system (e.g. local naturalist or LRC satellite. An outline of what this 'slim' version of Recorder would look like is given in Annex 4). This could be achieved by writing separate applications or writing one modular database with a high degree of user-selected install optionality. A further, attractive option is that the data model and access to the dictionaries be made available to other application developers who are interested in developing for specific 'vertical' markets such as bird recorders or entomologists. The consultation clearly indicated that the application should have a windows user interface and be able to communicate freely with other windows software including Geographical Information Systems. The way should be left open for developer's who wish to produce GIS or mapping-integrated solutions as Recorder add-ons.

2. Introduction

The contract for the Recorder project systems analysis was placed in the first week of November 1996 and the first project meeting was held on Wednesday 14th November. The outcome of this meeting was a revised project plan taking account of the extra time which would be required to arrange and attend at least twelve consultation meetings to be held throughout the UK. The time schedule for this first analysis stage of the project was extremely tight and the typical SSADM documentation requirements have, of necessity, been trimmed to ensure delivery of the key products within the limits. This has not be deleterious because only certain of the SSADM Stage 1 - 3 techniques are useful within the scope of the Recorder Project.

The range of biological recording is very diverse but has been well documented in the CCBR Report on Biological Recording in the UK (Burnett, Copp & Harding 1995). It was found that production of current system Data Flow Diagrams (DFDs) could add very little to what was already known of the biological recording systems already in place and has therefore been pared down to the minimum required to illustrate where the new system would be operative and what processes it could cover. It was also found that the production of Logical Data Models could not progress far without introducing relational data modelling at an earlier stage than originally planned. Much of the analysis time has, therefore, been concentrated on the logical and relational data models whereas details of application processes are thought best left until after the business options have been decided and work on specification commences.

The consultation meetings have emphasised the importance of the various Recorder dictionaries, particularly the Taxon Dictionary. The current discussions on the future management of the Taxon Dictionary also emphasised the need to more fully define its required structure and a system for delivering checklist products. For these reasons a significant amount of time has been spent investigating a suitable structure for the Taxon Dictionary from which both a dictionary management application and Recorders 'taxon delivery system' could be built. This has involved both data modelling and a degree of prototyping (by both C.Copp and S. Ball) to test the proposed structure, resulting in further modifications. We believe that we are now approaching a working model for at least the checklist delivery part of the required system.

One of the main requirements for the new Recorder, already apparent from the consultation meetings, is the need to broaden Recorder's approach to records, principally to deal with sampling and records of biotopes. There has also been a significant level of requests to integrate records with earth sciences and similar information. A considerable amount of attention has therefore been given to the logical structure of these various forms of record and an attempt to unify them in a single structure. The results so far are encouraging and the provisional logical and physical models have been extended to provide the framework for the full range of biological and conservation-based earth science recording..

3. Consultation Meetings

The analysis work involved consultation with a wide range of existing Recorder users, potential users, software developers and other interested parties. Meetings have been held in Gloucester, Cheltenham, Peterborough (2), Belfast, Bolton, Rotherham, Battleby (Scotland), Glenrothes (Scotland), Bangor (N. Wales), Cardiff, Birmingham and London. In addition to direct meetings, information has been obtained through telephone, letter and email contacts and a study of the 143 replies to the Recorder questionnaire sent out in 1996. A full list of contacts is given in Annex 1.

Detailed notes have been taken at all meetings but these have not been written up as formal minutes as a representative of the Recorder Management Board was also present at each meeting and distribution of minutes would have added little by way of further information. The notes of the meetings were, however, a prime source of input to the Requirements Catalogue. The requirements catalogue will be circulated to participants of meetings to ensure that their views and requirements have been properly understood and seeking further feedback. This refined catalogue will provide the essential framework within which to set the scope of the Recorder rebuild (the business options) and will include much of the input to the application design stage. The products produced at this stage of the analysis will not be the final word on what goes into the Recorder build phase as development is always a process of checking and refinement.

4. Limits to the Analysis

The CCBR Report on biological recording in the UK undertook a detailed investigation of the activities and data requirements of a wide range of biological records users. The findings of this survey have been published (Burnett, Copp & Harding 1995) and do not need to be repeated here although the figure from this work showing relationships between organisations involved in biological records makes a useful context diagram and is reproduced here as Figure 1. In the process of consultation for the Recorder rebuild, contact has been made with representatives of most of the organisations or interest groups represented in the context diagram. Their input will be important in ensuring that the new Recorder is based on as complete a data model as possible in order to ensure future compatibility of data between organisations. In the present project, however, there are neither the time or resources to attempt to solve all of these organisations' data handling requirements or to create a piece of software suitable for all uses (were that possible!). The analysis has, therefore, attempted to deliver a suitably general model within which the requirements of local conservation and planning networks and their relationships with national schemes are given particular focus. In the process of meeting their requirements many of the needs of other potential users will also be met and the wide ranging consultation will ensure that wherever possible these further considerations will be taken account of.

Figure 2 shows a more detailed context diagram relating to local networks. The hub of the network is identified as 'Local Records Management'. In many areas this equates to a Local Record Centre but the functions may also be undertaken by wildlife trusts and local planning departments. As the present Recorder is most closely targeted at the work of Local Record Centres the main limit to analysis of the present and required system will also be focused on Local Records Management, however as stated, the data model has been extended where necessary to reflect requirements arising from the wider consultation. The definition of what software products are likely to be specified on the basis of this analysis will be part of the Business Options Stage of this contract but is likely to be restricted to the specification of an LRC-oriented application and possibly a version suitable for the individual naturalist and recording scheme organisers.

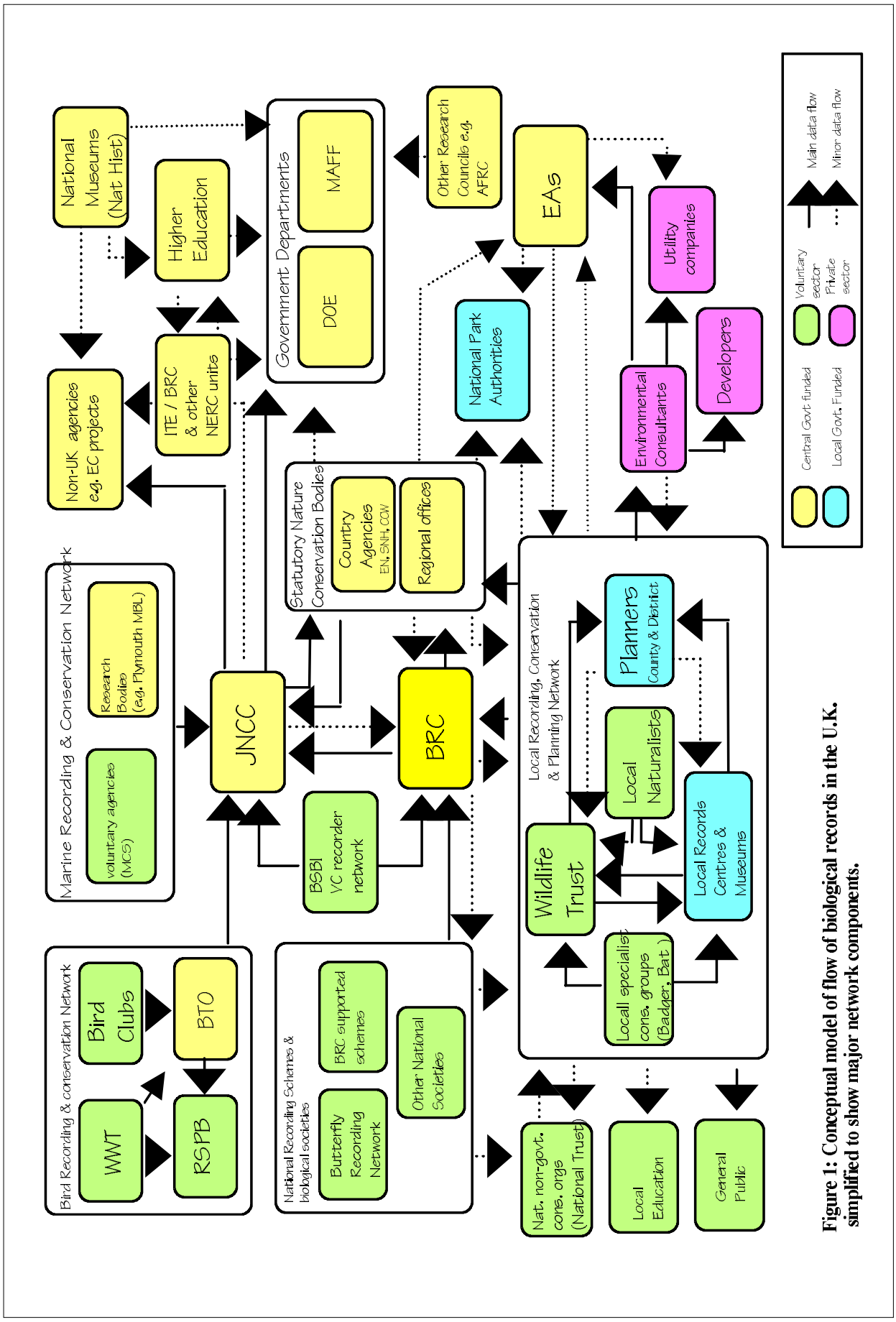


Figure 1: Conceptual model of flow of biological records in the U.K. simplified to show major network components.

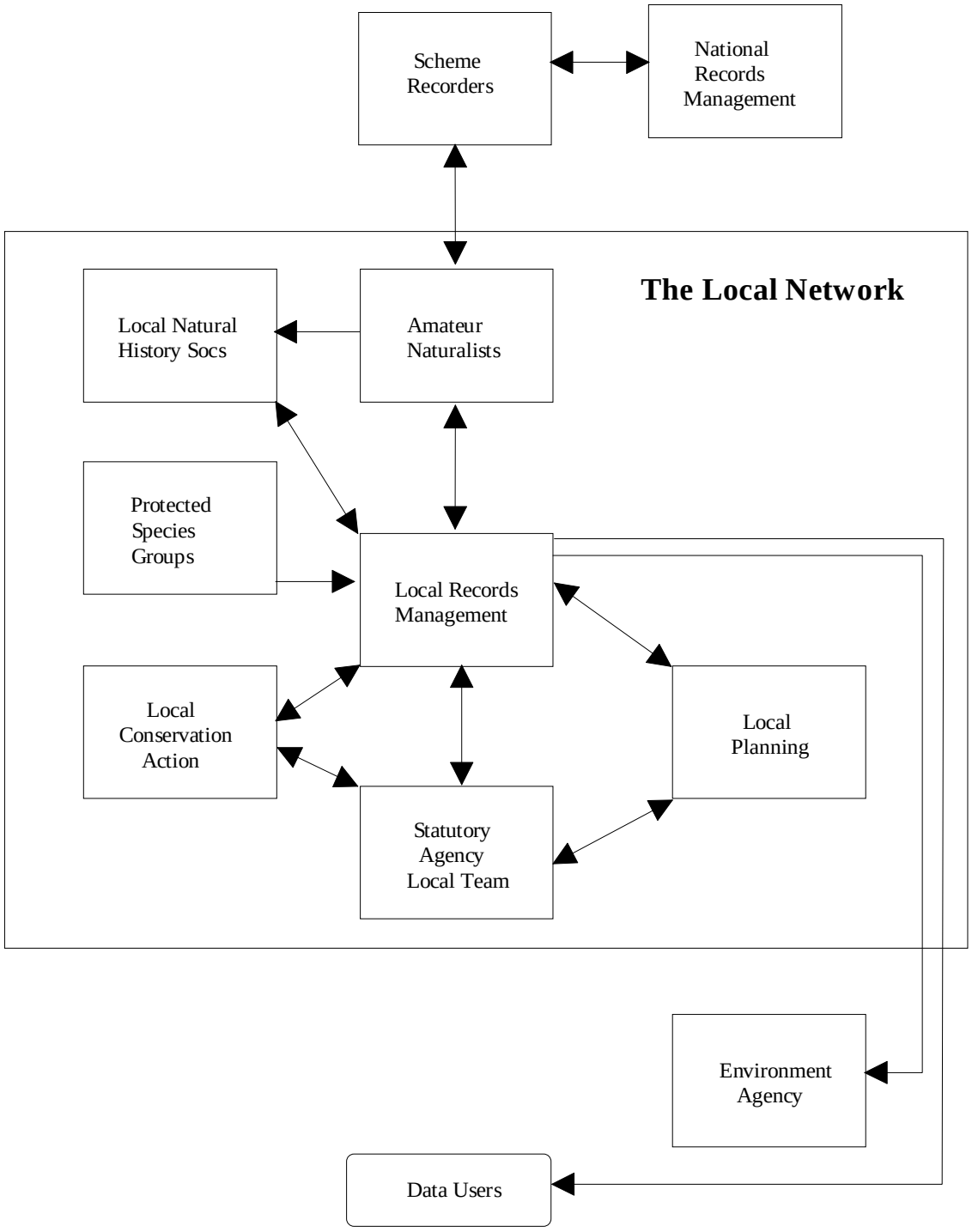


Figure 2: Limits to the analysis - the local network
Arrows show the normal direction of data flow

5. Overview of the current system

5.1: Current System - Local Records Management

For the purpose of this analysis, local records management is assumed to be carried out by a local record centre. The work of local record centres is reviewed in the CCBR Report and is further detailed in a report by C. Copp to the Wildlife Trusts (1996). These works in addition to the consultations and a review of the functions within the present Recorder have informed the present analysis.

5.1.1 Data Flow Diagrams (DFDs)

The work of Local Records Centres and recording schemes is already well understood and has been described in detail in recent works (e.g. Burnett, Copp & Harding 1995, Copp 1996). Only a small number of DFDs have, therefore, been prepared in order to highlight the main data stores used by local record centres and provide a reminder of the processes which centres require the data for. A simplified view of the typical functions of a local records centre are shown graphically in figures 3 and 4 - current system level 1 DFDs. Figure 3 refers to the data gathering activities of centres whilst figure 4 refers to data use and dissemination. Figures 5, 6 and 7 show level 2 DFDs for collating records, entering records on computerised databases and for answering enquiries. These latter three processes cover much of the day-to-day work of LRCs and highlight the variety of data handled.

5.1.2 Process Descriptions

Process		Process Name	Description
1		Collate statutory information	Lists of sites with statutory protection are maintained by the Country Conservation Agencies and JNCC. Summary information about SSSIs is sent in paper form from the agencies to local planning departments and either copied directly or indirectly to LRCs. Planners and some LRCs also have digitised boundary information for statutory sites either purchased from third parties or digitised directly from maps. Most store boundary information on hand-drawn maps or overlays. Lists of species with statutory protection may be copied from legislation or secondary published sources. National information on protected species is gleaned from Red Data Books, atlases and secondary sources such as the Recorder species dictionary.
2		Collate survey records and other data	One of the main roles of LRCs is to collate survey data from local sources which include local naturalists, county recorders and scheme organisers and surveys conducted by wildlife trusts, planners and the LRC itself. Information is provided in a wide variety of formats including site survey cards, species cards and written reports. Some data are transferred as computer files, most often in ASCII or dbase format but a significant amount is also exchanged through add-ons to Recorder.
	2.1	Contact data supplier	Contacting the data supplier should include the documentation of the data exchange agreement. This is often informal but greater control will be needed if data centres are to become part of a national framework for data exchange.
	2.2	Receive/copy records	Records may be obtained in various ways. They may

			be the originals for transcription into a database or onto cards. More frequently data are provided as either photocopies or electronic output from databases. Map-based surveys such as Phase I and Phase II habitat surveys may be copied whole and not processed further.
	2.3	Sort and check records	Data that are to be incorporated into master databases or made available to others are normally sorted and checked. Sites are frequently marked onto index maps (e.g. overlays on 1:10,000 scale maps) so that there is a quick 'manual' system for retrieval in geographic searches. Species data is often sorted for validation and ordering before input/transcription. Data that are to be entered onto computer databases need to be checked for completeness and marked up with notes for data entry (e.g. how to split note data, what site is being referred to etc.)
	2.4	Arrange validation by outside referees	In the case of data being provided by county recorders and scheme organisers, most record centres would treat the identification information as validated but in other cases data sets need to be checked either in-house or by outside referees. Geographic references also need validation if, for instance, an agreed site series is being used.
	2.5	Store validated records	Validated records are stored until time is available for data input (if that is intended). Most data sets are stored separately but details may be transcribed onto index cards and maps. Site-based surveys may be split up and individual cards/reports stored in site files with data from other sources. Some datasets are provided to LRCs with the proviso that they are maintained separately and sometimes, confidentially.
3		Extract information from literature	Many LRCs augment their records by extracting information from published accounts such as Annual bird reports and papers in local naturalists journals. The main problem with this is that the information is secondary, not complete and may actually duplicate primary records being maintained elsewhere. In the case of historical records (e.g. identifying the location of once important sites) this may provide valuable index information e.g. on alert maps.
4		Collate geological records	Most LRCs are not simply involved with biological records. As providers of information for planning and conservation they need access to the whole range of environmental interests but particularly geological and geomorphological sites as these are not usually handled by anyone else (although RIGS groups may operate independently). Archaeology already has an established information network outside of the record centre network. The need for integrating geological and biological site information was raised by many of the contributors to the consultation meetings.
5		Prepare data collection strategy	Many LRCs are involved in organising or carrying out surveys. The better organised centres have reference panels who help prepare a survey strategy to meet the information needs of the centre. Preparation of a strategy requires a knowledge of the extent and quality of existing data and the direction in which the needs of data users is moving. Major surveys such as

			landcover surveys are usually carried out by a consortium of partners (e.g. conservation agency, planners, wildlife trust and LRC).
6		Coordinate and commission survey	Where new survey is required, many record centres either coordinate the work or carry it out themselves with LRC staff. work may be carried out by volunteers, LRC full-time or temporary staff or outside contractors.
7		Extract for databases	Very few record centres have the staff or technology for incorporating all of their data into computerised systems. Map information is most often kept in manual form and surveys with complex data structures (e.g. quadrat samples within stands) are very difficult to computerise with existing software. Information is therefore, currently, selectively extracted or summarised for inclusion on databases.
	7.1	Select species records for data entry	Species records are selected for inclusion on databases from a variety of sources including published sources, survey cards and 'ad hoc' sightings. Some confidential data are withheld from computerisation for security reasons.
	7.2	Mark up records for data entry	Records are normally checked and may be marked up to flag which fields go where in the database. Some data need 'translation' or interpretation before they can be entered.
	7.3	Enter or update species data - interactive validation	Most (but not all) record centres use Recorder as their main database. Recorder works on interactive data entry with field by field validation. Site and species data are normally entered separately. Most other commonly used software packages also use interactive validation although some data centres including national BRC use simple data entry software and validate records manually/semi-manually 'off-line'.
	7.4	Select sites for data entry	The main problem with site data entry is the definition of sites, subsites and overlapping sites. Some centres and schemes try to control this by using an agreed 'site series' but in practice few sites are formally defined with agreed (and digitised) boundaries and many species records ,for instance, end up allocated to a generalised 'centroid' grid reference for a site, whose extent may vary according to interpretation. This tends to be more of a problem with older data.
	7.5	Mark up sites for data entry	See 7.2
	7.6	Enter or update site data - interactive validation	See 7.3
	7.7	Enter or update contact data on database	Most centres maintain contact data with details of recorders, referees, staff etc. This is most often on cards but may also be kept (at least for summary lookup purposes) on Recorder.
	7.8	Check all entered data for accuracy	Entered data is usually linked to species records, site descriptions and contact data. All records are normally (or should be!) checked for accuracy of input prior to approving for release by either flagging as checked or actually integrating into validated data tables (depending on the application).
	7.9	Make backup of computer database files	All computerised systems should have adequate backup procedures in place. Wherever possible all

			unique paper systems should have archived copies made.
8		Designate local sites of conservation importance	Virtually all centres are involved in providing information for the selection of sites of local conservation importance for both natural history and geology.
9		Prepare local Red Data Books	Many centres use their data on the distribution of species to prepare local Red Data Books and input into Local Biodiversity Plans (including species recovery plans).
10		Extract data for maps and geographical information systems	Data are extracted for use in maps in a number of ways including index maps, distribution atlases (e.g. using DMap or Plot5), hand-drawn constraint maps, and digitised for use within geographical information systems.
11		Answer enquiries and provide planning advice	LRCs exist to provide an information service. The range of this service varies from centres concerned exclusively with servicing local planners and wildlife agencies to centres with large 'outreach' programmes, involved in public education and popular surveys.
	11.1	Receive request for site-based or geographic area information	Most centres monitor the range and frequency of enquiries received so that annual statistics on data use and value for money can be produced. monitoring requests for information also informs the development of the data collection strategy.
	11.2	Receive request for species-based information	see 11.1
	11.3	Check for sites in given area	Requests for information relating to a given area e.g. typical planning proposals covering areas wider than individual named sites are best tackled through GIS. Most centres currently use hand-drawn index maps and constraint maps to guide them to sources of records in site files and individual survey files (e.g. Phase I/Phase II) as a lead in to the information they need. This can be very time consuming and may miss information in species distribution records particularly in taxonomically arranged manual systems.
	11.4	Check for sites by name	Enquiries referring to individual sites are usually handled by reference to database records for site name, a visual inspection of index and constraint maps and reference to individual site files in the manual filing system.
	11.5	Check for species data	Requests for information about individual taxa are normally easily dealt with if the centre has most of its records on Recorder (or similar software) or if it has transcribed its data onto taxonomically arranged summary cards. Most centres have both site-based and grid square based survey data relating to taxa.
	11.6	Check for confidentiality constraints	All information should be checked for constraints relating to ownership, copyright and confidentiality prior to release to third parties. This is may not be well documented in existing systems.
	11.7	Prepare report	Many requests for information require pulling information together into a structured report. Existing software can help by printing site or taxon based reports although this can be tricky with current technology. Virtually all centres now use

			wordprocessors and closer links between databases, GIS, word processors and presentation software is definitely needed. Most centres have a requirement for easier storage and manipulation of images and their incorporation into reports.
	11.8	Send out report to enquirer	Usually in paper form but there is a growing trend for dissemination of information in electronic form and the use of HTML web pages is certain to grow.
12		Produce constraint maps	Planning Constraint Maps are a major product for most record centres and are distributed to local planners, wildlife trust, country agency and Environment Agency. Most are in paper form but a growing number are in GIS format.

5.1.3 Data Stores - Local Records Management

The following table identifies the data stores referred to in the Local Record Centre Current System DFDs. The degree of generalisation means that individual LRCs may differ in some respects but the table still serves to highlight the variety of information stored by LRCs and how much of this is likely to remain in paper form even with increased computerisation.

Table 1: Typical data stores in local records centres and wildlife trusts

Reference	Detail
M1	Statutory Protected Species Information from legislation (e.g. Wildlife and Countryside Act) usually maintained as lists or photocopies of schedules. Extra details derived from Red Data Books for some species. Information about some protected species e.g. badgers and bats may be held by authorised groups.
M2	Statutory Designated Sites Usually SSSI notification sheets from Country Agency Local Team or copied from County Council. Local Teams may hold extra information in their own site files.
M3	Land Cover/Phase I Surveys Information normally held as a collection of field slips containing target notes for specific locations and field maps which are copied up and coloured in on best copy Phase I maps. [Note that in many areas the map information is digitised for use in a GIS]
M4	Phase II Surveys More detailed surveys usually based on named sites with associated maps and species lists. Data included detailed NVC classifications based on quadrat samples. The majority of Phase II Surveys relate to grassland. EN local teams and headquarters hold copies of this information in the VEGAN database,
M5	General Site Files Most LRCs have collections of folders based on named sites and keyed to 10K square maps (although some are arranged alphabetically). Site folders may hold a great variety of information in different formats including species recording cards, copies of Phase I and Phase II record sheets, letters and management plans. Most centres extract basic site details onto computer databases - often, but not exclusively, Recorder
M6	Species Records In addition to species recording cards which are added to site files in an *ad hoc* way most centres maintain collections of species records on cards, arranged taxonomically. Some collections of records may be kept separately for specific purposes e.g. a public outreach common butterfly survey (because of record quality) or the records from a specific type of survey such as IK square recording cards from a flora project (which won't file taxonomically). Species records on cards are the most common records to be copied onto Recorder.

M7	Geological Sites Details are usually kept on recording cards or sheets, the most common being either the MDA Geological Site Card or a variant of the NSGSD recording sheet. Geological site records often also include separate sites selected as RIGS. Details may be copied onto GD2 or other software.
M8	Locally Designated Sites Details of sites given informal protected designation (e.g. SINCs) may be kept in the general site file or maintained separately but is always indexed by a list covering basic details. In many centres this list is maintained on computer.
M9	Confidential Species Records Cards or files as for M6 but often kept separately in locked cabinets. Confidential records are those for species perceived to be rare or threatened or those to which the supplier has attached special restrictions.
M10	Reference List This may be an index to or a collection of actual publications and manuscripts.
M11	Constraint Maps Virtually all centres use 10K square maps marked up with statutory and informally designated sites including SSSIs, RIGS, County Key Sites, ancient woodlands etc. These are often copied to local county, district or unitary planning departments as alert maps.
M12	Contacts List of contacts and recorders. This may be a set of index cards, address book, folders or increasingly a computer file. In this analysis Contact information is further subdivided into (12/1) the main contacts name and address list and (12/2) the letter and agreements files pertaining to these individuals.
M13	Data Collection Strategy A growing number of centres review their data holdings and identify priority areas for data collection including geographic areas and types of data or taxa.
M14	List of Datasets - Metadata This may be a paper file, card index or computer file listing what data sets are held by the centre, where they originated and what terms are associated with them.
M15	'Temporary File' Data may be held separately in temporary files whilst they are being sorted, validated or further processed. These temporary files may become the permanent file for paper archives, datasets which need to be kept separate and material not suitable for computerisation. [Note that on the DFDs truly temporary lists and files are marked T1, T2 etc.]
M16	Site Index Maps Most LRCs keep a visual record of sites for which they hold data. This is normally in the form of a set of 10K square maps with index markers showing the location of sites and their protection or scientific status. These maps are often a key tool for answering locality-based enquiries. In some centres the site index maps may be augmented to become also the constraint maps circulated to partner organisations.
M17	Policy Documents All LRCs should be operating to a set of written policies and procedures including data security, data supply and data charging policies. (see Copp 1996)
M18	Reports File Reports and supplied data are logged in a file recording what has been sent to whom. In many cases copies of the actual reports are also kept for future reference. (M18/1) is a log of what data have been supplied (M18/2) is copies of the reports supplied.
M19	Map Cabinet Not shown on DFDs in this report but OS, geology and soil maps are an important LRC resource and can be referred to in relation to virtually all described processes.
M20	Photographs and Slides Most site files will contain photographs but many LRCs also maintain various photographic collections including aerial photo sets (often used in Phase I mapping), slide collections (sites, landscapes and species) and collections of historic prints and negatives. These collections are rarely properly indexed (there are exceptions).
M21	Enquiry Log

	Enquiries are logged by date, customer type and subject so that use of data can be monitored and information of data needs fed into the survey strategy. This is usually a paper file but may be held in word-processor or spreadsheet format.
D1	Site Descriptions Computerised lists of sites and land parcels, commonly but not exclusively in Recorder e.g. GEDU uses SiteBase and Kent County Council uses its AREV Countryside Information Database. May include details of ownership and management. Some centres and many Wildlife Trusts keep detailed management information on CMS.
D2	Species Records Species records are widely kept on computer. Most LRCs use Recorder but there are many other programs being used for specific purposes.
D3	Computerised Contacts List Many centres keep details of contacts on wordprocessor files or in databases including Recorder
D4	Archive Backup Tapes Computer databases are normally backed up on to tape although smaller systems may use floppy disk or other removable media. Some centres also take microfiche or photocopy archives of paper originals.

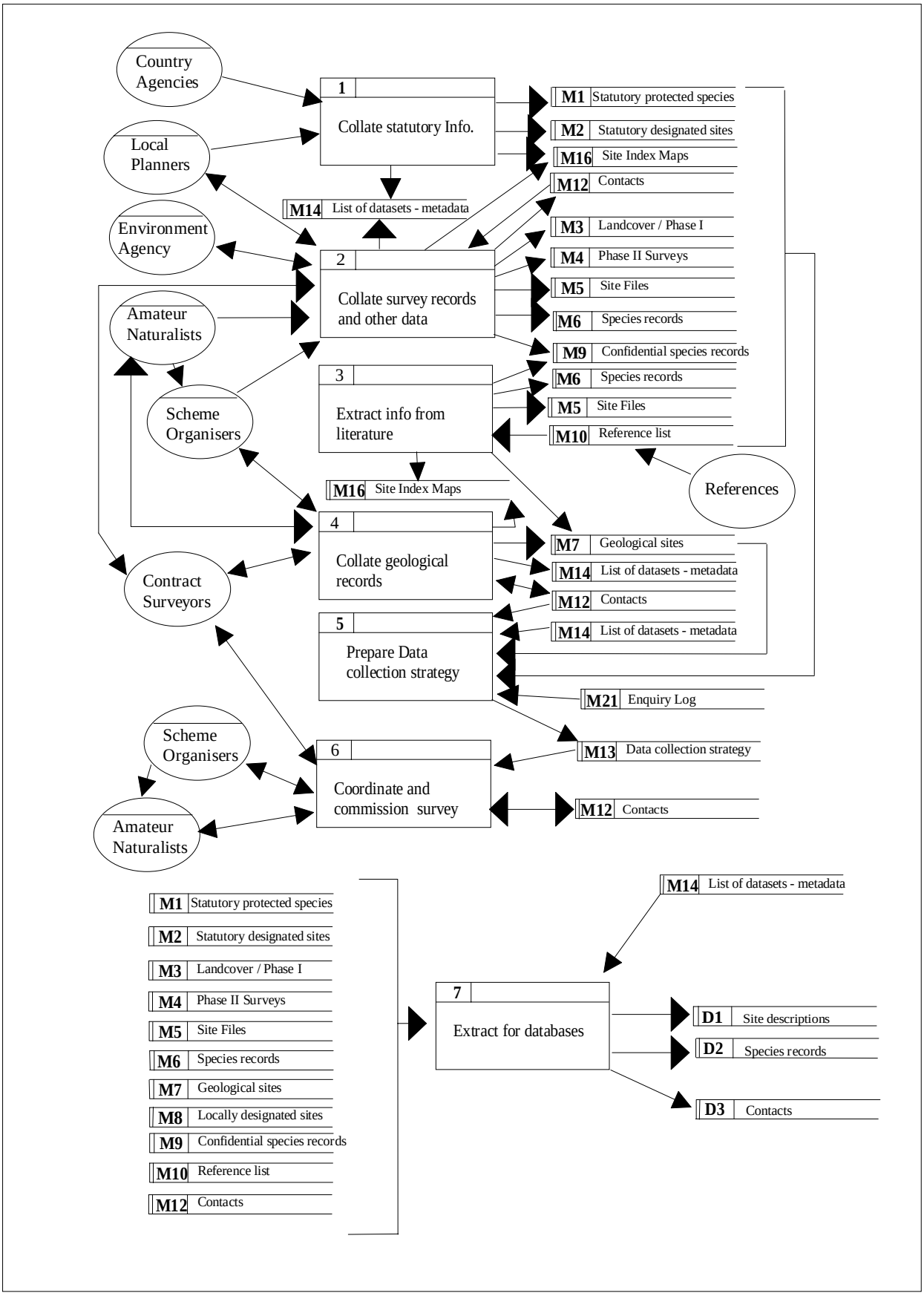


Figure 3: Current System DFD for Data Collection in Local Record Centres

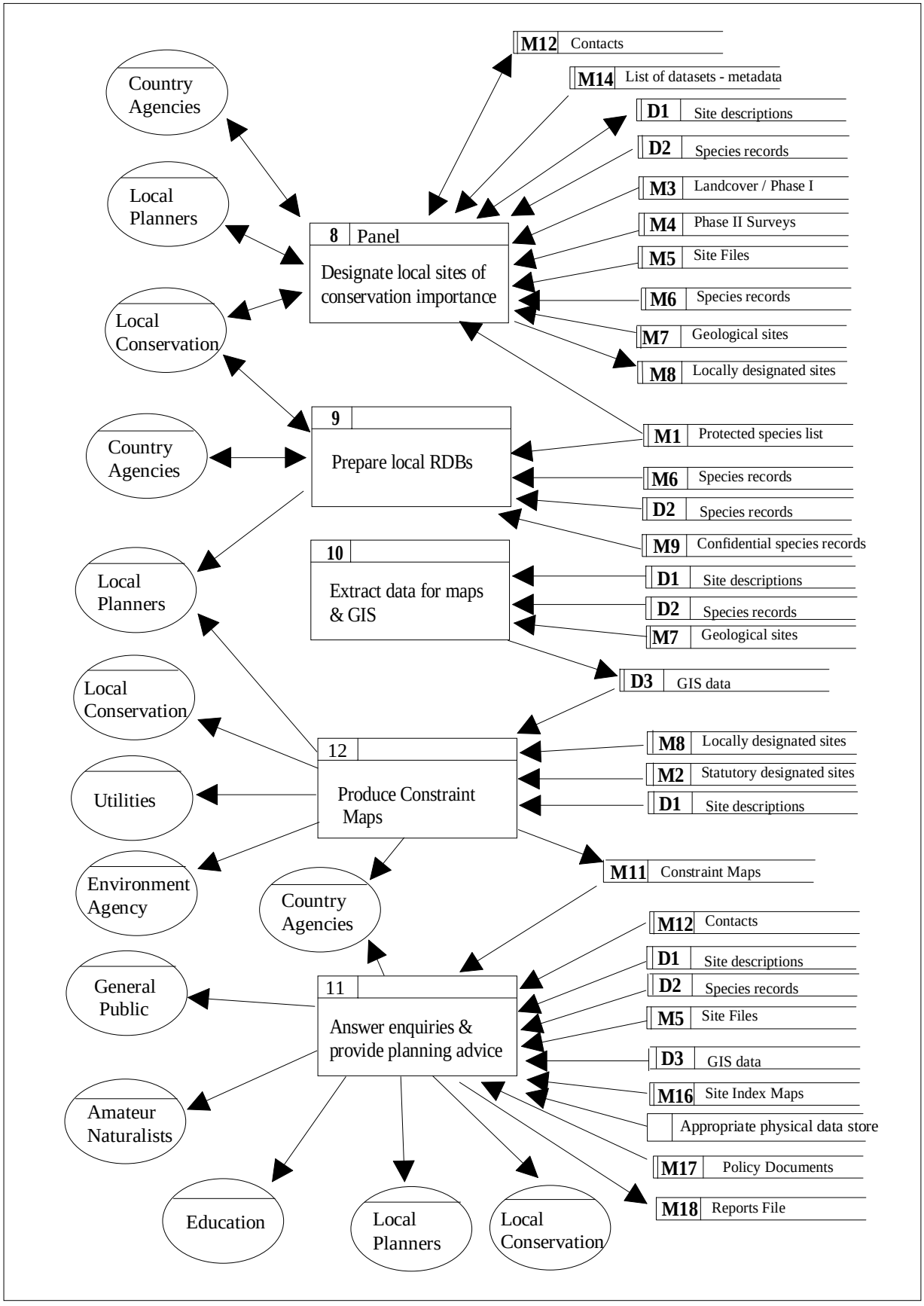


Figure 4: Current System DFD for Data Products in Local Records Centres

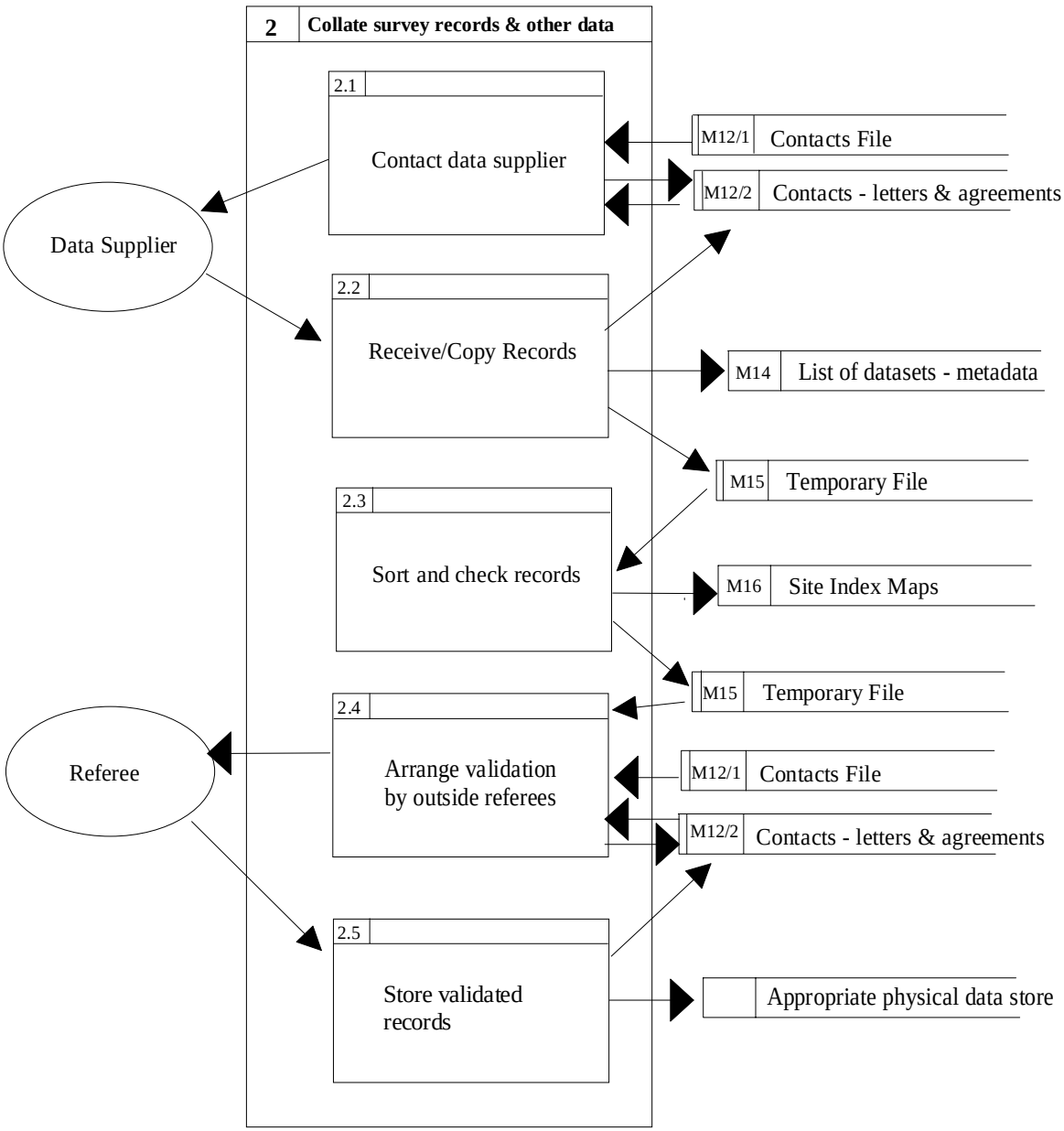


Figure 5: Level 2 Current Physical DFD for Process 2 - Collate survey records and other data
Data suppliers = all data suppliers for this process identified on level 1 diagram
Appropriate physical data store = all physcial stores for this process identified on level 1 diagram
Referee = any suitable individual usually amateur naturalist or scheme organiser

ver. 2.1

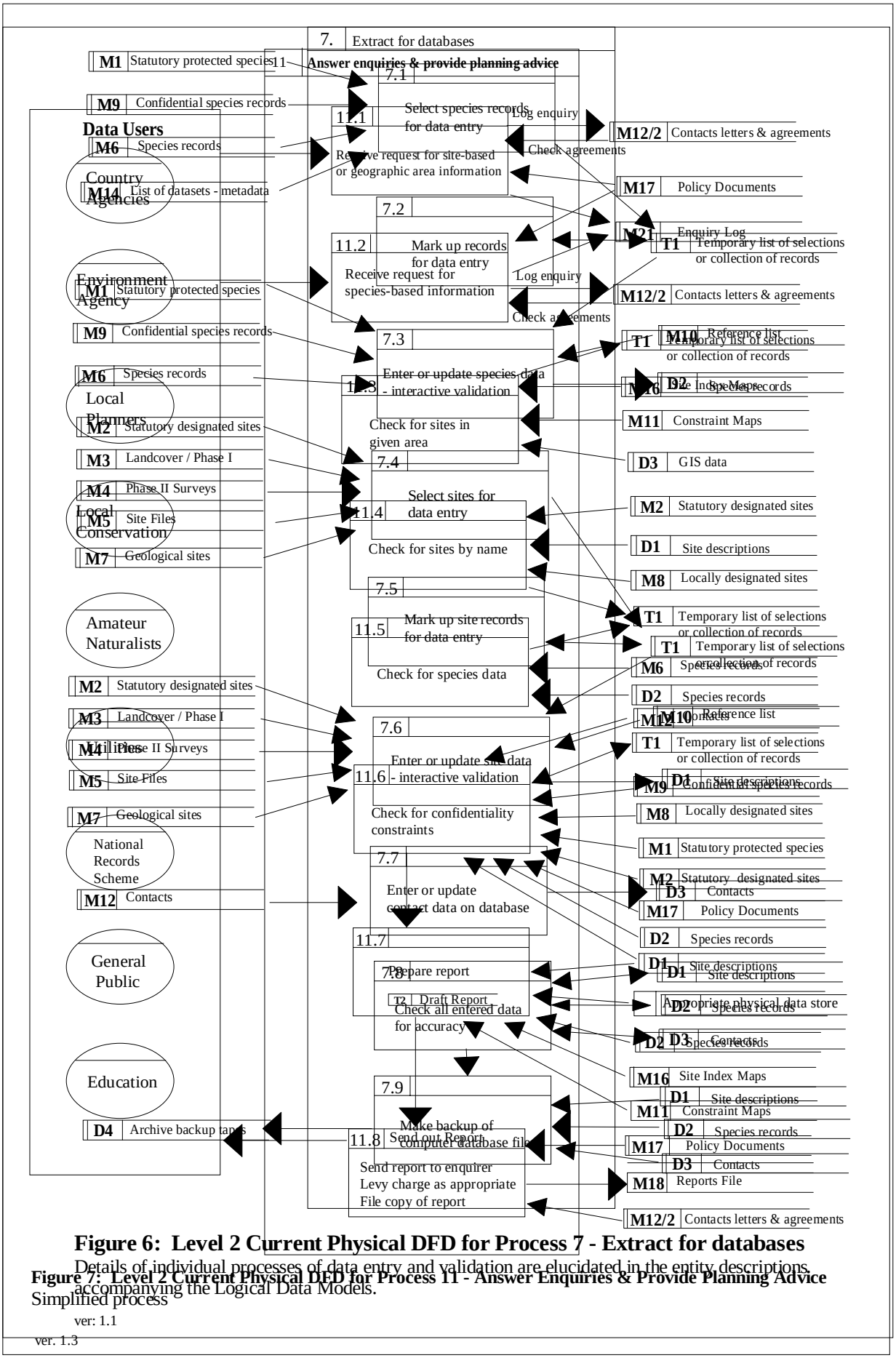


Figure 6: Level 2 Current Physical DFD for Process 7 - Extract for databases

Details of individual processes of data entry and validation are elucidated in the entity descriptions accompanying the Logical Data Models.

Figure 7: Level 2 Current Physical DFD for Process 11 - Answer Enquiries & Provide Planning Advice
Simplified process

ver: 1.1

ver. 1.3

6. Information in Biological Records

The discussion as to what comprises a biological record has been going on for many years, mostly with very little practical benefit. The general object of these discussions is to try to define a minimum standard of information content which will make records from one survey compatible with those from another for various third party uses. The fact is that few, if any, surveys are designed with re-use of data in mind and therefore data are most frequently only compatible at the most basic level of presence at a location. Even this level of compatibility may not be achieved if surveys use widely differing resolutions of either geographic or taxonomic accuracy!. Minimum information is most often envisaged in the formula *Who, What, Where* and *When*. The table below expands this formula and comments on its individual units.

Table 2: Who, What, Where and When in Biological and Geological Records

	Definition	**Characteristics**	**Problems**	**Requirements**
What	Usually a name (a determination) but can be a reference to a specimen or set of detailed field notes which can be determined at a later date.	A taxon, biotope, mineral, rock, fossil observed and either identified or collected as a specimen for later identification & study. Usually represented by a name from an identifiable checklist. In information terms the 'What' is made up of an '**occurrence**' and one or more '**determinations'**.	The level to which the observation is determined is controlled by the purpose of the observation and the skill of the determiner. Many names are commonly assumed as current and not directly related to any complete checklist.	Information relating to the identification skills of the observer/determiner or enough information for a referee to make/confirm the identification. or direct access to a specimen. Which checklist the name relates to. The reference work from which the determination was made (if any).
Where	A location or spatial reference	Usually either an identifiable place represented by a geographical name and attributable to a boundary drawn on a map or a reference to a grid square. Various grid square systems are in use according to country and context. In information terms 'Where' can be a map reference as an attribute of an observation or '**sample'** or an '**event'** linking many samples or a link from either to a named '**location'** about which other information may be recorded.	The level at which the observation is localised can vary greatly from a few metres to a 10 Km square or worse. Observations may use a variety of grid systems or named sites (which may or may not have agreed boundaries). Grid references extracted from centroids of large, vague or linear sites may have spurious accuracy.	Ideally all observations should be localised to a grid reference, lat/long or other standard grid system. Where records are localised to a site there must be a way of tracing the location of the site.
When	A time (temporal reference)	Valid date and (less often) time. Some records include a measure of the time period over which the observation was made. Many older published recorder specimen data labels are vague. 'When' can be an attribute of the '**sample'**, the '**occurrence'** or of an '**event** ' which includes many samples.	Degree of accuracy controls use of the record. Decade or even century may be good enough for tracking continued presence of a rare plant at a specific site whereas exact time might be needed for distinguishing sightings of rare birds along a line of observation points (to work out how many individuals were involved).	Ideally all observations should be linked to a specific date or date range. Vague dates can be used for some purposes.
Who	The original observer	The name of the observer(s) or information sufficient to identify the source of the observation. For many records the	The name of the observer and/or determiner may be clear to the original compiler of the records but this is unlikely to be	

		observer is also the determiner but this may not be the case and both names will be necessary. Personal attributes may be linked to **surveys**, **events**, **samples** and **determinations**.	true if records are transferred to other data systems especially where names or initials may be the same for different recorders.	
Why	The purpose of the observation	There is no single minimum record as the purpose for which a record is collected will define its required content. Knowledge of the original purpose of a record will provide much contextual information to other potential users. The 'Why' is what is commonly part of 'metadata' accompanying a record but should include details of the '**survey'** under which the observation was made.	It should be possible to extract a basic presence at location data from any biological record although the accuracy will vary according to the original purpose e.g. fresh water condition monitoring may only record taxa to genus or family level.	Ideally there could be a set of published 'standards' which cover the most common types of recording activity which would enable users to know the extent of information available in datasets and also encourage new surveys to collect compatible data.
Owner	The copyright & intellectual owner(s) of this record	If records are to be used by other than their original recorder then it must be possible to identify the ownership of the record. This is especially important where records may pass on to second or third parties and potentially back to the original recorder! Part of the 'metadata' referring to records.	Failure to document ownership and copyright of records can lead to many problems if records are subsequently used. passed on or altered. Very few current data compilers have adequate procedures for documenting data ownership and transfer.	Compilers of other peoples data should record how and under what circumstances they have obtained copies of the data. Each individual record should be traceable back to this information.
Source	The origin of this copy of the record	It is important to know the source of every record in any dataset especially where records are being compiled from second and third sources. Compilation databases should have facilities to record '**source'.** Source may include text and image references and references to other databases.	Many compilers obtain data from secondary sources such as annual bird reports and publications. These sources rarely include full information and may not be accurate. The same observations (even erroneous ones) may find their way into several secondary formats and be duplicated in compilations.	Documentation of the source will vary according to whether it is a primary or secondary source. Ultimately it should be possible to backtrack through sources to the original observer and determiner and establish copyright and ownership.

If we examine the information requirements suggested by the above table we can see that users (particularly compilers of databases from a variety of sources) need to manage information relating to:

- Sites and administrative areas
- Surveys
- Recording Events
- Taxon occurrences
- Biotope occurrences
- The protected status of sites, taxa, biotopes and earth science features
- People and Organisations
- Text References
- Image References
- Earth Science details for locations (Most LRCs, Planning Departments and Wildlife Trusts)
- Data exchange agreements

These basic 'entities' relate to each other in various ways e.g. people and locations relate through ownership, visits, management activities etc. People and taxa relate through observations, collection and determination. Taxa and biotopes or taxa and locations relate through taxon occurrence and so forth. *Much of the information collected in surveys describes relationships between entities.*

Users need controlled terminology for many aspects of recording the information about these entities and their relationships in order to validate input and aid retrieval. Controlled terminology requirements will be noted against individual attributes in the table descriptions.

Users also need 'value-added information' for some of the terms used to validate data in which case we refer to the lists as dictionaries. The value-added information is required to aid in interpretation of records, translating records from one user checklist to another, and a ready source of context information for reports. The main items requiring value-added information and therefore management as dictionaries are:

- Taxa
- Biotopes
- Administrative and protected areas - (expands location information for sites locations)
- Legislation
- Applications including Earth Sciences will also need further information relating to stratigraphy, minerals and palaeontological taxa.

6.1 Sites and bounded areas

Biological records must be linked to a geographic location although the ways in which such locations are defined are varied. Many existing records are generalised to a site name, the locational details of which are held to be implicit in the name within the current recording context. Other records are linked to grid references which may vary in their accuracy and therefore in their ability to be linked to named sites. Conservation interest and protection are nearly always linked to defined sites whereas planning interest tends to be related to broader zones or 'temporary locations' defined by planning applications, road schemes and land type within strategic plan areas.

Despite the frequently repeated view that all biological records should carry detailed grid references and that Geographical Information Systems can sort the relationships out, sites will remain important because that is the way most people think in relation to everything from biodiversity action to field visits. Sites will remain the most convenient focus for summarising complex information and implementing conservation action. A site is, however, just another form of *bounded area* which is of interest to us. There is, therefore, no real difference between a site and an administrative area such as a district or vice county. In practice, however, we usually find it most convenient to separate sites about which we record biological and geological information and administrative areas which are used for context and retrieval purposes.

Bounded areas have the following characteristics:

- A boundary which may be expressed as a line (vector) on a map: There are, however, locations which may not have a formally defined boundary e.g. the Mendips or the Somerset Levels. Such locations are often based on geomorphological or agricultural regions but 'fuzzy sites' also exist on the small scale. The 'Roman Encampment' is a well-known 'place' in Leigh Woods although the boundaries to what constitutes this as a site for recording purposes have never been defined.
- Some sites may, in practice, only be defined by a centroid grid reference or perhaps individual grid references for end points and corners. In biological recording it is very common practice to record either to 'sites' localised by a single grid reference or to record to a grid square (1K, 2K, 5K or 10K) usually localised to the bottom left hand reference.
- Some but not all sites may be defined as one or more land parcels defined on small scale ordnance survey maps.
- A name: Many locations have regional or site names. These may be referable to place names recorded on ordnance survey maps but may also be designated in some other way for a particular purpose

e.g. SSSI or GCR names. Many locations have been referred to by a number of site names over the years and may continue to be as for instance where a 'site' such as a wood observable on a map has both a map name and perhaps a different SSSI name. The situation is often further complicated as when different 'sites' named for different purposes (e.g. land ownership, SSSI, GCR, local nature reserve) occupy or considerably overlap the same physical piece of ground.

- An owner: (Ownership boundaries). Every parcel of land, including the foreshore, in the UK is owned by someone, although it may not be easy to find out who. Ownership and tenure relationships, even for quite small sites can be complicated.

Bounded areas very typically fall within one or more sets of hierarchical relations e.g. they fall within a nested set of administrative areas or map squares. Elucidating such relationships is the natural function of geographical information systems (GIS) but the majority of users (and uses) for the data do not have or require GIS software and a means of expressing the geographic and administrative relations in text form is, therefore, needed in standard database applications.

A further distinction, used in Recorder, is to divide sites into subsites for the purposes of more detailed recording. The master site is most often a recognisable bounded area unified by being a certain landcover type (e.g. a wood), by conservation status (e.g. SSSI or local nature reserve) or by ownership. Subsites may be based on individual biotopes, stands or any other convenient geographic feature. In logical terms sub-sites are bounded areas (called locations in the physical model - Annex 3) connected to their master site through a parent-site attribute or a location-location relation record.

In the following tables the main recording 'concepts' are listed and defined. The tables also include reference to entities developed in the logical and physical models.

Table 3 : Information relating to Bounded Areas

Location Information	Definition	Logical Entity	Validation
Name	The name given to the site or region. Some locations may have more than one name or various versions of the name (e.g. spellings) at different dates.	Location	• Designated site names may be validated against a supplied dictionary of protected sites and areas. • Administrative areas may be validated against a system supplied dictionary. • Local site names may be validated against a locally agreed and managed list of site names.
Grid Reference	In most systems it is convenient to record a centroid grid reference which may be used for locating the location on a map or depicting the location in simple map-based output. Many users wish to enter more than one grid ref. for linear or angular sites. Grid reference is normally expected to be a 6 or 8 figure UK or Irish reference. System should, however, be able to use other referencing systems including Lat. / Long and UTM. Where grid references are given, a statement of precision can be valuable.	Location	Grid references may be checked manually or system checked. Primary check for whether it is a valid grid reference then checked for context e.g. does grid reference lie within the boundaries of stated administrative areas (county or vice county). Recorder has algorithms for this.
Boundary	Few current database systems record boundaries and even where GIS are used accurate boundaries for all 'sites' may not be available. Eventually, however, all 'sites' should be linked to boundaries. One useful approach is to store a scanned image of a site plan, aerial photo or sketch	Location Boundary	Database entry might be a pointer to a boundary file which may need a check that it exists. Validation of stored vector boundaries must be done through a Geographic Information System
Administrative Area	Administrative areas are locations in the same way as sites. They relate to each other in a hierarchical fashion and have a number of relationships (e.g. contains or overlaps). Administrative areas may have many versions with changed boundaries. It is usually found convenient to record certain fixed administrative area items for any site e.g. its parish, district, county and vice county but these may change e.g. with the recent introduction of unitary councils.	Location or Admin Area	By use of system supplied administrative area dictionary. Validation and controlled data entry may be done by entering the most detailed administrative area and having the system dictionaries provide the higher levels of Admin. Area. In other examples, the highest level is entered and progressively more detailed 'popups' offer the lower levels (e.g. county ⇒ district ⇒ parish). This approach has been complicated by the introduction of unitaries and makes for an inflexible application.
Region	Regions may be dealt with in the same way as administrative areas although the user may wish to define their own recording regions and add them to the Admin. Dictionary.	Location or Admin. Area	As above or by provision of a scrolling popup sensitive to typed entries - as in Windows help applications.
Land Parcel	A location may span one or more land parcels as marked on small scale maps but the boundaries may not necessarily be coincident. Logically a land parcel is another type of location and could be stored in the locations table although it is more convenient not to.	Land Parcel	Likely only to be successful through GIS
Planning Authority	Name of the organisation responsible for judging planning applications relating to the location	Location	Usually none but could use controlled terminology list and it should be possible to provide relevant authorities linked to administrative areas in the Admin. Dictionary.

Area of site	The actual land area covered by the location, usually recorded in hectares but could be in any other system or scale (e.g. acres or sq. metres)	Location	Application may provided algorithms for converting from one system to another e.g. acres to hectares. Implies the need to record the measurement system in use, although most databases assume or ignore this. Area validation may be validated manually or through GIS.
Location Type	Locations may be classified for many purposes e.g. to group them or mark their position in a hierarchy (e.g. county, district, parish). Sites may be grouped by interest, ownership or protected status.	Location Type	Controlled terminology list
Description	Virtually all site or location records require a free text area to give a general description and/or history of the site. In practice there may be several types of description required which need separating out. Examples are: • General description • Legal statement (as in the SSSI legal statement) • Geological description • Simple explanatory note suitable for brief reports etc. For some applications it may be important for the same type of description to have more than one dated version.	Location or separate table for multiple versions	Spell checking Date and Author checking Some information provided with Admin. and Protected sites dictionaries.
Boundary Type	Boundary features e.g. hedgebank	Location Boundary or Location	Controlled terminology list?
Maps	In text-based system it is common to record the scale and reference number of any maps which depict the location. The commonest referred to are O.S. 1:50,000 and 1:10,000 series but any map or plan including topographic, geological, soil or land-use is equally valid.	Location Maps or Text Reference	Not usually validated but possible check against an existing list e.g. as entries in a reference file.
Conservation Status	Conservation status (e.g. SSSI, SINC or RIGS) is commonly associated with named sites although a number of status types are applied to larger areas (e.g. AONB, ESA and RAMSAR). Individual locations may have more than one status accorded them both simultaneously and over time. Boundaries of areas of specific status may contain one another, coincide or overlap and status may be removed. Details of conservation status should therefore include a start date and where appropriate an end date.	Location Designation	Validation against a dictionary of nationally (and possibly locally) recognised lists of sites and areas within each status type. Controlled terminology lists for input where checking is not done against a provided dictionary. Check that end date is after start date.
Location Code	Locations, especially recording sites, tend to have several classification numbers associated with them e.g. the file reference number for storage purposes, unique database number, Country Agency SSSI number, GCR number etc.	Location Code	Not usually validated other than to check that code is in the right format and where a new one is expected, a check that it is unique. Some numbers e.g. SSSI numbers could be validated against a provided dictionary.
Measurements Length & Breadth	The main proportions of a site can help to visualise it and to more readily recognise it when looking on a map. Normally expressed in metres but could be in other units.	Location & Sample Location Data	Imperial to metric conversion Implies the need to record the measurement system in use, although most databases assume or ignore this.
Altitude Depth	For some purposes it is convenient to record altitude or depth for a location. This may be a mean or a range as	Location &	Max. > Min. Imperial to metric conversion

	This may be a mean or expressed as maximum and minimum. Normally expressed in metres O.D. but could be in other measures or to another datum.	Sample Location Data	Implies the need to record the measurement system in use, although most databases assume or ignore this.
Aspect (Slope & Direction) Exposure	General aspect of the location (its overall dip), usually expressed as degrees of slope and degrees from North. Other 'keywords' may be used to record aspect e.g. open or shady.	Location & Sample Location Data	None usually for measurements. controlled terminology list for 'keywords'.
Microrelief	Details of finer aspects of topography e.g. crack, fissures and drainage channels.	Sample Location Data	
Physical Measures: pH Nitrates Pesticide Levels	A very wide range of physical measurements may be made at a location. These are all time limited and are therefore repeatable as physical observations.	Sample Location Data	To be defined as necessary Implies the need to record the measurement system in use, although most databases assume or ignore this.
Climate	Climate type prevailing on a site may be recorded. Data may be taken from climate maps.	Location	Selection from a controlled list of climate types.
Soils	Soil information may be generalised for a site and derived from soil maps or it may form part of a detailed sample.	Location or Soil Occurrence or Sample Location Data	Controlled terminology list of soil types.
Microclimate: Temperature Humidity	As above	Sample Location Data	To be defined as necessary Implies the need to record the measurement system in use.
Ownership/ Tenancy	Many organisations need to keep track of the ownership and/or tenancy of sites. A single named location or bounded area may have several owners and tenants and these are likely to change with time. Records, therefore require from and to dates. The Data Protection Act applies to the computerisation of this information.	Tenure	Check for person/organisation against the name file. Check location against location list. Controlled terminology list of ownership/tenancy terms.
Biotopes/habitats	See Table X - Biotope Occurrence	Biotope Occurrence linked to Sample	Valid Sample, Location and Biotope keys
Taxa	See Table X - Taxon Occurrence	Taxon Occurrence linked to Sample	Valid Sample, Location and Taxon keys
References	Any number of references may be relevant to a location either as a whole or relating to any of its attributes (e.g. ownership, management, geology etc.) See table X for details of text reference attributes.	Reference Link	Check for valid reference key Check for valid location key
Images	Any number of images may be relevant to a location either as a whole or relating to its attributes (e.g. panorama, specific feature etc.) Images may include slides, photographs, video, book-plates. It is possible to store actual images as well as references to them. See table X for details of image reference attributes.	Image Link	Check for valid image key Check for valid location key
Subsites	Sites may be sub-divided in many ways. Each is effectively a new location record and may have all of the attributes of the master site.	Location linked by Location Relation	Checks in relation record for valid location Keys and selection of a relation statement from a controlled terminology list.
Educational/ Recreational Use	This may be broken down into a number of different headings including: Present use, Potential Use.	Location or Location Use	May use controlled terminology lists e.g. use types and linked gradings.

	Location may be assigned a grading based on educational potential (e.g. RIGS grading). Should really be qualified by a date and could therefore represent a separate entity.		
Location condition	Statement of the condition of the location. May be resolved under a number of headings - time related observations	Location Condition	May use controlled terminology lists
Threats to location	Statement of the perceived threats to the location. May be resolved under a number of headings - time related observations	Location Threat	May use controlled terminology lists
Damage to location	Statement of recorded damage to recorded features of the location. May be resolved under a number of headings - time related observations	Damage Occurrence	May use controlled terminology lists
Land Use	Current use of location - often more than one use and time related	Location Use	May use controlled terminology lists
Management Aims	Text statement of management aims for the location. Subject to change - time related records	Management Aims	Usually none Spell checking
Management Methods	Management methods used at location Subject to change - time related records	linked to Location Features	May use a controlled terminology list Valid dates
Management Agreements	Links between organisations, people and location. Subject to change - time related records	linked to Location Features	Valid keys
Management Events	May apply at level of site or subsite. Many records for events on different dates.	Event	Valid location and personal name keys Valid dates
Management Restrictions	Details of any restrictions to landuse or developments e.g. SSSIs would have a set of PDOs.	linked to Location Features	May use a controlled terminology list
Surveillance Frequency	Suggested frequency for checking location condition or repeating survey e.g. once per year.	Location Features	None
Next Appraisal Date	Reminder date for revisit, survey or monitoring.	Location Features	Valid date - later than yesterday
Access Route	Text description of approach route and entry to site. This can be useful.	Location	Spellchecking
Access	Details of permissions needed for access to site e.g. permit from local wildlife trust or seek permission from farmer at ...	Location	Spellchecking
Facilities	For sites likely to be visited by parties a note of the facilities for parking etc. can be useful.	Location Facilities	May use a controlled terminology list
Associated People	People may be associated with a location in many ways e.g. recorders, wardens, owners, managers, referee etc. There is a need to record a link between sites and people and their roles.	Name Link	Valid location and name keys controlled list of roles
Associated Organisations	This is logically the same as associated people	Name Link	Valid location and name keys controlled list of roles
Geology Geomorphology Soils Sediment/ Substrate Hydrology (Water Features)	Taxon and Biotope records may require additional information on geology, geomorphology, soils and hydrology to put them in the correct context. Many local record centres, planning departments and wildlife trusts also wish to record these aspects of sites in their own right. A number of conservation classifications pertain specifically to earth sciences e.g. GCR and RIGS.	see table 3	see table 3
Selection Criteria	Many conservation or Site use classifications select sites according to fixed criteria (or should do!) This	Selection Criteria linked to Location	Controlled terminology lists related to different type of status.

	attribute allows the recording of which criteria relate to the present location	Features	
Site Assessment	Assessment of the quality of the location e.g. in relation to selection criteria	Location Assessments linked to Location Features	Keywords

There is a long and distinguished history of geological research and site recording in the UK. Some sites have a two hundred year history of study and collecting. The interest in earth science and the information available relating to geological site conservation is still growing at a fast rate. Significant amounts of information are managed by the British Geological Survey, the country conservation agencies, geological societies and RIGS groups. There is a demonstrable need to integrate biological recording with earth science and indeed other kinds of information such as agriculture and archaeology. This has been largely prevented in the past by a lack of dialogue between interested parties and the separate development of survey and data storage projects. One of the aims of the current data modelling is to identify how the information relating to some of these other interests relates to the standard information collected in biological recording. The table below illustrates some of the earth science information relating to 'sites' commonly available to local record centres.

Table 4: Earth Science aspects of locations

Location Information	Definition	Logical Entity	Validation
ESCC Code	Earth Science Conservation Classification code. Frequently used for GCR and RIGS sites.	Location Code or Location Feature	controlled terminology list
Geological Description	Free text for describing geological interest of a location. With GCR sites this is the GCR statement.	Location also Earth Sc. Ftr Occurrence	spell check
Stratigraphy	Geological sites may be collated by their stratigraphic nature. The stratigraphy of a location may be recorded using several different schemes including: • Lithostratigraphic terms • Chronostratigraphic terms • Biostratigraphic terms	Stratigraphic Occurrence	Stratigraphic dictionaries covering the various stratigraphic classifications. Should include links between classifications.
Minerals	Geologists frequently wish to record mineral occurrences at a location.	Mineral Occurrence	Mineral dictionary including added value information.
Rocks	The type of rock actually exposed at a site is of interest to geologists and has a profound affect on flora and fauna.	Rock Occurrence	Controlled terminology list of rock types or added-value dictionary
Fossils	Fossil taxa can be handled in the same way as modern taxa except that they require links to stratigraphic data.	Taxon Occurrence (subtype)	Supplied checklists (if available)
Geomorphology	Land form is of great importance to both geologists and ecologists. The ability to retrieve locations which exhibit a chosen landform would be valuable.	Earth Sc. Ftr Occurrence	Dictionary of geomorphological terms classified by type (e.g. fluvial, glacial, coastal etc.)
Soils	Soils are important aspects of the geomorphology and ecology of a location. They are an important substrate for flora and fauna but also have physical attributes of their own e.g. layers, grain size, minerals.	Soil Occurrence or Earth Sc. Ftr Occurrence	Controlled terminology list or Dictionary of soil types
Sediment/Substrate	Ponds, rivers, sublittoral areas etc. are likely to have modern sediments which may be recorded as biotopes but also have earth science interest and attributes of their own e.g. grain size and sedimentary features.	Earth Sc. Ftr Occurrence	Controlled terminology

6.2 Surveys

The responses to the CCBR questionnaire demonstrated that for most record centres, information is collected or grouped by its common origin. This origin may be a specific commissioned survey such as a Phase I county land-cover survey or related to a single collecting/collating source such as the data derived from a vice county recorder or the records copied from a local natural history society. These records may be kept separately for convenience or security purposes but are also frequently copied whole or in part onto index cards or computer databases. The common origin of the records therefore constitutes important '*metadata*' which may be expanded to include information about management, quality and transfer of the records. To this extent Surveys relate to 'datasets' although in practical terms what is commonly thought of as one survey may be made up of several discrete data sets.

Table 5 : Information relating to Surveys

Survey Information	Definition	Entity	Validation
Survey Name	Many recording events are organised in relation to wider ranging surveys. Surveys may be set up to achieve a specific target e.g. to publish a 1K square flora atlas of a county or for more general purposes e.g. a natural history society entomological group. Surveys may be geographically wide ranging or confined to a single location.	Survey	None (possibly spellcheck)
Date started	The date when the survey was formalised or when the first records were made.	Survey	Valid date - but may be vague
Date ended	Date survey was completed or last records made.	Survey	Valid date - but may be vague
Survey Status	Is the survey static or ongoing?	Survey	choice of terms
Survey Description	Text description of survey and its aims	Survey	Spellchecking
Geographic coverage	Statement of the general geographic area the survey relates to. e.g. county or region.	Survey	Link to administrative dictionary. May use controlled terminology list for improved retrieval.
Responsible	Organisation or persons responsible for organising the survey. [If this involves several organisations or individuals then a name/survey link entity would be needed].	Survey or Survey/Name Link	Valid Name keys
Survey Type	Many surveys fall into well-known types e.g. Phase I, Phase II, Flora, National mapping scheme etc.	Survey	Controlled terminology list - Survey Type
Survey Methods	Note of the method or methods employed in the survey to obtain data. e.g. mist nets, pit fall traps, Pollard walk, timed observation at fixed points etc. A survey may be based on more than one method.	Survey Method may need to be separate list	Controlled terminology list
Recording Media	How the data are normally recorded e.g. BRC card, Phase I card and map etc.	Survey	Controlled terminology list
Ownership	Who owns the records? Copyright and IPR.	Survey	
Text References	Any publications, manuscripts, letters or agreements referring to this survey.	Link to References	Valid reference keys
Survey Quality	Measure of level of survey quality e.g. thorough, adequate, superficial. This may be supplied by the survey organisers but any such judgment will be subject to the data protection act.	Survey	Keywords
Validation	How quality of survey is maintained and how records are validated.	Survey	Keywords
Volumetric	Number of records, recording events and samples in the survey dataset	Survey	System calculated but sometimes supplied by users [may not tally!]
Record Management	Details of how the data are managed e.g. how and where cards are stored. If transferred to a database. When copied or	Survey Data Management	Keywords

	archived.		

6.3 Survey events and recording samples

Within any survey there can be any number of recording events. For instance, within a county flora project there will be very many individual recording 'expeditions' carried out by the participants. Typically a recording event will be defined by the date, location, the survey type and the participants. The location may be a grid square, a site or a combination of locations. A recording event may therefore, be a simple event where only one location is visited and one set of records made or it could include a number of individual sampling events related to one or more locations (sites, subsites or biotopes). Examples include a list of plants recorded within a 1K grid square during a given time period (possibly a year) to several detailed quadrat descriptions made within a single NVC community stand on a single chosen site. For these reasons, logically, individual observations (e.g. of a biotope or taxon occurrence) relate to **sampling events** which are grouped into **survey events** which are grouped into **surveys** even if for most practical purposes these distinctions may be telescoped into a simpler data format.

Table 6: Information related to Recording Events (Visits) and Samples

Survey Event and Sample Information	Definition	Entity	Validation
Recording Event Date	Date (or range of dates) upon which this particular recording event within the overall survey took place. Individual samples may have their own date within a range.	Recording Event & Sample	Valid date - may be vague
Location	The recording event may relate to one or more geographical locations, including sites and sub-sites. [i.e. Recording events are themselves divisible into discrete sampling events.]	Recording Event & Sample	Valid location keys
Sample Scale	A cue to the scale that the sampling refers to e.g. whole site, subsite, community, stand , transect, quadrat etc. This may be recorded as Sample Type.	Sample	Controlled terminology list
Sample Area	measured area for the whole sampling location e.g. area of land parcel or size of quadrat	Sample	In appropriate measure e.g. square metres or hectares.
Recorder's Locality Reference	Any reference number or name given to the sample site by the recorders e.g. quadrat number or informal subsite name	Sample	Individual applications may use a checklist or create sample references from a combination of site number and running number.
Grid Reference	Detailed grid reference for the sample site	Sample	Valid grid reference [may apply conversions to other referencing systems]
Grid. Ref. Source	Source of the grid reference e.g. original map reference, original GPS reference, subsequent GIS ref., inferred grid reference.	Sample	Controlled terminology list. May need two fields, one for original ref. and one for GIS-derived ref.
Weather	Record of the weather conditions at the time	Recording Event	
Observation Period	Time spent collecting/observing	Recording Event or Sample	
Survey	Which survey this event belongs to. Note that for practical purposes an individuals records, not linked to an organised survey, would need a survey entry for the individual recorder.	Recording Event	Valid survey key.
Survey Type	This is necessary if the information is not available under the survey heading e.g. in the situation of general records from a natural history	Recording Event	Controlled terminology list

	society or individual naturalist.		
Survey Method	Sampling method used for an individual Recording Event or sample. e.g. Quadrat, Malaise trap, Satellite TM.	Sample	Controlled terminology list
Recorders	Individuals involved in collecting samples or making observations	Recorders	Valid name keys
Text References	Any publications, manuscripts, letters or agreements referring to this recording event.	Link to References	Valid reference keys
Related Samples	Within a survey event it may be necessary to link certain samples e.g. quadrats within a single biotope.	Sample Relations	Valid sample keys
Altitude/Depth	Specific altitude or depth measurement related to sampling activity	Sample /Physical Data	Usually in metres
Temperature	Specific temperature related to sampling activity	Sample /Physical Data	Measure dependent units
Relative Humidity	Specific rH related to sampling activity	Sample /Physical Data	0 - 100 %
Physical Data Measurements relating to the Locality	Many of the physical data measurements listed under locality (bounded areas) would actually belong to the entity dealing with sampling events. Examples include soil depth, soil pH	Sample /Physical Data	Usual checks

6.4 Taxon Occurrences

The range of information which is recorded related to the occurrence of taxa is immense. At the simplest levels a biological record may be no more than a taxon name (at any level) related to a location (at any level) with a date range (possibly vague) and a source (preferably the observer). For many mapping projects, the data are just this simple (what, where, when, who), albeit somewhat more tightly controlled on the level of accuracy. It should be noted that a name need not be recorded if a specimen is available for study and later determination. Extra details are derived according to the purpose of the survey and the collection or observation methods used.

There are taxon and biotope specific classes of information which cannot be generalised to all biological records. For these reasons it is not possible to record all the possible attributes and measures which may be made relating to taxon occurrences. I have instead considered the most frequent sources of information available to local record centres and attempted to demonstrate how these classes of information may be incorporated into a model from which an application such as Recorder can be built. The logical model which will be derived from a consideration of the data should, however, be such that new taxon specific entities and attributes can be added as the need for them is identified. This will open up the way for allowing third party developers to create specialist market sector applications, allow mapping of existing databases (e.g. bird ringing and nesting surveys) and creating links to museum cataloguing applications.

Table 7: Information relating to Taxon Occurrences

Taxon Information	Definition	Entity	Validation
Taxon Key	The original name applied to a taxon recorded at a location. This is normally expected to be a standard species referred to by a scientific binomial but may in fact be at almost any level in the taxonomic hierarchy, a common name, a phenotypic form without taxonomic status, an approximation (e.g. staphylinid) or an informal group term (e.g. waders). Most databases use codes for taxa as	Taxon Occurrence or Taxon Determination	Valid taxon key - should link to a specific checklist although most often this is assumed. Value-added taxon dictionary

	a means to save space and often to enable taxonomic sorting.		
Observation /Collection Date	The date on which the observation was made or the specimen collected. This may precede actual determination - this is very common where specimens are collected e.g. in pitfall traps and circulated to specialists for identification.	Sample	Valid date
Determination	The name applied to an observation or a collected specimen must be related to the person who makes the determination. Over time several people may redetermine the record either because of changes to taxonomy or different opinion relating to the determination. The database is likely to use taxon codes linked to specific taxonomic checklists.	Taxon Determination	valid taxon and name keys
Determination Date	Date linked to any determination	Determination	Valid date - may be vague but must be on or after original observation/collection date
Determination Type	New names may be given to a record because of changes in taxonomy, change of checklist or changes in opinion on the identification.	Determination & Taxon Dictionary	Controlled terminology list
Determination Reference	The work from which the determination was made. Gives a guide to the checklist to which the taxon belongs.	Determination Reference Link	Check if it exists in reference table Possibility of providing a dictionary of most frequently used reference works.
Determination Comment	Text comments relating to the identification or changes to the name used	Determination	
Location	Handled under Recording Event/Sample	Event & or Sample	
Grid Reference	Handled under Recording Event/Sample	Event & or Sample	
Substrate	For many invertebrate (and other) taxa it is valuable to record the substrate from which they were collected e.g. bark, bare rock etc.	Taxon Occurrence	Controlled terminology list keywords
Associated Taxa & Nature of Association	It may be important to record the association of one taxon with another e.g. an ectoparisite on its host, an insect gall on a plant, one animal eating another! Essentially a link between two taxon observations.	Associated Taxon or Taxon Occurrence relation	valid taxa keys possibly use of controlled terminology although taxon level may be imprecise.
Record type	Description of the type of record e.g. olfactory record, tracks, pitfall specimen etc.	Taxon Occurrence	Controlled terminology list
Sex	Sex or sexes present	Population Data	a fairly limited range of choices but could be taxon specific
Stage	Stages present - varies according to taxon e.g. seed, flowering, larva, imago, egg, adult etc.	Population Data	Taxon related controlled terminology lists
Number/Abundance	An attribute which may relate to the whole observation or to sex, stage, form subsets	Population Data	Valid number or choice from controlled set of values e.g. DAFOR or DOMIN scales
Behaviour	Activity record related to the observed taxon e.g. nesting, hibernating, hunting, singing	Behaviour or Population Data	Taxon related controlled terminology
Associated Biotope	Habitat or biotope associated with the taxon in this observation - should be an attribute of the sampling event.	Biotope Sample	Valid biotope key
Text References	Any publications etc. referring to this record.	Link to References	Valid reference keys
Images	Any number of images may be relevant to the observation either as a whole or relating to its attributes (e.g. behaviour, tracks, nest etc.) Images may include slides, photographs,	Image Link	Check for valid image key Check for valid location key

	video, book-plates. It is possible to store actual images as well as references to them. See table X for details of image reference attributes.		
Vouchers/Collection Identifier	Specimens relating to this record. This could be a single voucher specimen or a group of specimens awaiting determination. Specimens may bear identification numbers which relate them to other applications e.g. museum cataloguing system.	Specimen	Could use check for valid registration number within individual applications.
Confidential Flag	Marker for confidential records. This may be for individual use or there may be a more general level set by the taxon dictionary.	Taxon Occurrence	Yes or No (or perhaps a range of options related to types degrees of confidentiality?)
Checking Status	Marker for reliability of record or determination e.g. checked, needs checking, known incorrect.	Taxon Occurrence	As per current Recorder application
Transfers	Dates and details of copies made of this record	Record Transfers	Check confidentiality restrictions. Validate against data transfer, ownership and copyright agreements.

6.5 Biotope Occurrences

Biotope records may be made as part of the context for taxon occurrence records or in their own right. There are many possible biotope, habitat, landcover and landuse classifications available and no single one is suitable for all purposes. An important asset for the new Recorder application would, therefore, be a biotope dictionary which includes the overlaps and equivalencies between different classifications. One of the weak areas of the existing Recorder application is the lack of facilities for making repeated observations on individual biotopes e.g. to map changes. This can be overcome by introducing a sample entity as a link between biotopes, taxa and recording events. The logical linking of biotopes and taxa to a sample entity which included a sample relation entity and links to physical measurements (See logical data model) would facilitate the writing of an application which could adequately cope with Phase I and Phase II survey data.

Table 8: Information relating to Biotope Occurrences

Biotope Information	Definition	Entity	Validation
Biotope Key	Link to the Biotope Dictionary - which will contain full details of the biotope classification or checklist being used	Biotope Occurrence	Valid biotope key
Biotope Area	Measured area of the biotope or biotope stand at a location or within sample on a given date.	Biotope Occurrence	Usually in hectares or square metres therefore need also to record measurement units used.
Biotope boundary	GIS boundary or could be a scanned image	Biotope Occurrence but probably not in database	GIS validation
Description	Text description of the features of this biotope or biotope stand at this sampling site	Biotope Occurrence	Spellcheck
Recorders Reference	Any reference code e.g. Stand number given to this Biotope Occurrence	Biotope Occurrence	
Max. Height	Maximum vegetation height	Biotope Occurrence	
Min. Height	Minimum vegetation height	Biotope Occurrence	
Grazers	Information typically recorded in Phase II surveys (esp. Grasslands) but also in Phase I target notes.	Biotope Occurrence or Biotope Occurrence Data or linked to Location Feature	Controlled terminology list
Management	Biotope specific management notes as opposed to those recorded for the larger	as above	Controlled terminology list

	site		
Features	Physical, land-use and agricultural features affecting this biotope stand e.g. ridge and furrow, ant hills, scrub incursion.	as above	Controlled terminology list
Damage	Damage relating to the biotope e.g. storm damage	as above	Controlled terminology list
Images	Any number of images may be relevant to the observed biotope either as a whole or relating to its attributes (e.g. panorama, close up of community etc.) Images may include slides, photographs, video, book-plates. It is possible to store actual images as well as references to them. See table X for details of image reference attributes.	Image Link	Check for valid image key Check for valid Biotope Sample key
Text References	Any publications etc. referring to this record.	Link to References	Valid reference keys

6.6 People and Organisations

People and organisation details occur throughout biological records, for instance, associated with taxon records, determinations, site ownership, habitat management, references and so on. Keeping details of identifiable individuals on a computer database is subject to the Data Protection Act, which amongst other requirements holds that information should be accurate and up-to-date. Users should, therefore, consider carefully what information it is necessary to keep about individuals and not just amass name lists for the sake of it.

A further consideration is whether it is right or feasible to maintain gradings of recorders on the database. The future possibility of greater mobility of data means that the quality of records needs to be documented, which inevitably implies a need to pass judgments on the identification skills of recorders. One possible solution is to introduce a series of qualifications in identification which will take some of the subjectivity out of the problem.

The need to link people or organisations to a wide range of information throughout a biological recording application means that the information relating to them should be managed separately and linked to other attributes via a link entity although simple applications derived from the model may use ‘hard coded’ people fields.

There remains the problem of how to identify individuals in records once those records are transferred to other databases or made available over the web. Presumably most individuals would not be happy for having information about themselves (e.g. name, address, birth date etc.) copied and distributed without their knowledge and control. Copying personal information also leads to problems of keeping such information accurate. One solution could be to ensure that only the very minimum number of personal references are included in record transfers and for recorders and determiners it could be possible to set up a national register so that records could be linked to a ‘national registration number’ which would give positive identification of records without imparting personal information. In any event compilers of records should be very clear about what personal information they need in their work and how they maintain both its security and accuracy. Any database compilation of personal information in the UK requires registration under the Data Protection Act.

Table 9: Information relating to People and Organisations

People & Organisations Information	Definition	Entity	Validation
Name Key	Unique reference for person or organisation. This could be a nationally allocated number for recorders and determiners.	Name	Unique Key

Name Type	Is this the name of a person or an organisation - keys to subtype lists of attributes	Name	list of choices
Person Title	Usual title e.g. Dr. Mr. Mrs. Professor	Person	Controlled terminology list
Person Forenames	First name(s) or initials	Person	
Person Surname	Last name	Person	
Person Qualifications	Letters and qualifications following name e.g. B.Sc. , F.G.S.	Person	
Person Date Born	Date born	Person	Valid date - may be vague
Person Date Died	Date died	Person	Valid date - may be vague
Person Floreat	The period when the person was most active - sometimes the only dates known of a recorder	Person	Date range - may be vague
Person Skills	It may be convenient to list the taxonomic, survey and other skills which the person possesses. A can of worms!	Person Skills	Possibility of linking gradings to a controlled terminology list
Organisation Name	Full name of an organisation	Organisation	
Organisation Acronym	Short name or acronym for an organisation e.g. JNCC	Organisation	It could be possible to provide a dictionary
Organisation Date Founded	Date founded	Organisation	Valid date - may be vague
Organisation Date Ended	Date organisation ended or changed its name	Organisation	Valid date - may be vague
Organisation Floreat	Date organisation was most active	Organisation	Date range - may be vague
Name Relations	Links between people and organisations, organisations and other organisations or organisation name changes etc. Includes type of relation and relation from and to Dates	Name Relation	Controlled terminology list for relationships Valid dates - may be vague
Address	Various Address attributes e.g. Address lines, town, county, county, Zip Code. Linked to name by a Name at Address Entity to allow linking of many people to one organisation address etc.	Address Name at Address	Valid keys in link file
Role	Person's role in organisation or any other role relationship e.g. identify individual as a moth recorder etc.	Role Name Role	Controlled terminology list of roles Valid keys for links
Comms. Number	Entity with various comms. attributes including: Prefix, Number, Extension, Number Type (e.g. Phone, Fax, Email), Constraints (e.g. Office hours). Links to Name and therefore covers individuals and organisations	Comms. Number Comms. Type	Valid Name Key for link
Communications	Entity to manage all forms of communication with a person or organisation e.g. logs of phone calls, letters , written agreements etc. Attributes include; communication type, communication file reference, communication content, name keys for sender and recipient.	Communication	Valid name keys Controlled terminology list for communication type
Images	Any number of images may be relevant to the person or organisation. See table X for details of image reference attributes.	Image Link	Check for valid image key Check for valid Name key
Text References	Any publications etc. referring to or by this person or organisation.	Link to References	Valid reference and name keys

6.7 Text References

Text references refer to any written information including publications, manuscripts, letters and wordprocessor files. Many different attributes in the application may need text references attached to them.

Table 10: Information relating to Text References

Publication & Text Information	Definition	Entity	Validation
Text Key	Unique identifier	Publication	Unique key
Authors	Probably best as a single 'field' using standard bibliographic format (e.g. Copp C.J.T.) even for multiple names although it would be possible to use the Name Entity to store author names and access them by key but this would be very difficult to maintain except in specialist bibliographic databases.	Publication	format
Date	Date of text or publication date	Publication	Valid date - may be vague
Title	Free text - title	Publication	
Type	Type of text e.g. manuscript, book, serial publication	Publication	Controlled terminology list
Serial	If the text is in a serial publication, link to subtype attributes including: Serial Name (from Dictionary), serial volume, volume part, page start and end, serial part, serial number, serial supplement.	Serial subtype	Valid key to serial publication dictionary (e.g. list of journals)
Serial Dictionary	A list of serial publications would be a valuable asset to a biological recording application. It would require the following attributes; Serial key, Serial name, serial abbreviation, start date, end date, publisher, country, links to associated people or organisation.	Serial	Dictionary of serial titles and publication details.
Edition	Books, especially have edition numbers but wordprocessor documents may have version numbers.	Publication	
Symposium	If the text is an article in a symposium volume this will include attributes for ; Symposium title and symposium editors.	Symposium subtype	
Pages	Number of pages or page range for the publication	Publication	
Plates	Number of plates (could even use a link to images file for details of individual plates)	Publication	Valid key to images file (if used)
Figures	Number of figures (could even use a link to images file for details of individual figures)	Publication	Valid key to images file (if used)
Tables	Number of tables	Publication	
Maps	Number of maps	Publication	
Publisher	Name of the publisher	Publication	
Publication Location	Where published	Publication	
External Reference	A text or publication may be referred to by many classification or filing numbers e.g. ISBN, ISSN, Library of Congress, Shelf number etc. This entity could also store a wordprocessor file name and directory.	External Reference	Valid key

6.8 Image References

Images include slides, photographs, negatives, sketches, paintings, book plates, scanned images, maps and many other non-text references which may be linked to a wide range of attributes throughout the application.

Table 11: Information relating to Image References

Image Information	Definition	Entity	Validation
Image Key	Unique identifier	Image	Unique key
Image Type	What sort of image e.g. print, slide, photo etc.	Image	Controlled terminology list
Image title	Title if any	Image	
Image Description	Description of image and or its content	Image	
Image Date	Date image created	Image	Valid date - may be vague
Stored Image	The actual image may be stored in the database: May need to store info on image format and size. Could store a thumbnail image for reference.	Image or link to stored image	Format
Publication key	link to text/publication entity for linking images to publications. Need also to store information on link between image and publication e.g. plate in publication or this image scanned from this publication.	Published Image	Valid Text Key
Image Relations	Links between individual images (e.g. a slide of a painting, a series of etchings!)	Image Relations	Valid Keys
Image Reference Codes	Images may bear many reference codes e.g. accession numbers, plate numbers etc.	Image Reference Codes	
Moving Image	The moving image subtype needs to store information on format and duration	Moving Image subtype	Controlled terminology list of formats
Photographic Image	The photographic image subtype may need to store information on format, material, finish, negative number, negative type etc.	Photographic Image	The MDA data standard provides a good model for attributes
Artwork Image	Original artwork e.g. sketches and paintings may need to store information on size, format, material, technique, frame etc.	Artwork Image	The MDA data standard provides a good model for attributes
Location Image	Link to a location - may need to describe content, format, film, speed, aperture etc. For monitoring purposes the camera position, height and direction need to be known.	Image of location	Valid Keys
Text References	Any publications etc. referring to or by this person or organisation.	Link to References	Valid reference and name keys
Associated Person	Links to people and their roles	Link to Name	Valid Keys

6.9 Controlled Termlists

Many entities require a controlled terminology list to ensure consistency between records and improve data retrieval. Some lists can be provided, as in the case of the current version of Recorder which includes many terms and codes in its Codes table. Users may, however, wish to set up their own sets of keywords or phrases and they may even wish to create hierarchical lists such as those commonly used for biotopes. This facility can be supplied in a number of ways, informal or user defined taxa and biotopes

can be entered into the appropriate dictionaries with a flag to mark them as local. The same should be possible with the geological dictionaries. This will give users the full power of the dictionaries for managing multi-version, hierarchical classifications and cross-referencing to standard checklists. In the case of simple 'flat' termlists used for data entry control on the majority of data fields, this can be provided through a term list module which also allows users to create local lists.

Table 12: Information relating to Termlists

Termlist Information	Definition	Entity	Validation
Term	The actual term / list of terms appropriate to a data item	Termlist	spellcheck
Term Type	What attribute this list is relevant to.	Termlist and Term Type	check that this is linked to existing attribute
Term Code	Single code used for this term where appropriate	Termlist	non duplication within single termlist
Definition	Text description of what the term means	Termlist	spellcheck
Source	Where this term/termlist was derived from	Termlist	Source record in Source table
Entry Date	When term was added to list	Termlist	Valid date
Sort Key	Internal sorting number to ensure termlists print in the desired order	Termlist	-

7. Requirements and User Catalogue

The requirements catalogue provides a starting point in planning a new system. It generally consists of a number of problems which have been identified from an existing system together with a 'wish list' of features which might appear in any new application which is developed. The provisional requirements catalogue is deliberately broad in its approach but as analysis proceeds and the actual limits of the new system are more clearly delimited then the final requirements catalogue is made more specific and serves as a checklist to inform the actual specification of the developed system. The requirements catalogue tends to accumulate entries in a *ad hoc* way but is reviewed constantly throughout the project. This will involve the flagging of essential items and the removal of other items deemed outside of the present development.

In the Recorder Project, the initial entries and additions for the requirements catalogue were derived from :

- The project tender specification documents
- An examination of the existing Recorder package
- Discussions between the consultant and the project officers.
- Meetings with existing Recorder users, potential users and biological software developers. To date, there have been twelve consultation meetings held across the UK.
- Telephone interviews, letters and email contributions
- The responses to the 1996 Recorder Questionnaire.

Further additions to the catalogue arise from detailed work on the logical and relational data models and system function specifications. It should be emphasised that the list of features, options and technical requirements in the draft requirements catalogue represents a 'brain storming' exercise from which the final options will be chosen when the appropriate business and technical options are selected subsequent to this report. This version of the catalogue is still repetitive and in need of rationalisation and the existing layout is likely to change substantially during the next phase of work.

7.1 General Requirements

Probably the clearest messages that came from the consultation meetings were:

- The need to get user-naturalists more confident with the software - reliable, easy-to-use software, good documentation, continued user support and training.
- The provision of streamlined methods for data input and reporting
- The need for a simpler approach to reporting
- The importance of the taxon and biotope dictionaries
- A recognition of the importance of data transfer
- The need for maps and spatial access to data

The following list of 'general' requirements reflects the basic assumptions of what the new software will be attempting to achieve or could achieve in the right circumstances. Most of these requirements reappear under specific headings or individual user requirements, which provides a double check.

1. System independent data model
2. Database schema to be modular
3. Should be based on standards - defining new standards where necessary (*de facto* basis for later agreed standards)
4. Must have good quality, authoritative reference dictionaries especially for taxa, biotopes and administrative areas and, if possible, protected sites.
5. Need to maintain the freedom of long text fields and accounts available in AREV.

6. GUI application - emphasis on good design and simple application navigation. It should work as users (accustomed to main stream windows software) expect it to.
7. Applications must attract users - good visual design, simple to use, good program logic, reliable performance. (e.g. no difficult index rebuilds!). No steep learning curve.
8. Application and application support software (dictionaries) to be modular
9. Application to allow full or customised installation. This will include user selected option setting from the toolbar or menus.
10. There should be differentiation between professional and amateur users and/or LRCs and their satellite recorders. This might be expressed both in the size of the application and its cost for different users.
11. Details of tables, validation algorithms and dictionaries to be available in open published form
12. Data security and confidentiality will be a high priority. Control of confidentiality at all levels must be available.
13. Data validation a high priority both as provision of standard checking and the flagging of records as checked or needing confirmation.
14. Changes made to data must be trackable - original records and later interpretations should be identifiable and attributable.
15. Access to data from other windows software e.g. wordprocessor or spreadsheet a high priority.
16. Dictionary software to include value-added information e.g. RDB information related to taxon dictionary.
17. The software will be a means of distribution of centrally maintained dictionaries and added value information.
18. Need to explore the degree of customised data query required but must be a balance between provision of essential reports and facilities to generate custom reports.
19. Reports output in a choice of formats including maps in common graphic formats, numeric data to spreadsheets and text to wordprocessors.
20. Reporting must include basic distribution mapping e.g. to the level of Plot5 or DMap.
21. Need to consider links to Biodiversity Network - e.g. web access taking security and the user interface into account.
22. Possible design of field data capture software based on the model
23. Need to develop rapid data entry facilities including, if possible, import of data using Optical Character Recognition programs.
24. Numerical data must be accessible for analysis (e.g. relates to confusion of numbers and abundance codes)
25. Softkey links in AREV Recorder very useful - need similar functionality in new system (drill-down and button bar access)
26. Wider access to information e.g. by education users. Need for metadata and quality control
27. A simple and reliable way of installing the software including the ability to customise the installation. Software probably to be distributed on CD with choice of what (or what parts of) dictionaries to load.
28. All records to be permanently linked to the original recorder and later determiners, in order to reduce record copying and duplication within the system
29. Envisaged future use of data (particularly in National Network) implies a greater need for stringency in record validation and thereby a need for some means of vetting or grading recorders.
30. Possibility of third party software developers producing applets. Might need some form of accreditation.
31. Good data transfer facilities must be available and to include user-defined filters and wide choice of formats. Data import and export facilities are among the highest priorities for the new version. The main facilities must be simple to use even if further customisation is available to skilled users. Many of the amateur naturalists and scheme recorders emphasised the need to exchange data with BRC as well as local record centres.
32. Data import should, if possible, include a means to identify duplicate or possible duplicate records. Every record is, therefore, likely to need a nationally unique identifier
33. Must be easy to transfer a gazetteer of locally agreed recording sites from one application to another e.g. for a LRC to supply satellite recorders with a fixed set of recording units.
34. Developed system must make it possible to integrate other environmental databases e.g. earth sciences and possibly sites and monuments.
35. Applications should be transferable to other countries and languages.

36. Need for intelligent Help system with advice on error checking and quality control. The system mangers manual should be a separate document.
37. There must be good training and support available. The provision of clear, unambiguous help in the form of on-line hypertext help (probably in the form of html help), a basic user manual and availability of training are critical to the success of the software. Support and training needs to be easily and cheaply available to volunteer recorders who are actively providing records and taxonomic skills to the national network.
38. An easily affordable product

7.2 General Technical Requirements

1. Modular design - schema and application. Attempt to keep main application , or its applets, small and easily managed not huge and full of bugs!
2. Ideally, platform independent (e.g. UNIX, Windows, Mac) or otherwise straightforward to port.
3. WIMP-based application(s) - standard GUI - for most purposes this is likely to be Windows (95/98)
4. System must perform at an acceptably fast speed. Moving to SQL and windows, for instance, should not put unacceptable performance limits on large data files.
5. Capable of being implemented on any ODBC (or its successor) or SQL database
6. Application should not be limited to a specific data storage location. Data should be accessible across multiple drives and directories if necessary. The install process should allow for default and user-defined drive/directories for all files. Consideration needs to be given to the possible size of data files and the effects on performance as well as the hardware and backup implications.
7. Application separate from data tables - this is a technical option which may or may not be adopted for the LRC version. It may not be acceptable for single-user amateur recorders.
8. Choice of applications tailored to users? Ability to write small applications for specific uses. Ability to hide or not install unwanted options.
9. Individual applets (including third party) to be addable to the Recorder toolbar - thereby enabling individuals to create tailor-made applications
10. Acceptable performance on modestly specified machines (at least for modules aimed at individual users). This should not be an issue for 'professional record centres' although many are still poorly equipped.
11. CD ROM modular installation - especially for species dictionary with ability to return to the CD for further information or to download new modules.
12. Data input from on-screen images of recording cards
13. Location input directly from scanned maps - 'click and tell'
14. Field data capture software should include links to GPS for accurate location fix.
15. Security on data editing e.g. control of editing of data by GIS users
16. Transaction logging for rollback in case of data problems. Automatic recovery in case of database problems.
17. All spellings should be able to use correct form including diacritics and 'foreign' letters. Also all Latin names should be in italics.
18. Data exchange to be improved - easier, safer with more automation.
19. Check that developed software is compatible with voice control programs for sight or hand impaired users.
20. Investigate the opportunities for 'drill down' from data fields i.e. hot links to further information screens or other data tables. It should be possible to click on a species or recorder name and have further details appear in a popup window somewhat like hyperlinks. It should even be possible to build true hyperlinks and WWW links into the system.
21. Many organisations regard Advanced Revelation as an obscure and ill-supported non-standard piece of software and are therefore unable or unwilling to commit to its support. This will need to be addressed when choosing the replacement development software.
22. Transfer from the AREV version to the new version should be as 'painless' as possible and no data should be lost through adoption of the new software.

7.3 Links with other Software and data models

The redevelopment of Recorder will need to take account of other similar software development projects. These include other large scale developments such as museum cataloguing systems and various GIS projects. On the other hand there is also a need to recognise the potential of linking in to some of the more specific biological recording applications which have been developed by individuals and small companies. It will not be possible for the developers of Recorder to tap into or satisfy all the potential markets in biological recording but by judiciously making the Recorder data model and dictionaries more widely available it should be possible to encourage these other developers to produce compatible programs for their individual targeted markets.

1. Arev Recorder
2. JNCC general model
3. ENSIS
4. CCW Phase II Survey database (Now the CCW Habitats Database)
5. LASSI model (and probably Multi-MIMSY applications)
6. DMap for Windows
7. GD3
8. BioBase
9. Adit Site
10. RecordIT
11. EntRecs
12. Levana
13. LOFM
14. DMap
15. SARIS herptile application
16. Brecon NP Access/MapInfo application
17. CMS
18. Information from CIS (climatic and physical data)
19. MODES - museum cataloguing system
20. Must be generally compatible with standard windows business software

7.4 System Provided Dictionaries

There is general agreement that a major strength of Recorder is the availability of standard taxon and biotope dictionaries. The new system will also need administrative area and legislation dictionaries.

7.4.1 Taxon dictionary

1. Current dictionary needs expanding to include littoral and sub-littoral marine species. Content of dictionary would benefit from a thorough review and establishment of a strategy to bring all groups up to a common standard.
2. Dictionary to be available separately from application.
3. Information in dictionary needs to be attributable to the provider and date. This may vary for different attributes in the same record.
4. Taxonomic details - name, authority, synonyms, hierarchical position - particular need to be able to access by old and new names as required (implies the need to fully revise the synonyms)
5. Common names in more than one language (esp. English and Welsh)
6. Species description
7. Need for short species (as well as long) accounts for adding into reports.
8. Species biology
9. Biotope occupancy and food preferences
10. Behaviour notes
11. Species distribution including national map
12. Endemic status
13. Legal status - statutory protection GB and International

14. Local, regional, national and international context & RDB status
15. Biodiversity - species recovery plans
16. CA corporate targets for species
17. Taxon codes from various checklists
18. Skill level required for identification - e.g. easy for all, normal recorder, skilled (accredited) recorder and needs a voucher specimen or equivalent specialist approval.
19. References and images
20. Dictionary quality needs control and surveillance e.g. with regard to species accounts.
21. Multiple checklists e.g. different current versions
22. Legal protection status
23. Environmental indicator information
24. All elements e.g. national status need to be complete and regularly reviewed
25. Should be possible to create a local RDB using local species accounts and gradings. Links to national accounts and actual local species records should make it possible to produce the RDB from 'Recorder' (although output would be formatted in a word processor).

7.4.2 Biotopes dictionary

1. Range of biotope classifications including full NVC
2. Legal status of protected biotopes
3. National and regional distribution status
4. Marine biotopes needed
5. Relationships between different classifications - biotope equivalencies and overlaps
6. Details of origin and ownership of classification systems
7. Possibility for user-defined classifications
8. Need for land management related classification e.g. covering ancient woodland, meadow and permanent pasture. Also informal classification e.g. parks, road verges, gardens.
9. Application needs to be able to filter biotope options for users e.g. LRCs may want the lot but many individual users will have a much more limited requirement. Filter options.

7.4.3 Other value-added dictionaries

1. Legal status and legislation - covering sites, biotopes and species
2. Up-to-date list of UK administrative areas (including Vice Counties, National Parks, Natural Areas and Sea Areas)
3. Lists of statutory protected sites (SAC, RAMSAR, SPA, ESA,SSSI, NNR)
4. Lists of taxa and biotopes from various legislation e.g. Annex 1 habitats list - [This may be managed through the biotopes dictionary]
5. Digitised boundaries for protected sites, counties, unitaries and vice counties.
6. Climatic data
7. User-defined gazetteer
8. Historical landscape terms
9. Stratigraphic dictionary for geological records

7.4.4 Checklists (other potential dictionaries)

1. Sex, stage, age
2. Measures of abundance (including, DOMIN, DAFOR, Hawkworth & Rose)
3. Soils
4. Species associations
5. Type of record
6. Types of organisation and individual roles
7. Types of event

7.5 Types of data recorded

A more detailed consideration of the information collected is given in section 6 - Information in biological records.

7.5.1 Recording Event Information

1. Survey type
2. Survey method
3. Survey quality
4. Collection method
5. Extent of survey
6. Weather
7. Observation period
8. Type of record (sighting, trapped specimen etc.)
9. People involved

7.5.2 Taxon records

1. Date (and time) of observation
2. Taxon to be easily picked up from taxon dictionary - using the terminology of the original Recorder (unless centre has a policy and the available skill to do otherwise!). When selecting species which have been split the aggregate should be the default choice not the 'sensu stricto'. There must be some way for 'taxonomically advanced' users to enter the names that they want to use - even if this results in a redetermination when the record enters the national system. [Taxon records must be linkable to more than one determination] . It would also be useful to check what any taxon is under different checklists or to update old records to new taxonomy for reporting purposes.
3. Many old records already in system so new software must be able to cope with existing records including existing taxonomy not just newly entered records.
4. Observer(s) - associated person(s)
5. Biological taxon - must allow for 'fuzzy' and informal taxa (e.g. Dandelion or Gulls)
6. Negative records - e.g. expected taxon not found despite a search in the right place at the right time
7. Nature of the population (or individual) recorded e.g. native population, introduced.
8. Determiner/referee
9. informal taxon
10. number observed
11. measure of population at location
12. sex, age, stage information - important that records for sexes and stages e.g. counts, behaviour, habitat are able to be recorded separately.
13. Quantitative data associated with sample e.g. counts in quadrat or specific observation time
14. Behaviour including direction of travel
15. association with other species including ability to track hierarchical relationships e.g. parasite on a parasite.
16. Taxon specific data models? certainly ability to design taxa specific data entry screens
17. Ability to enter data or search for records using common names at various levels.
18. Cross reference to vouchers or collected specimens. Also preparations and microscope slides.
19. Confidence in determination - Correct, Known incorrect, Needs checking
20. Ability to record time series records e.g. counts at specific times of day at one location. (e.g. birds coming to feed or roost or migrants flying by)

7.5.3 Biotope/Habitat Records

1. Ability to record features and associated taxa for all biotope at location, individual stands and quantitative samples (e.g. quadrats and transects).
2. Information on grazing, damage and management for any identified biotope/habitat parcel.
3. Size measurements - e.g. length, breadth, area, height of stand (max., min., average)
4. All observations linked to a date and recorder

7.5.4 Locality Records

1. Recording location to include grid squares and if necessary 'fuzzy areas'
2. Some localities are house/building addresses (e.g. especially bat records) data model needs to be able to handle this, particularly with the need for confidentiality.
3. Must be able to define linear sites e.g. road, rail and river sections.
4. Possibly saving site plan or field sketch in locality record (or recording event?) to indicate positions of recording points or zones e.g. sketch of beach showing rock pools and seaweed zones)
5. Sites to be related and definable down to any level of subsite.
6. Location name - may need to allow for multiple or alternative names
7. Biotopes - must be able to use different classifications and make repeated observations e.g. changes in area over a period of time. Must also be able to link land-use, management, damage records to landparcels or biotopes.
8. File number(s)
9. Associated geographic locations
10. Land parcel number(s)
11. Ability to deal with point grid refs., vague refs., squares, end points, vectors and boundaries.
12. Grid Reference plus precision statement - ability to record multiple grid references e.g. for ends and centroid of site.
13. Total area (preferably in hectares but should be able to use other systems)
14. Altitude range (maximum and minimum)
15. Text description
16. History of site
17. Management aims
18. Management events and methods
19. Associated people and organisations (and their roles)
20. References
21. Photographs
22. Maps and plans
23. Legal status - site protection status. ability to record more than one status and log history of changes in status
24. Geology including RIGS
25. Soils
26. Spatial access to data and GIS functionality
27. Graphical drag and drop linking would be very useful for creating site, subsite hierarchies and rearranging them as necessary.
28. Ability to display site hierarchies and to use this as a basis for record selection.

7.6 Application Features

This section covers requirements which will affect the way the application works

7.6.1 Security and Confidentiality

1. Application or user configurable. LRC model and application will need to have users with different levels of access e.g. system manager, data edit and view only rights. Smaller applications for individual naturalists do not need these controls.
2. All records must carry a confidentiality flag or reference to metadata describing the limitations placed on use. Confidential records should only be viewable by users with the appropriate security level clearance.
3. All records must be traceable to the recorder and in the case of taxon records determiner.
4. Import and export routines must include metadata describing origin, scope, copyright and confidentiality of the records involved.
5. Data model to allow for individual tables or fields to be flagged as confidential or views restricted to levels of user privilege.
6. If data tables are separate from the application, security and confidentiality safeguards are needed against access by other tools e.g. SQL
7. It must be possible to track changes to records e.g. addition of interpretations of site identity or redetermination of taxa.
8. Security levels should also work for data export e.g. it should not be possible to print reports or export data on disk with details of confidential records unless a user with appropriate clearance has authorised it. Amateur naturalist single users may want a simpler system for their own use.

7.6.2 Geographic Referencing

1. Ability to record grid refs. for more than UK - e.g. Irish grid refs., UTM and other continental referencing systems.
2. Ability to deal with point grid refs., vague refs., squares, end points, vectors and boundaries
3. UK system to accept full numeric and letter + numeric input
4. Probably internal conversion to same numeric referencing systems used in GIS e.g. ARC/INFO or possibly lat./long.
5. Application to automatically provide generalisation to larger sampling units e.g. from six figure ref. to 1K, tetrad and 10K square.
6. Ideally, entering spatial position by clicking on a map would be very useful.
7. Need to be adaptable to new focuses for recording e.g. more interest in marine records based on maritime natural areas.

7.6.3 Data Management

1. All records identifiable to original recorder and date. Ideally all records should have a nationally unique identifier linking them to the original recorder and the collating centre.
2. Copyright and ownership of all records clear
3. Date records entered on database
4. Who entered the record
5. Alterations to records recorded
6. Transfer history of records -with good feed back to original data suppliers (credit and where necessary obtain permission)
7. Quality stamp - checked flag - status of record (needs confirmation etc.) Probably need a recorder's stamp that data entered are as recorded, a geographic stamp to show location details are accurate and a taxon stamp to show that the determination has been approved by the relevant specialist. [Obviously interpreted according to the nature of the record - e.g. critical species or not]
8. Confidential flag
9. Complete flag - is the record complete or is there further information available on the original record cards/record source.
10. Easy merging of data from 'satellite' recorders

11. Checks for data duplication
12. Data transfer in a variety of formats including .dbf, comma delimited and Tab separated

7.6.4 Data Input Requirements

1. Rapid data entry methods required - including OCR and use of GUI (e.g. clicking on recording card images) or data entry in table mode. This also implies the need for choice of interactive or batch validation methods. [Note some informants said that windows interfaces slow down data input and development may not be recouped in time saved by users.]
2. Take account of how data are to be entered. In some centres data entry staff are used who are not taxonomic experts and who may change regularly, therefore need a simple and quick to learn interface. Other situations e.g. used by individual specialists may be able to assume a higher level of biological knowledge but not necessarily IT skills.
3. Ability to set or cancel defaults for any attribute
4. Visual keys might be useful [application idea - pick weather from a picture icon]
5. Where codes are used option to display code on-screen or hide. [Many users remember the codes and find this quicker than searching indexes].
6. Investigate possibility of user-defined data entry templates e.g. for use with individual recorder's data of a known structure and much repeated information.
7. Need a way to mark inferred data e.g. [ ] as in MDA convention
8. Recording Event data entry
9. Site/Geographic location data entry - physical descriptions, ownership, biotopes
10. Landcover/Phase I records data entry screen
11. Taxon records from recording cards or user defined lists
12. Need to examine individual styles of taxon recording to establish taxon specific data entry screens (These may be left to individual developers e.g. for a birdwatching package or butterfly monitoring etc.)
13. Flexible date entry including vague dates and ranges.
14. Details of people and organisation. (Defining their roles and relationships)
15. Examine needs for entering management and ownership records
16. Input details of references
17. Input details of photographs and other visual or auditory media
18. Local dictionary entry screens e.g. local and informal taxa
19. Interactive or batch data entry
20. On-line validation of interactive data entry
21. Skill-related taxon record validation
22. Use of validation tables and coding systems
23. Investigate off-line data validation (e.g. batch validation of imported records or records entered by clerical staff)
24. Ability to flag original data and later interpretation (e.g. square bracket convention from MDA)
25. grid reference checks
26. Investigate visual keys for input (e.g. pictures of weather etc.)
27. Update from data transfer files in a variety of formats (e.g. ASCII, .DBF, tab delimited etc.)
28. Ability to enter metadata relating to imported data and sets of records
29. Date validations against people and for consistency e.g. determination cannot be before observation
30. Many users actually remember codes (especially site codes) and prefer to use or see these on screen. Need an option to view and use codes in applications.
31. All records must carry unique identifying code (like a national insurance number!) so that they can be traced even when transferred to other systems. This implies that the numbering algorithm needs to be changed e.g. each machine gets a unique number which is appended to a running integer key and this is unchangeable even when record is transferred. Numbers for deleted records should not be re-used as the record may have been copied off somewhere else in the network.
32. Bill Hardwick's EntRec highlights first records for a site, grid square, vice county during data entry - a useful validation cue as well as adding interest to the records.
33. Need to record who entered record [and who edited it if there are later changes].

7.6.5 Application output

1. Check through Recorder list of available reports for essential ones to provide in new application. Current version of Recorder has at least 6 different techniques for producing reports including TCL/RLIST, QBE and SQL. This variety is daunting to unskilled users but gives invaluable flexibility for manipulating data. Similar facilities will be needed with the new Recorder either as part of the package or available as separate software.
2. A unified approach to data selection and reporting. Aim for a non-confusing user interface. Reporting supplied with applications should be simple to understand and easy to use. Selection and processing should be as intuitive as possible
3. Range of pre-defined reports - examine current Recorder list of predefined reports and balance against other ways of achieving the same output (e.g. will users require label lists? are habitats in 10K squares best calculated by GIS?)
4. Examine needs of specific users e.g. do amateur entomologists require specimen labels printed from their records?
5. Selection of output by geographic area - by name
6. Records for one or more taxa selected by a range of criteria e.g. place, date, recorder
7. Site descriptions - including choice of associated taxon records
8. Output of lists (and added value data) direct to windows wordprocessor (or in format readable by wp)
9. Output of numbers direct to spreadsheet for calculations when needed
10. Output to TWINSPAN, MATCH, DECORANA etc. - Cornell Condensed Format
11. Data graphing - perhaps export as comma-separated values to common packages e.g. Excel then using supplied macros.
12. Reports selected by RDB or other national/local status - could even set this as a filter to species lists for locations)
13. Use dictionaries to deliver useful lists and information to other applications e.g. to wordprocessor to create recording cards.
14. Reports must be good looking without truncated data or poor layout.
15. Site grading/indexing on basis of species and habitats calculated by different means (see ENTREC)
16. Phenology output with choice of sampling. Transfer to Word or similar for printing.
17. Investigate Recorder output and Word Macros for automatically producing Floras and Atlases.
18. Extraction of data to monitor introductions and extinctions.
19. Museums would be interested in user views of non-confidential data for visitors and gallery use. Maps important.
20. Hypertext exploration of data
21. Printed reports with images (e.g. site sketch map) dropped in.
22. List reports to be output to screen, where column order and width can be adjusted prior to printing. Should not have to save lists or rerun selections.
23. Filtered output to lists e.g. remove duplicate spp. records for sites.
24. Selectable time ranges for output e.g. in time series analysis.
25. Some users would like cross tabulations e.g. species to sites/samples. [also valuable for analysing Phase II surveys]
26. Distribution and coincidence maps. Important that maps can be printed on a wide range of printers and be exported in a range of graphics modes for editing and publication.

7.6.6 Mapping Output

1. Simple output of either site or taxon record positions
2. Selection of output by geographic area - by indication on map e.g. outline an area on map and produce site/taxa reports or click on distribution dots and retrieve data for that point.
3. Distribution and coincidence mapping with country and county/unitary or Vice County maps - choice of maps user controlled or could be set to automatically select the most detailed for the data out put. included (DMAP as an included applet)
4. Distribution maps with choice of overlays e.g. geology or drainage. (outline maps for DMap or Plot5)
5. Output to Constraint maps or GIS geared to create them

6. Good choice of symbols for map output e.g. year classes, number of records etc.
7. Click on dots or capture in polygon to make a selection for reporting
8. Zoom in and out when inspecting map output
9. Good range of choice for titling , scales and keys.
10. Control over colours
11. Access by GIS

7.6.7 Geographic Information Systems

1. Clear links to standard GIS e.g. ARCView and MapInfo
2. Potential to link to existing/developing GIS applications e.g. National Parks Map Info Application.
3. Summarised data to 1 kilometre squares for integration with CIS output.
4. Digitised boundaries to all legally protected sites (available from CD ROM)
5. Point in polygon and polygon overlap searches - returning list to database reports

7.8 User Catalogue and User Roles:

Part of SSADM analysis involves documenting the users of a proposed system in terms of the tasks they carry out and the data that they need to access and later in the analysis in terms of their roles in relation to the functions managed with the developed software. This approach is not appropriate in the current analysis because the project is not seeking to supply a single piece of software for one organisation with diverse internal users, instead the aim is to produce software for a diverse number of organisations with a very low range of internal users.

There is very little differentiation between users in what information they may need to access and the real differences relate to security and confidentiality. It is likely that the maximum number of user types is:

- Manager: System manager with full security rights who can create new users and authorise access to confidential records.
- Data Assistant: Users with add/edit rights
- General User: View only users with or without confidential record access

On the other hand there is a great diversity of organisation types who might wish to use the software. Each of these types has needs in common with other users and other needs, specific to their own activities, which may or may not fall within the bounds of the developed software. For these reasons the normal SSADM practice of creating User Catalogue and User Role forms has been abandoned and descriptions of user types has been incorporated into the Requirements Catalogue as the most useful means of taking their individual needs into account.

The following lists of requirements relate directly to the information needs of different types of user. The lists are not exhaustive and many instances of repetition between groups have been omitted.

7.8.1 Requirements common to most users

1. Continued and improved support and management for the Recorder Project. Essential for the overall strategic development of recording and data interchange. Interviews and survey returns highlight how important users regard a continued commitment to Recorder to be.
2. Good documentation written in a clear and concise way. This includes hypertext linked windows help and printed user manuals.

3. Ideally printed documentation should include a separate system managers manual and a new user's 'Getting Started' manual.
4. Continued central telephone support available freely to registered users.
5. A clear and simple method of installation. Many users have reported difficulties installing the AREV version.
6. Clarity of program flow and an intuitive interface. There is a strong need to overcome the perception of complexity. Probably the commonest plea in the consultation meetings was to make the new Recorder simple for non-technical users
7. Recorders should concentrate on their biological skills not on IT.
8. A large number of owners of the AREV version had not used the package because of the steep learning curve involved, particularly because of the complete lack of any popular books or documentation relating to AREV.
9. Good taxon dictionary offering checklists, synonyms and value-added information. The amateur specialists, in particular, were concerned to be able to use the latest or most accurate names. Other users more concerned to work with fixed checklists. Many users highlighted the absence of marine taxa as a weakness.
10. Data exchange is a prime requirement and should be as simple as possible to achieve.
11. The ability to customise the application in various ways e.g. which taxon groups and biotope checklists to use, individual rapid data entry windows, customised reports.
12. Rapid data entry techniques and possibly batch validation of bulk records.
13. Virtually all users want a improvement to the reports interface with simpler selection and control of output. Many users expressed particular problems in the current Recorder with record selection and reporting due to a mixture of AREV problems and application design. Improvements needed include the ability to preview and modify the appearance of reports (e.g. column width and order) without re-running selections. All users required output to maps which could be printed on a wide range of printers or through any common business software and which could be edited for publication purposes.
14. Many users would like to be able to view records in 'table mode' for more rapid 'eye-balling' of data and rapid editing.
15. Virtually all users require better text editing facilities. (The AREV editor is very limited)
16. Confidential access to confidential records.
17. Clear understanding of what to back up and how to do it.

7.8.2 Amateur Naturalists and Contract Surveyors

Amateur naturalists are most concerned with the collection of data either for their own uses or as input to a recording scheme. In general they require fast, simple means of data entry and most often only for one or a limited number of plant and animal groups. Reporting needs are generally simple e.g. lists of taxa seen at various locations and dot distribution maps. Those naturalists with more complex data analysis requirements are generally able to use spreadsheets or statistics packages and require simple export from their database. Naturalists involved in organised surveys or recording schemes require simple but reliable data transfer facilities. Contract surveyors are very similar to amateur naturalists in their needs although they are more often involved with biotope and detailed site surveys. They, therefore, require the ability to store sample data (e.g. quadrats) and retrieve this information in various aggregated ways (by stand, by biotope, by site). Contract surveyors also need good links to wordprocessing and presentation software for the preparation of survey reports.

1. Ability to record data from Transects
2. Ability to record data from Quadrats
3. Taxon specific abundance and survey methodologies. Numbers and abundance codes required.
4. Data input from scheme recording cards especially BRC-style records. [Some users also requested images of old BRC cards as well as current ones]
5. Modular species dictionary and ability to create localised species checklists.
6. Small applications dealing with individual animal or plant groups. Simple to use, quick to learn, cheap to buy. A number of recorders want data input to match BRC type cards with simple reports and distribution maps.

7. Quick data entry using species abbreviations that match those on cards being used. Also the ability to repeat data automatically ranging from one field to the whole record - with the repeat toggled on or off.
8. Memory of last operations e.g. if last taxon selection was in the hoverflies then the next might default to that.
9. Ability for dictionaries to recognise old or obsolete names - particularly of use if entering data from collections. Application to be able to display taxa in a group and switch checklists.
10. Data export for sending to scheme organisers and record centres
11. Potential for hand-held PDAs for data capture especially if linked to GPS
12. Ability to record absence e.g. I looked for X but did not find it
13. Local area detailed maps - possibly linked to data input (e.g. on map data entry as in SARIS)
14. Link to simple distribution maps e.g. DMap for Windows or Plot5
15. Facilities for transferring records to scheme organisers or record centres.
16. Ability to record details of specimens/vouchers and track identification work in progress e.g. record a specimen but not its determination (must be linked to a collected specimen)
17. Choice of simple habitat/biotope keywords as well as 'jargon lists' - possibly user defined terms for substrates.
18. Application able to print out specimen, cabinet and exhibition labels
19. Ring numbers and associated information for bird ringers
20. Ability to record absence when searched for (e.g. indicate date of extinction on a site)
21. Ability to record forms and varieties is important to many naturalists especially lepidopterists.
22. Ability to record micro-niche as a substrate or collection location
23. Low cost software and modest system requirements
24. Easy to understand record selection and reporting with the option to make more complex selections where possible. Ideally complex selections would be made by writing an English description of what you want to do and letting an intelligent agent sort out the tables and syntax.
25. Prediction modelling - if x occurs in association with y at site Z then it should be at site W also(!)
26. Must take user fears and difficulties in understanding software seriously. system should aim to maximise on capture of users biological expertise and minimse on their need for IT expertise.
27. Literature references commonly used to track identifications.
28. Reporting aggregated to different levels e.g. 1K, 2K and 10 K lists/maps, also aggregated by dates e.g. year
29. Species record summaries for year/season e.g. first record, last record, peal, number seen. In table form for lists of species.
30. Built-in backup facility.

7.8.3 Recording Scheme Organisers

Some recording schemes have the backing and office facilities of large societies (e.g. Institute of Mycology) but most are run by one or two amateur naturalists using their own resources. Few scheme organisers are young enough to have 'grown up' with computers and many have had to make valiant efforts to come to terms with new technology, a contributing factor in some of the negative views concerning AREV and Recorder. The outstanding requirement of scheme organisers is to be able to enter or import data quickly and to be able to pass it on simply and efficiently to BRC and other major users (e.g. local record centres). Most scheme organisers also want to be able to print distribution maps and use the software as an aid to publishing their own atlases although BRC provides this service for many of them.

1. Data import from recorders, including from other packages e.g. Levana or EntRecs.
2. Data export to record centres and BRC
3. Output to county maps and vice county maps - most use DMAP
4. Lists of occurrences by taxon including counts of records for taxa and squares. [mostly at 1K, 2K or 10K resolutions)
5. Means of recording identification skills of recorders
6. Means of validating identifications or flagging records for checking. Needs tracking of determinations with date and determiner.
7. Automatic flagging of new records e.g. for site, square, vice county or species.

8. Recording reference lists for species and records.
9. Maintaining lists of recorders, details of involvement (e.g. what squares covered) and statistics on records.
10. Low cost software and modest system requirements
11. May include Irish data and grid references
12. Species oriented data (sites secondary)
13. Need to know national and regional status
14. Conservation priorities
15. Mapping
16. Transects and repeated surveillance techniques
17. Grid references important more than site
18. Ease of transfer from local systems to new Recorder

7.8.4 National BRC

Among a growing range of activities, BRC remains the focus for a large number of national invertebrate recording schemes and manages the BSBI flora dataset. BRC is contracted by JNCC to provide wildlife information (other than birds and marine life) for its own use and the Country Agencies. BRC is therefore a major 'gateway' for information flow between the voluntary and statutory sectors. BRC has to process hundreds of thousands of records per year and therefore speed of data entry and batch validation methods are a main requirement for any software developed. As much of the information reaching BRC is fairly simple in format there is little perceived need for a complex structured database or application function. These perceptions may well change as new roles are developed, particularly, in relation to the proposed NBN.

1. Validated data in a format that can be used for national summarising purposes
2. Data for under-recorded groups
3. Simple mechanism for entering data e.g. quick data entry by typist then batch validate. (Data entry currently c. 1,000 records per staff member/day)
4. Simple ways of managing data for schemes e.g. ability to produce country and regional distribution maps
5. Facilities for capturing the backlog of data
6. Single on-line source to up-to-date taxon dictionaries for the groups being worked upon at any time
7. Intelligent system for aiding interpretation of names used at any date and system for noting if name used in data summaries different from original.
8. Retrospective interpretation of existing record base (can't retype 12 million records)
9. Application to work with Oracle tables.
10. Good export and import facilities
11. Help with geographic validation - much at present is checked manually.
12. Output to DMap for checking and publication
13. Links to ITE habitat and satellite data

7.8.5 Local Record Centres (data collators)

Local records centres play a key role in promoting a sense of 'community' amongst suppliers and users of data in their geographical areas. By cultivating trusted and professional relationships with other organisations they can play a major part in holding a local environmental information network together. The functions of an LRC include:

- Provide professional management and secure storage for environmental records including distribution and status of wildlife taxa and details of sites of wildlife, geology or geomorphological importance.
- Maintain an overview of the existing environmental information resource in their area. [This includes knowing the recorders and other compilers of records]
- Take a strategic view of future information needs and how these can be met
- Be aware of all local and relevant national recording projects

- Promotion of quality recording and the relevance of standards
- Promotion of standards for data exchange
- Act as a clearing house for environmental information - ensuring a single point of entry for most information and saving recorders from having to deal with multiple requests for their data.
- Encourage local naturalists to participate in recording and monitoring projects
- Liaise with national data centres
- Provide raw or interpreted data to partners and customers either directly or through an agent. Typical products include wildlife and geology alert maps and provision of site-based information in response to planning proposals. [Note, that the raw data from a site may be interpreted either by record centre staff or by the wildlife trust conservation officer depending on local arrangements]
- Be a source of validation for the commonly recorded groups and maintain arrangements with partners and specialists to ensure that all records are properly validated.
- Maintain registers of wildlife and geology sites of local importance for inclusion in conservation and structure plans.
- Maintain a wildlife enquiry and information service for the public. This service is more often provided by records centres that are associated with local museum natural history departments but some counties have no formal arrangements.
- Produce a range of publications including, red data books, distribution atlases and guides to wildlife sites. [May be done in conjunction with partners]

Application Requirements:

1. Fast methods of data entry including batch validation. Many record centres have huge backlogs of data awaiting entry.
2. Also need ability to cope with small numbers of records from large numbers of recorders (e.g. popular surveys)
3. Automated links with satellite recorders -e.g. satellite user specific data import and validation routines.
4. Wide range of options for transfer of data in and out of database. e.g. set up scripts for data import from individual suppliers.
5. Output to wildlife and earth science constraint maps
6. Better spatial access to data e.g. points in polygon
7. Virtually all LRC's have Phase I data with the maps either in manual form or copied into GIS. Few yet manage the target notes and biotope accounts adequately on computer.
8. Full range of information on biotopes, species and sites
9. To inform strategic planning of survey
10. Site evaluation
11. Selection of information by named site. Place names remain important despite use of grid refs. and GIS.
12. Selection of information by general area including 'corridors'
13. Abstracted information for publications
14. Means of logging data imports and export
15. Metadata about imported datasets. Lists of accredited data providers.
16. Validation trail for records - system of 'stamping' types of validation
17. Secure back-up and archiving
18. Communication and data exchange with satellite recorders
19. Asking questions of complex data
20. Improved event recording e.g. site visits
21. Repeated surveillance data e.g. dates against habitats and areas
22. Facility for handling imperfect or changing habitat classifications
23. Multiple biotope classifications for same land unit without messing up total area calculations
24. User defined gazetteers
25. Customised reports
26. Ability to match or translate biotope records between classifications as needed
27. Control of personal data and ability to flag individuals and organisations for role and poss. skills.
28. Contact tracking - keeping track of data agreements, letters or complaints.
29. Linking sites to planning applications
30. Links to public information systems (including the Web)
31. Monitoring the use of data

7.8.6 Wildlife Conservation Organisations (NGO)

In many cases the data requirements of Wildlife Trusts is the same as for Local Record Centres e.g. for informing planning matters. They are also generally responsible for the acquisition and management of reserves which tends to make their thinking very site oriented. The work of Trusts is becoming very much 'biodiversity' driven - Local Agenda 21, target species etc. The detail of data collection and use varies considerably between Trusts depending on the presence or relationship with a record centre and the amount of development pressure in their area. Most trusts have a significant public education role which requires wide-ranging summary information ranging from assessment of land-use change to species distributions. Trusts in low population areas can experience real difficulties obtaining this information due to a lack of volunteer recorders or funds for surveys.

1. Wildlife trusts tend to be interested in 'sites' and 'habitats' and want to keep information relating to their conservation.
2. Lists of county wildlife sites (key wildlife sites) - controlled local gazetteer of sites
3. Boundaries of statutory and informally protected sites
4. Need to be able to manage Phase I and Phase II type survey data.
5. Ability to grade sites linked to reasons for grading
6. Site-based information for conservation action. Many trusts are interested in managing long-term surveillance records for individual sites. e.g. repeated time series data for sub-sites and biotopes and links to management information.
7. Species lists for sites
8. Local and national RDB species information for biodiversity action plans
9. Monitoring records for management and conservation of reserves and managed land
10. Link with Local Biodiversity Plans and species recovery plans
11. Links with earth science records
12. Ease of learning for volunteers. Ease of use is critical.
13. Links to GIS
14. Software must make it easier to collect and manage records e.g. generate checklists for recording and batch input. Good dictionaries and key-term lists to encourage people to be more precise. There must be a simple route for translating from field records to database. Possibly batch processing and validation.
15. Output should help motivate recording e.g. maps and reports linked to value added information.
16. Good data transfer to encourage the use of satellite recorders.
17. Dictionaries should have best available value added information. Feedback will encourage more recording.

7.8.7 Local Planning Organisations

Local planning organisations vary widely in their approach to environmental information. Some district councils, for instance, rely on their county planning department and/or local record centre to provide them with whatever information they need. In other cases planning departments may effectively be running as the local record centre and also be involved in extensive survey activities. Even where local councils do not have a formal record centre function they may well employ ecologists or commission environmental information. The prime need in local planning is for information related to planning casework and in the development of local plans and conservation strategies. A growing number are actively involved in Local Agenda 21 projects and Environmental Audits. Some local councils also own or manage significant areas of land of conservation value and as such their information needs match those of wildlife trusts for their reserves.

1. Wildlife and earth science constraint maps
2. Access to locality, boundary and status information for all protected sites in their area
3. Better coordination with archaeological constraints
4. Site-based information for planning
5. Linear and buffer zone retrieval of data

6. Landcover and extent of selected biotopes for structure plans
7. National and local RDB species information for environmental audit and local biodiversity plans
8. Data in format for use in GIS and spatial analysis of data
9. Land-use change statistics and maps
10. Linking sites to planning applications.
11. Linking biological data with other environmental data
12. Links to land management information
13. Developing countryside strategies
14. Summarised data e.g. composite species lists for sites and tabulations of sites and biotopes.
15. Value-added information e.g. multiple levels of status information for biotopes and species.
16. Need to know where the gaps in information are
17. Output to maps including overlays of geology and drainage.
18. Combination of conservation data with social information for strategies.

7.8.8 Country Conservation Agencies

There is wide variation in the Country Agencies both between headquarters and local teams and between individuals in the degree to which data are computerised and in the way information systems are seen as integral to work. At one extreme many officers rely principally on ad hoc paper files with no culture of update control and quality management and at the other there are highly computer literate individuals working with databases and GIS. All staff, however, are aware of a need for better spatial access to information and the need to be more systematic in data collection. The focus of the Country Agencies has traditionally been on protected sites and species although there has been a shift to wider countryside issues. It remains to be seen to what extent the introduction of species and biotope recovery plans and focused monitoring strategies will have on these wide interests.

It was emphasised several times that CA staff do not have the time to invest in learning complex systems and that any software provided to them must clearly be supporting them in their work.

1. Monitoring information relating to target species and biotopes (including repeated samples)
2. Monitoring or repeated surveillance of selected features (including taxa) on protected sites - includes photographs
3. RDB information
4. Detailed survey of protected sites
5. Detailed survey of threatened biotopes
6. Ability to handle marine taxa and biotopes and link to natural marine areas.
7. Bat data and bat-related casework. [Also badgers]
8. Data related to arbitrary geographical areas (e.g. natural areas)
9. Contextual biotope and geological resource information
10. Overall resource information - need to know how many sites are there like the one under threat or proposed for conservation etc.
11. Population and time series data for target species
12. Relationships between land protected under different designations
13. Association of data with Natural and Landscape and Landscape and Landscape Areas
14. Management plans for NNRs
15. Links to land agency database e.g. for tracking of management agreements with owners and tenants [Not part of Recorder]
16. Links to statistical and other analysis packages e.g. VESPAN.
17. EN and CCW have much Phase II Grassland data at present managed on spreadsheets or using VEGAN. CCW will be developing a grassland database in parallel to Recorder redevelopment. Need to maintain compatibility of data models.
18. Metadata about information held with each agency
19. Map-based spatial access to data
20. Direct links to BRC for national summary data
21. Access to centrally held data by local teams but also local data handled locally (or possibly by LRC)
22. Simplification for local teams - should not need to buy lots of different bits of software.

23. Simple to use, quick to learn application for regional office users - no time to invest in steep learning curves.
24. Links to GIS e.g. MapInfo
25. Boundaries of statutory sites
26. Links with corporate databases e.g. ENSIS
27. Conservation objectives and management methods
28. Classification of features and links to site selection (Ensis)
29. Local teams need wide ranging information for casework and planning related enquiries. Essentially same information as LRC and Trust need but possibly more for protected species e.g. bats.
30. Centrally need information for species recovery schemes and generally for delivering BAP related activities - reporting extra info.
31. Access to national distribution atlas data for species and biotopes but filtering for 'important' ones.
32. Better means of making agency accumulated data available to wider users (with due regard to confidentiality)
33. Surveillance and eventually monitoring data for biotopes and species. Repeated samples.
34. Aggregated data and abundance scores
35. Security for sensitive records - species and localities.
36. Metadata - list of surveys.
37. Good links to wordprocessor and spreadsheet applications.
38. National and regional status in species dictionary (also to include WCMC classification).
39. Better performance on networks

7.8.9 Environment Agencies

The Environment Agency and the Scottish Environment Protection Agency were formed from the amalgamation of a great number of smaller agencies although by size the old NRAs and River Purification Boards make up their largest constituent. The Agencies are involved in or commission a great amount of environmental survey such as river corridor mapping although much of it is specialised for their own purposes.

1. Freshwater biotopes information
2. Marine and coastal information (Dictionaries needed for marine biotopes and marine taxa). Recorder at present does not allow recording for non terrestrial squares (part of validation algorithms).
3. Freshwater fish - species and populations
4. River corridor survey. Need to incorporate river habitat classifications.
5. Site and species information related to pollution incidents
6. Ability to record taxa in higher groups than species (e.g. water quality may be gauged by families or genera present)
7. Alert/constraint maps and direct links to GIS
8. Linking biological data with other environmental data e.g. air pollution drop out predicted by GIS
9. Spatial querying of data particularly by catchment area. (also biodiversity plan area, marine environment and biogeographic zone)
10. Many computer users but few support staff, therefore, new Recorder must be as intuitive as possible and have the look and feel of standard windows software.
11. SEPA data theoretically available to public, therefore would appreciate easy ways of delivering this information.

7.8.10 MAFF

1. ESA survey data
2. Fisheries information

7.8.11 Utility Companies

1. Alert maps for operations in general countryside
2. Species and biotope data relating to their land holdings
3. Integration particularly with sites and monuments record
4. GIS spatial access to data

7.8.12 General Public

1. Easy access to summarised information about wildlife and wildlife sites
2. Publications and guides to publications
3. Distribution maps

7.8.13 Education

1. Simple interface for retrieving non-sensitive wildlife and habitat information
2. Access to non-sensitive raw data for projects.
3. Biotope and species maps
4. GIS functionality

7.8.14 Consultant Ecologists

1. GIS functionality
2. Wildlife and biotope information for sites
3. Sampling data
4. Wildlife and biotope information for corridors
5. Local and national RDB information

7.8.15 Government Departments

1. Information in a format usable in GIS
2. Nationally summarised data for strategic planning and legislation

7.8.16 National Trust

1. Already have defined sites
2. Audit requirements e.g. what properties have Large Heath Butterfly?
3. National and local species accounts very useful
4. Ability to create user checklists
5. Need to be able to record land use/management classifications e.g. parkland and ancient woodland. Hay meadows and permanent pasture. need to concurrently apply different classifications.
6. Database must be usable over a national network
7. Needs integrating with Earth Science data.
8. Spatial data to be used in GIS

7.8.17 National Parks

1. Earth science and landscape information including landscape classifications
2. Archaeological information
3. Climate information

4. Landcover/land use information
5. Links to GIS (most have MapInfo also Wings and Spans.) Need to look at integration with current Access/MapInfo 'sites & species' application.
6. Species data to 8 fig refs.
7. Information for prioritising conservation and development effort
8. Constraint maps for planning and casework
9. Linear habitats
10. Marine data for coastal parks
11. Information for local species action plans
12. Land ownership information [and confidentiality controls]
13. Tracking of agreements with landowners
14. Management planning (links to CMS?)
15. Parks Inventory and Monitoring System (PIMS)
16. Landcover and habitat aggregated to 1km squares for analysis
17. Protected species data e.g. bats and badgers
18. Means of improving access to data including interpreted information for publications and displays (Parks required to make their data available - all have education officers)
19. Surveillance/monitoring for targeted species e.g. spread of invasives (rhododendron etc.)
20. Links to aerial photography
21. Modelling data e.g. water catchment and water purity
22. Repeated surveillance/monitoring in habitat restoration work
23. Better data exchange with other agencies and spread of information to local communities
24. Writing biodiversity action plans
25. Multilingual names for sites and species (e.g. Welsh)
26. Spatial access to information and GIS functionality e.g. for landuse change and predictive modelling.
27. Environmental indicators and statistics for comparisons across parks
28. TPOs
29. links to analysis software like MATCH
30. Physical data readings from research work e.g. soil pH etc.

7.8.18 Museums and Collectors

1. Links between specimens, sites and recording/collecting events. Especially important for voucher specimens of critical and difficult groups
2. Compatibility with museum collection records systems - ideally MODES and MultiMimsy (NMW uses MicroMusee). May not be possible but a clear means of data transfer should be established.
3. Generation of collection and exhibition labels directly from the database
4. Ability to record details for specimens not yet fully taxonomically determined (a common situation with material from pitfall traps and similar collection methods)
5. Ability to retrieve material from a single recorder, survey or site.
6. Ability to list material for a species including details of sex, stage form and varieties.
7. Public access to non-sensitive/confidential information
8. Fast method of data input where, for instance, working through a draw of insects there are many specimens for one taxon but from many localities or many closely duplicate specimens.
9. Historical records (including the taxonomy and site names used) are very important when working with collections.
10. Generation of reports with pictures either for distribution or in web pages
11. Good security model
12. Maintain the advantages of AREV e.g. long descriptive text and easy lists
13. Good training

7.8.19 Bird Organisations

1. Many data collection projects with bird specific information e.g. nest records and ringing data
2. Bird specific abundance counts e.g. numbers of nests in a colony

3. Huge datasets e.g. Ringing data, CBC and WEBS
4. Need for improved access and simplified data transfer between main bird organisations
5. Ability to record repeated samples and time series samples.
6. Specialist data e.g. reproductive success of protected species

8. Modular Nature of the 'New Recorder'

The approach to data modelling has been to break the overall model down into a number of separate modules. The modules can in some ways be regarded as 'objects' and this approach allows for individual aspects of the total project to be worked on in detail without needing to finalise the internal details of the individual modules. The modules will form an important part in the structuring of the new Recorder and the way in which data are held within them will affect the way in which installation of Recorder can be customised to user needs or in which alternative applications (perhaps by third party developers) can be produced for specific target markets.

The modular approach is also valuable in that it gives a better insight into the functioning of the various dictionaries and allows them to be easily separated out for other projects e.g. Taxon Dictionary maintenance under the National Biodiversity Network project. The central module is the Recording Event Module which relates to other modules through table intersections (link entities). Some of the modules including Source, People & Organisations, Text References and Images may link to any other module as required.

The following modules are included in the relational model given in Annex 3:

1. Survey and Recording Module
   including submodules for Taxon, Biotope and Earth Science observations.
2. Location Module
3. Individuals and Organisations (Contacts) Module
4. Location-related Event Module
5. Source Module
6. Images Module
7. Text References Module
8. Biotopes Dictionary Module
9. Taxon Dictionary Module
10. Protected Status and Legislation Module
11. Stratigraphy Module
12. Controlled Termlists (for maintenance of flat termlists)
13. Recording cards

The functions dealing with record transfer and user security levels have not been modelled yet as they are likely to be specific to the business and technical options adopted for the build.

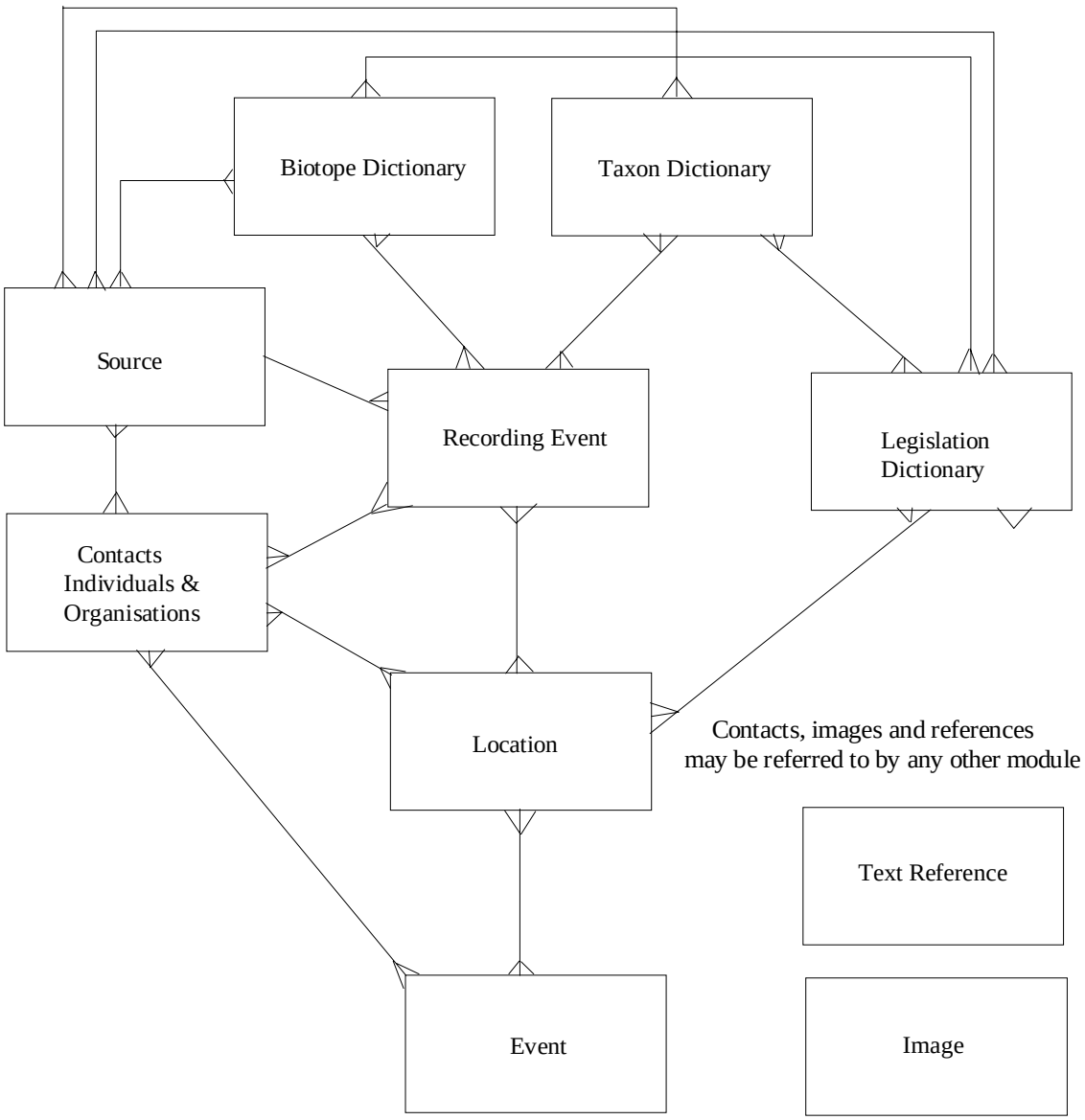
It is stressed that the following module descriptions are provisional and that details are likely to change as the analysis continues and work on defining system functions progresses. Figure 8 shows the general relationships between the various modules. The majority of links are many to many and some modules may be called from any other module.

One of the build options will be to make Recorder user-configurable. This, for instance, would allow users to choose what taxa and biotope checklists they wished to work with. This would mean that a recorder who only wanted to work with say a single list of butterflies that matched the recording card they were using could install Recorder with just that or at least have a data input option which used an on-screen version of the card. It should be possible to install other desired checklists and recording cards at any time. The dictionary modules have been designed to make this easier as well as giving the means to manage records coming from a range of sources and dates. All terms in the main dictionaries are related to checklists so that all references to taxa and biotopes can use their original names and in theory the dictionaries should be able to make later name equivalencies where needed.

Further degrees of modularity could be applied to the Recorder build by creating a range of taxon or survey-related data entry screens and report templates which again could be selected or rejected as install options. Presumably major data collators such as LRCs would want access to everything whereas their

'satellite' recorders might only want a 'thin' version for data capture (including possibly field data capture).

Figure 8: General relationships between modules in the Recorder Data Model



9. Logical Data Models for Modules

9.1 The anatomy of biological records

Biological records are conventionally described in terms of *who*, *what*, *where* and *when*. Although this convention is essentially correct it does not go far enough in the context of the Recorder or NBN projects (as shown in section 6). In addition to needing to refine the four basic concepts we also need to add *Why* - which comprises the source, motivation and quality control aspects of the record normally associated with the survey details. An analysis of the different categories of information in biological records (see section 6) and a study of the various recording cards used in surveys shows the basic anatomy of biological records to be grouped around three key concepts, these are;

- Reasons for making the observations e.g. the details of the survey, its aims and management. (The *Why* component)
- Recording events e.g. actual field visits for the purpose of collecting data. (The *Who*, *Where* and *When* components). There can be many recording events within a survey.
- Connected groups of observations e.g. a sample which may link habitat, taxa and physical location data (The *What* components and possibly more detailed *Where* and *When*). There can be many samples within a recording/survey event.

These groups of information and their relationships are shown diagrammatically in figure 9. This model has the advantage in that by using the survey-event-sample relationship as the 'spine' of the record the old distinctions between species recording, site recording and habitat recording disappear and the way is opened for better integration between datasets. The model also has the advantage that other kinds of information such as geological site descriptions can be readily incorporated, meaning that we have the real possibility of creating a fully integrated model for all forms of environmental recording.

Some examples are given below:

- **Standard 1K square or tetrad recording cards**
  Many local floras collect information about common species on a square basis, with the same card being used for a whole year. Typically the data recorded includes: Recorder name, Grid Reference, List of Taxa, Year. This information easily fits on the diagram in figure 9. In this case the whole year's effort is regarded as a single sample within a single event.

- **Single Site Visit Cards**
  This would include many of the basic BRC-style record cards which are based on single site visits. Older BRC cards have a single box for habitat whereas more recent examples (e.g. RA19 - Marine Isopods) have tick boxes for habitat, microhabitat, collecting technique, recording conditions and other information. All of this can be mapped onto the model. The single visit card would represent a single sample within a single recording event.

- **Species Record Form for Site**
  Many recorders maintain record sheets for sites which include taxa seen on various dates e.g. species, date, number seen. These are the sort of recording media commonly used to feed into monthly bird reports. In this case each date is a recording event.

- **Phase I Landcover/land-use records**
  Phase I surveys are locality-based with the locations being a mixture of named sites and groups of one or more landparcels which are related by a common landcover or land use. Within a single event e.g. day's surveying, numerous samples (target notes and associated landcover/landuse observations) are made. For any 'cover'-type a number of associated facts may be recorded e.g. damage, threats, management and use. Some Phase I surveys also record species lists for interesting 'sites'. This all maps quite readily onto the model in figure 9 where for instance one sample (landparcel) can have several landcover types each with its own set of facts (threats, management etc.).

- **Phase II Survey - Quadrat records**
  Phase II surveys are usually site-based. The site will be visited on one or more days and the site described in terms of biotopes/habitats, stands within those biotopes and detailed quadrat records within those stands. The records accumulated may therefore be quite complicated but essentially come down to one or more events with a number of samples which may relate to each other in various ways e.g. 5 quadrat samples may fall within a stand sample which describes the overall habitat. This latter aspect would be covered by a record of the relationships between samples as shown in the more detailed model shown in figure 10.

- **Repeated surveillance and monitoring records**
  Repeated surveillance and monitoring records are covered by the use of recording event and sample records. For instance, in the case of a particular habitat on a site (e.g. *Calluna vulgaris - Ulex minor Heath* to see if it is spreading or decreasing), the data on area, sward height, grazing damage can all be linked to different survey event / sample records to give a time series. This particular feature of the model overcomes one of the current major weaknesses in Recorder.

The basic model given in figure 9 can be refined and augmented to be able to include any form of biological records and further examples will be given in the next section where the structure of the Recording Module based on this model is developed.

9.2 Recording Module Logical Data Model

The recording module will lie at the heart of the new Recorder application and a provisional data model is given in figure 9. A more detailed version is developed in figure 10. This model attempts to overcome the perceived differences between species recording and habitat recording and also to introduce the sampling element which is missing from the current version of Recorder. The first indications are that this is, in fact, a very powerful model which will allow the integration of most forms of recording including extensions to cover earth science records and links to collection management software. The roles and relationships of the various entities are described in general terms below and a detailed relational analysis with entity and attribute descriptions is provided in Annex 3.

9.2.1 Survey

The Survey Entity will be an important part of information management in the National Biodiversity Network as it effectively describes the original source and quality of the associated records. In simple terms it groups together common data (e.g. Phase II Chalk Grasslands Survey of Sussex) giving, among other things, who organised the survey, its geographic range and date span. In a record centre this entity would include or be linked to metadata on the number of records, quality constraints, copyright and use constraints and details of the actual source of this copy of the survey data (Source Module). It is clear that not all of the information coming into a record centre is part of an organised detailed survey but some thought will demonstrate that there is still a need to record the source and data constraints and that there are logical links which group records together - if only for administrative convenience.

9.2.2 Survey Event

Every survey is made up of a number of discrete recording events which may be interpreted in a number of ways e.g. an event may represent the efforts of one or more recorders at several locations on one day or it may represent efforts at a single location over a period of days. The controlling factor will be the common information which links all the observations together. Survey event information includes the recorders, the date, the weather and the survey methods used. The locality at which observations are made can be part of the Survey, Survey Event or Sample information but practical build reasons make the Survey Event the most convenient with perhaps sub-locations (if any) attached to the Sample as this allows for several locations or sub-locations to be linked within one event.

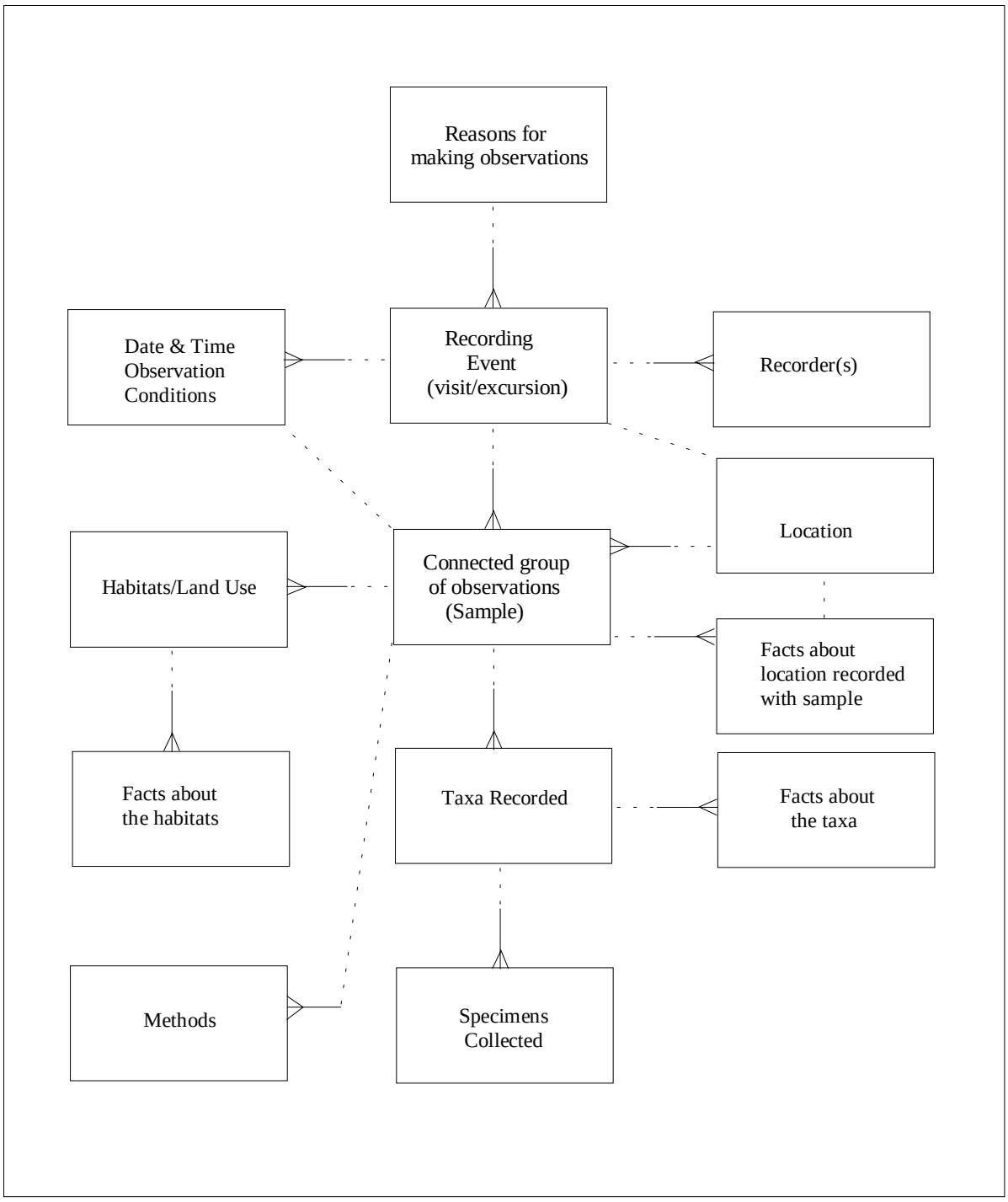


Figure 9: The basic anatomy of biological records

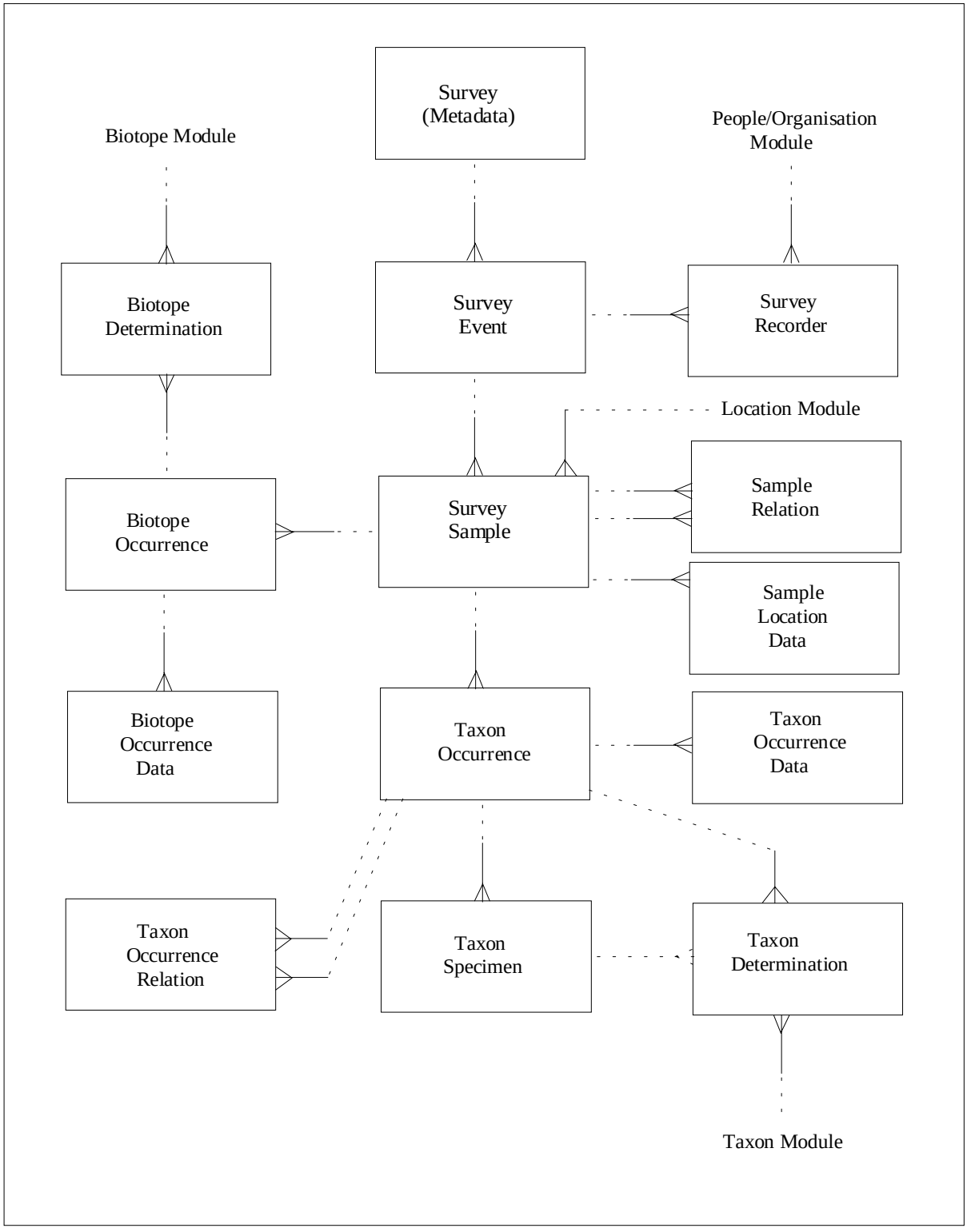


Figure 10: Logical Data Model for the Recording Module.

9.2.3 Survey Recorder

This is a link entity between the Survey Event and the Name Entity (People & Organisations Module). The recorder could be any valid name e.g. a person or an organisation (useful for some published records). The link might include information relating to the individual's role in the Survey Event so that it might be clear from group efforts who was responsible for covering plants, insects, birds etc.

9.2.4 Survey Sample

This entity links any specific data which might be collected during a recording event to the overall recording event and general survey information. The survey sample can be made at any level from a general link between a location and a list of taxa (e.g. to create a species list for a 1 kilometre square) right down to the detailing of the contents of a pitfall trap. Survey Samples may be linked through the **Survey Sample Relation** entity to enable the recording of, for instance, several quadrats within a single stand of a particular biotope on a grassland site. Survey Samples may also be related in time, which would enable time series observations to be recorded or for repeated surveillance and monitoring records to be associated.

The Survey Sample entity may have a link to location and conversely could be a link from the location module into the biological (or earth science) data recorded for that location. This link would also be the way that most repeatable physical data about the location would be recorded. This is clear when physical data likely to change are considered (e.g. soil or water pH) which allows the management of measurements used for monitoring purposes. These data are represented by the **Survey Location Data** entity on the LDM in figure 9.

Details of biotopes or taxa occurrences are both made in relation to a Survey Sample record. This is useful device because it allows for the recording of any mixture of biotope and taxa records. This includes biotope land-cover data where taxa records are subordinate such as in Phase I Surveys through to site taxon lists where habitats are not noted. It also allows for the detailed recording of taxa for very detailed habitats such as in Phase II surveys.

9.2.5 Biotope Occurrence

The Biotope Occurrence entity is a link to the Biotope Module which covers all the various landcover and habitat classifications that might be recorded. This could also include more informal descriptive and land-use classifications which would allow users to record hay meadows, ridge and furrow or ancient hedgebanks. In some applications it is important to know who actually identified the habitat particularly with some NVC types. It may be necessary to change the identification at some point but not lose the original record. This is achieved by linking occurrences to determination records in the **Biotope Determination** entity.

Descriptive information relating to a single biotope or landscape type would be recorded in the **Biotope Occurrence Data** entity. Typical information might include minimum and maximum sward height, management keywords or damage records. For instance, in a Phase I Survey each landclass for a site might be recorded using an RSNC/NCC term and for each of these individual landclasses there might be a set of use, management, threat or damage notes and comments in addition to a more wide-ranging target note.

The model would allow for several biotope terms to be linked to a single sample, which would be useful where the available information only allows a listing of types for a site or where overlapping or different classifications might be required. It should be noted that the calculation of areas for biotopes and sites would be an application problem not a data model one.

9.2.6 Taxon Occurrence

Taxa would relate to the Survey Sample in the same way as Biotopes. Thus it would be possible to make a list of taxa for a location (how ever it is defined) without reference to biotopes or a list of taxa could be provided for a specific habitat within a location. The **Taxon Occurrence Data** entity would allow for the recording of facts about any taxon observation e.g. sex, stage, number of individuals (see below). The **Taxon Relation** entity allows for recording associated species, for instance a parasite and its host and even a parasite on the parasite!

9.2.6.1 Taxon Occurrence Data

There are many attributes which users may wish to record about taxa, some of these such as sex and life stage are catered for in the existing version of Recorder but others are not. In particular there are some types of recording such as bird ringing with associated measurements or bird nesting records with clutch size, hatch rate and fledgling success. These more specialist classes of information can be treated as subtypes of the taxon occurrence data entity and as such could be built into Recorder or added as a third party applet. Each subtype, as illustrated in figure 11 above would have its own specific attributes and use controlled terminology as appropriate for instance, Evidence of breeding would include singing and ovipositing whilst Seasonal form would include summer plumage, winter coat and eclipse.

The name applied to a taxon observation is recorded in the **Taxon Determination** entity which links to the Taxon Module. This arrangement allows for any number of names to be applied to the observation. This may arise through disagreement over the identification, reclassifying following a taxon split or use of a different synonym. The Taxon Determination would include the determiner, date and checklist used.

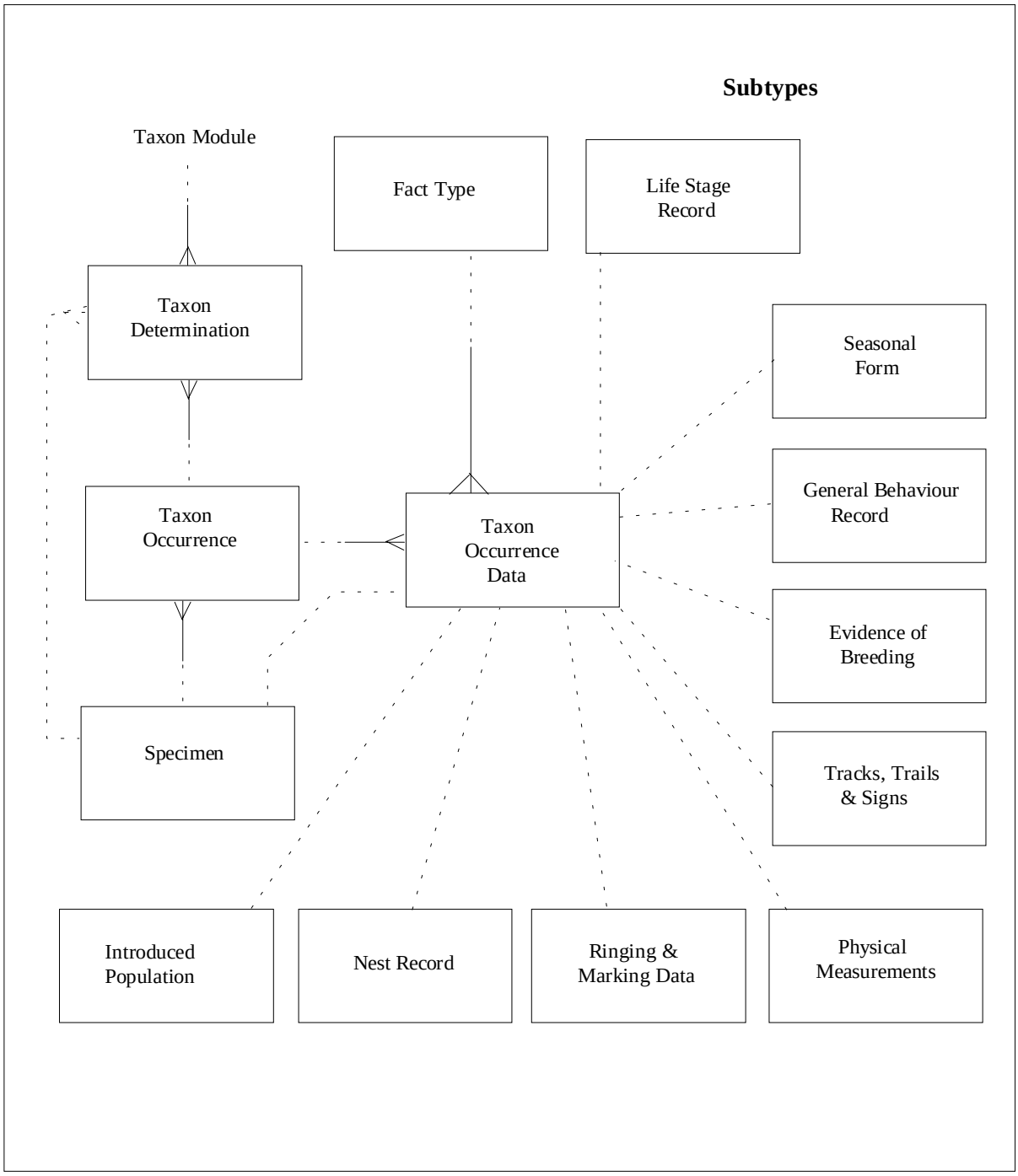


Figure 11: Taxon Occurrence - Possible subtypes of taxon occurrence data

9.2.7 Specimens

Problems can arise where specimens are collected. The specimens may not be identified yet although their location, date and collector are known so that they represent a valid biological record (and voucher). Things can get complicated if the specimens originally lumped together as one record turn out to represent different species. In museum collections the specimens may be identifiable but other important parts of the record might be missing. This situation is summarised in figure 12 which shows the possible links between field records, specimens, facts (e.g. sex, stage, number) and identifications. Boxes 1 and 11 are the two extremes of seeing something in the field and not knowing what it is and having an unlabelled specimen in a collection. Between them are the various permutations of information. Most field records fall into boxes 3 and 4. Box 5 represents survey material awaiting determination. Box 6 is the ideal voucher and museum specimen.

This grid highlights some of the differences which cause problems with different types of recording and integration with museum records. Applications have traditionally only sought to deal with parts of the grid. I believe that it is logically possible to integrate all of these forms of record using the model in figure 9. The basic details of specimens are recorded in **Taxon Specimen** which is linked to Taxon Occurrence. Identifications and facts (**Taxon Occurrence Data**) would normally be linked to Taxon Occurrence but the inclusion of alternative links from Taxon Specimen to facts and determinations would allow for specimens to be individually described and ,if necessary, determined differently from the original record. More traditional museum information relating to storage and conservation would be linked to the Taxon Specimen entity. Sorting out how these possible relations will be used and what parts of the grid are relevant to a biological recording application is a matter of choice and application programming!

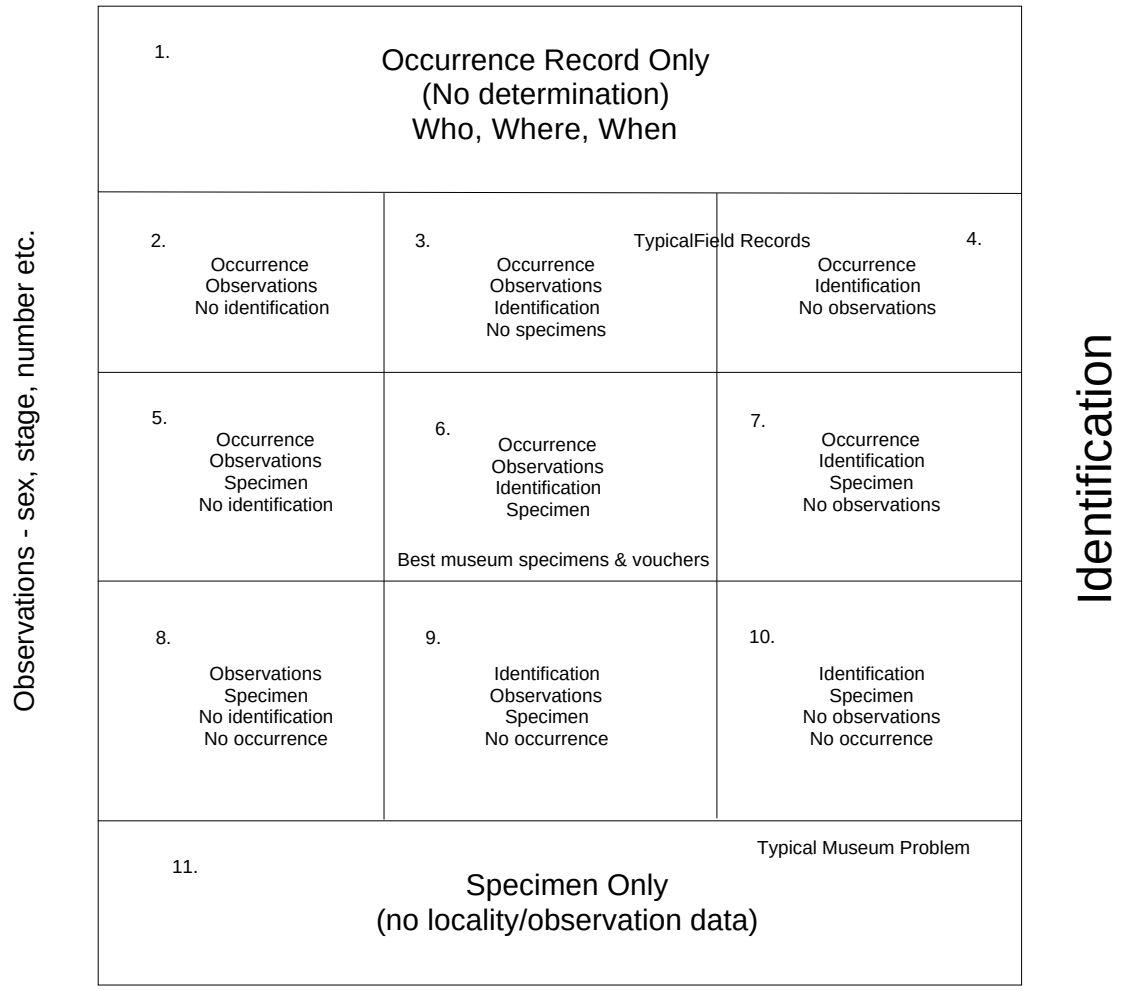


Figure 12: Permutations of information related to field records and collection specimens

9.3 Extension of the Recording Module to Earth Sciences

The basic model for the Recording Module appears to be generalised enough to allow for its extension to cover a wider range of environmental records. The most urgent need is to integrate Earth Science data with biological records. This is needed because naturalists may wish to record facts about the geology, topography, soils etc. of the sites on which they are collecting biological records and also because most Local Record Centres, Planning Departments and Wildlife Trusts need a more integrated means of dealing with environmental data such as that coming in from RIGS groups.

A first approach to mapping Earth Science aspects of recording onto the Recording Module is shown in figure 13 which is very similar to the data format that would come from GD2. In this example there are added entities for mineral, rock type and earth science feature (e.g. terms describing geomorphology, topography etc.). Fossils have been mapped onto the Taxon model used for modern taxon occurrences. This has the advantage that specimens of fossils can also be catered for. This does raise the point that recorders may wish to collect specimens of more than just taxa (e.g. minerals, rock specimens, soil samples) and the same occurrence, specimen, determination and fact, entity relations would be applicable in all instances. The possibility of having a generalised Item (or Feature) is demonstrated in figure 14. This would be compatible with the feature model used in the English Nature ENSIS database and in the JNCC General Model. The problem is that the most elegant logical model may not indicate the best physical way to build the application. Some of the tables would become very large and there would be problems coping with a wide range of subtypes. For the purposes of the remaining analysis, assuming the Recorder rebuild will be essentially as a biological application, the module used will be that in Figure 10 with extensions as illustrated in Figure 14 as appropriate for mapping existing Recorder data across without compromising future enhancement.

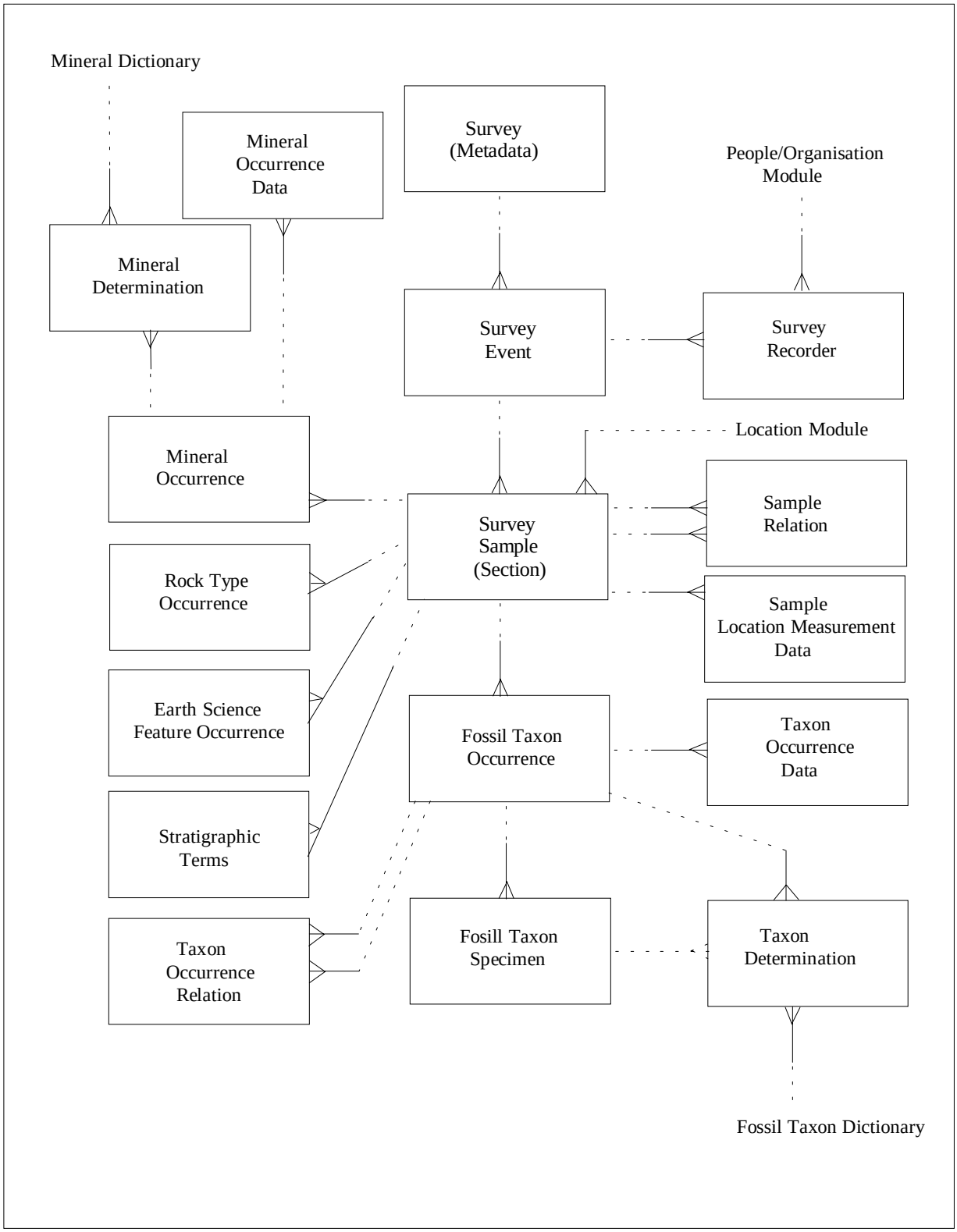


Figure 13: Recording module modified for Earth Sciences

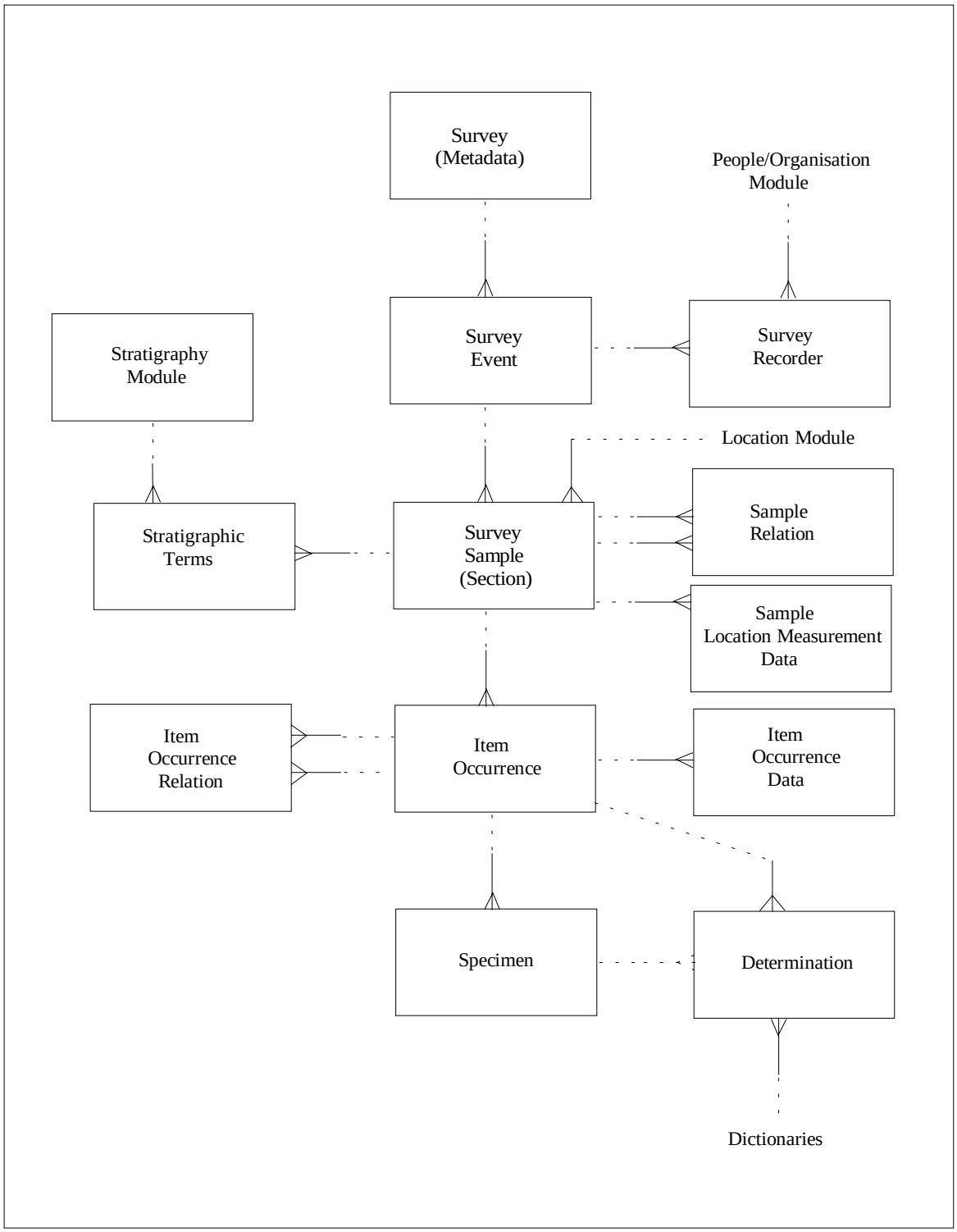


Figure 14: Simplified Recording Module modified for Earth Sciences and general features

9.4 The Biological Records Cube

Biological Records could be plotted in a multi-dimensional space, for instance, taxa, places, recorders, surveys and observation dates could be represented as a five-dimensional plot. This is comprehensible mathematically but not easy to draw! A simpler view can be obtained by plotting just taxa, places and dates - as might occur when dealing with a single recorder's records. The result would be a cube where any individual record (a single taxon, at a single place on a single date) occupies a position inside representing the intersection of the three axes; this is shown as point G in figure 15.

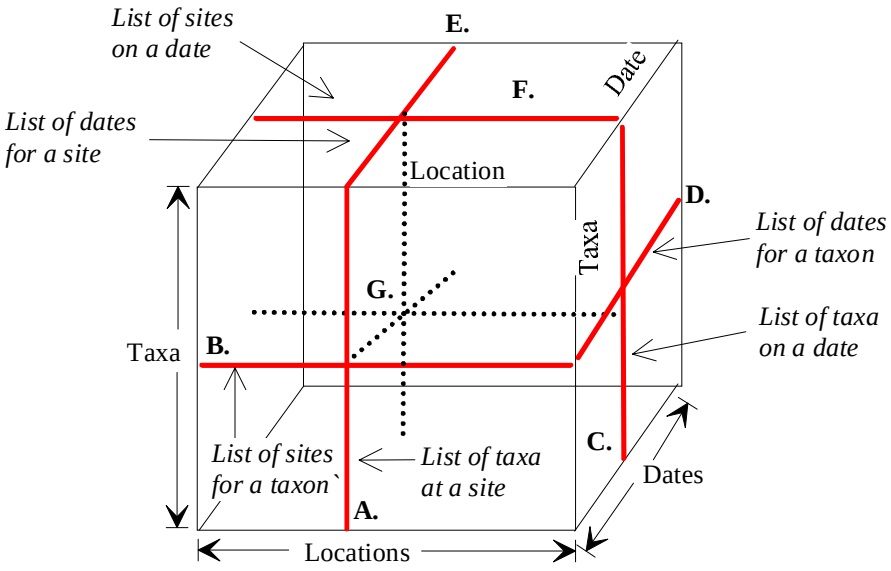


Figure 15: Biological records cube showing relation of data views to individual records

The logical data model that has so far been described provides a means of tracking all of the individual points within the biological records cube and all of the cubes for various surveys and recorders.

The lines on the three exposed faces of the cube in Figure 15 represent projections of all the values that lie on planes cutting through the cube. In database terms they represent unique views, that is all duplicates are reduced to one. For instance, line A represents a list of the taxa occurring at a site ignoring duplications of occurrence relating to different dates. Line B represents all the locations that a taxon has been recorded at, regardless of dates and repeated observations, this is the equivalent of a distribution dot map. It is also clear from this diagram that much of the distinction which we have formerly perceived between site based and taxon based recording stems from thinking about data structures that work on the projected faces of the cube rather than the looking at the deeper structure.

The value of this diagram is that it allows us to interpret the relationships between data held in different databases and therefore map data between them. It also helps to clarify the application processing needed to manage different types of information. For example, the English Nature ENSIS database has a table for natural feature occurrence linked to subsite and the Inter Agency Earth Science Database (IAESD) also has a feature occurrence table. In both these cases, what is of interest is the list of features at the site to which some kind of monitoring or action can be linked, which is the equivalent of line A in figure 15. This would also be the case with a naturalist's locality list or a site card where dates are not kept against the species names/ticks.

In practical terms the diagram shows that *some classes of information may be linked to views of the data rather than to individual occurrences*. For instance, management aims, agreements or constraints, may be linked to one land-use or biotope on a site and as such refer to a view of the overall data. Condition statements and recording of threats, however, should be linked to observation events and fall within the

scope of the normal recording model although they too might need summarisation within an application. This is shown diagrammatically in figure 16.

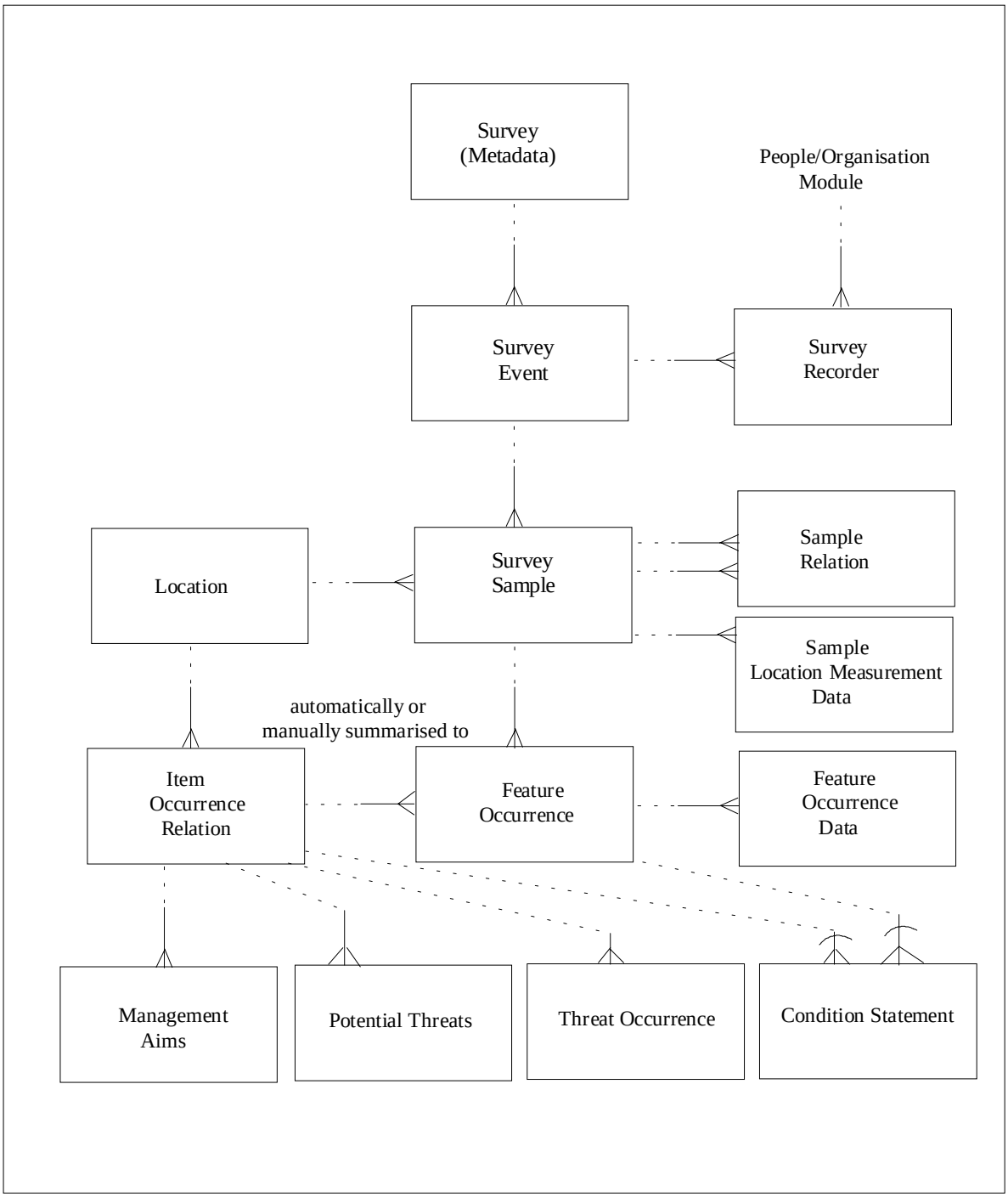


Figure 16: Relationship of Recording Module to Conservation Feature Monitoring in Location Module

9.5 Location Module Logical Data Model

In most environmental applications a distinction is drawn between sites and administrative areas. In many, a further distinction is made between ordinary sites and protected sites, for instance the Geological Conservation Review Database uses three tables to refer to administrative areas, GCR Sites and SSSIs. The current version of Recorder uses separate tables for Sites and District/Parishes, with counties listed in a Codes table. These arrangements are used to split up the information into easier managed units and to cope with the different attributes which might be recorded about each type of location. In principal, however, there is no fundamental difference between administrative areas, sites and protected areas, they are all geographic areas identifiable by a boundary drawn on a map. This argument remains true for any spatially referenced entity including subsites and transects.

In the context of a general biological recording model it is possible to argue that users may wish to record data for any spatial area, for instance, an old literature record may give only the vice county for a species. The model given in Figure 17 demonstrates how bounded area or locality information can be generalised.

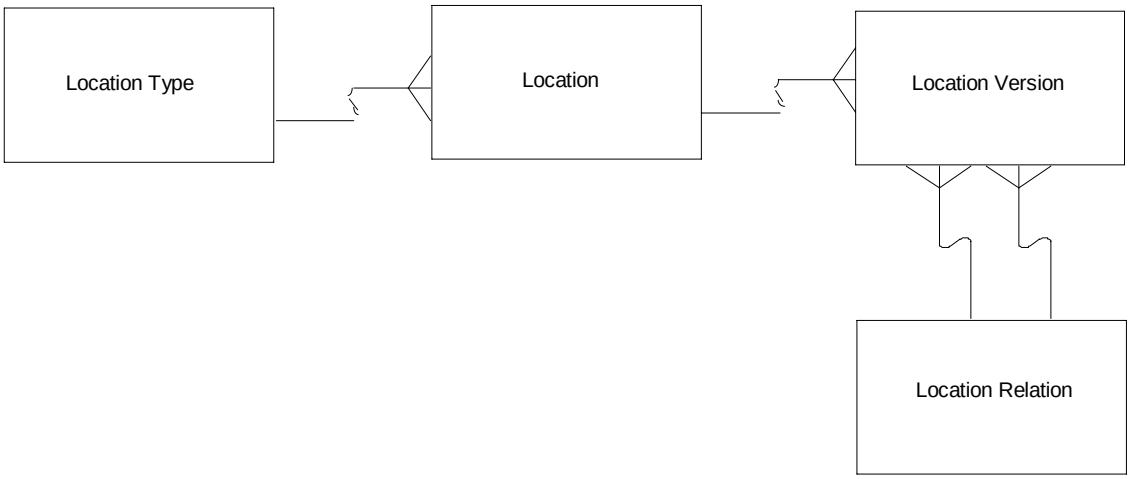


Figure 17: Generalised Logical Data Model for Bounded Areas/Localities

Location Type is a list of the various kinds of bounded area of interest to the system e.g. counties, unitaries, districts, SSSIs, SINCS, named sites etc. **Location** lists the names and details of bounded areas that fall within any of the classifications in Location Type. Each location must have one and may have several **Location Versions** usually linked to boundary changes. These could be major versions, as in the completely different interpretations of Somerset pre-74, post-74 and post -96 (in which case they should be different location types), or minor versions caused by local adjustments to boundaries. Relationships (**Location Relation**) between locations take place between versions of the locations. Relationships include relations between versions of the same location and relationships between different locations e.g. Site A overlaps SSSI B, district C lies within county D, unitary E replaced district F. The model could be simplified further by merging the Location and Location Version entities as in the physical model developed in Annex 3.

This model is quite powerful in terms of building an application which includes digitised boundaries, details of tenure, conservation designations, land parcel numbers and location codes as these can all be associated with the same set of tables. An extended model for locations is given in Figure 12. The greatest weakness of the model is that within an application the information managed for SSSIs might be very different from that for ordinary sites and different again for administrative areas. Furthermore each type may be managed and distributed by different organisations. This can be handled by using sub-types

or even having many attributes in the Location table but in practice it is more likely that in the final build tables for administrative areas, protected sites and user defined sites will be kept separate.

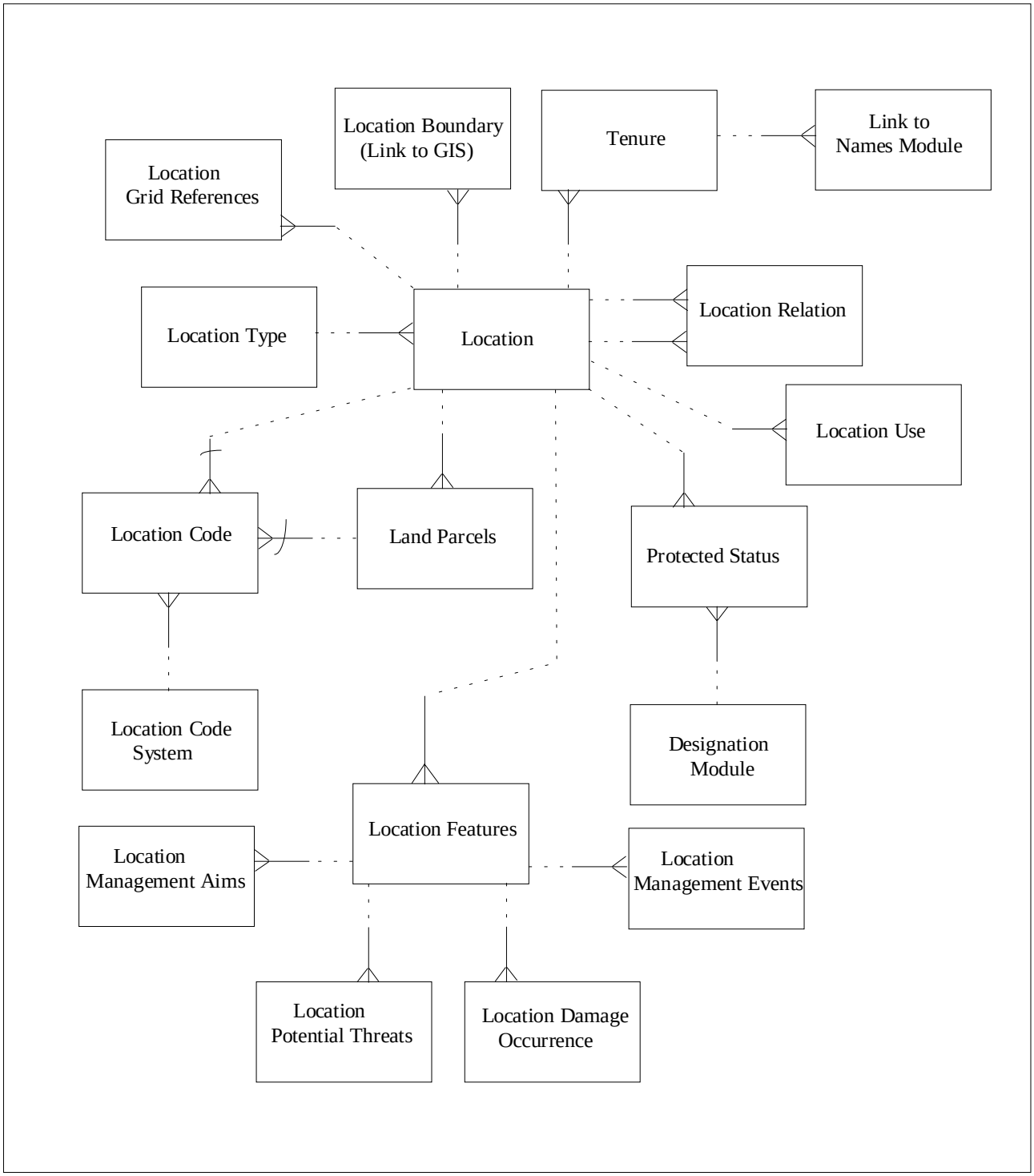


Figure 18: Extended LDM for the Location Module with Feature Monitoring

9.6 Individuals and Organisations Module (Contacts) Logical Data Model

The model proposed for the contacts module is based on the assumption that links may be needed to both individuals and organisations and that much of the information required is common to both. For this reason, the central entity of the contacts module is called **Name** which points to subtype entities for individuals (**Person**) and organisations (**Organistion**) each with its own appropriate attributes. Names of people or organisations are referred to throughout the application, as recorders, determiners, authors, owners, participants in events etc. In the physical model in Annex 3, the most obvious are 'hard-coded' as attributes using Name_Key or a synonym. This may be in a linking entity such as **Survey_Recorder** which allows multiple recorders to be associated with a recording event or as a single attribute of an entity (e.g. determiner in determinations) where appropriate. Logically it is possible to generalise the relationship by creating a multi-purpose link entity which could associate any name with any table or attribute but this would have very few build advantages.

Individuals and organisations may also be known by one or more codes (including national insurance number and BRC recorder code) each of which is stored in **Name_Code.** This could be important in the future as the wider availability of data through enhanced exchange facilities or the delivery of information over the Web could lead to a need for unique codes for every recorder.

Details of addresses (**Address**) are kept separately and associated with individuals or organisations through a linking entity (**Name_at_address**) which includes dates. In this way several 'names' can share one address and one 'name' can have several addresses either simultaneously (home & work) or sequentially (changes of address). Any name can be linked to any number of electronic communication numbers such as telephone, fax or email through the **Comms_Number** entity. For simplicity, numbers are linked direct to names although this would need the addition of attributes for address_key and date to avoid confusion.

Names (individuals and organisations) can be linked together through the **Name_Relation** entity which records dates and nature of the association. This entity can be used to record anything from membership of societies, marriage and employment to corporate mergers. A separate entity called **Name_Role** allows individuals and organisations to be classified for various purposes such as listing all local record centres, wildlife trusts or vice county recorders.

One contentious item is the inclusion of a **Taxon_Skill** record for the purposes of checking determiners against required skill identification levels recorded for taxa. This was dropped from the current version of Recorder because of fears of complaint under the Data Protection Act but is included here as a marker that this problem will need to be tackled if the NBN is to become a reality. In this model any individual (or organisation) can have any number of taxon skills all of which are associated with dates and a statement of who applied the accreditation.

It would also be possible to use the Contact module as the basis for tracking interactions with any individual or organisation. This is represented in the model by the **Communication** entity which includes attributes for communication type and file reference. It could include copies of files or pointers to them in other systems. This could include notes of telephone conversations, copies of letters or data supply agreements and could also be linked to a data transfer tracking module (not yet modelled). The use of name keys from Name in the same way as the Name_Relation table (logically this is a sub-type of Name_relation) means that communication between any individuals or organisations in the database can be recorded.

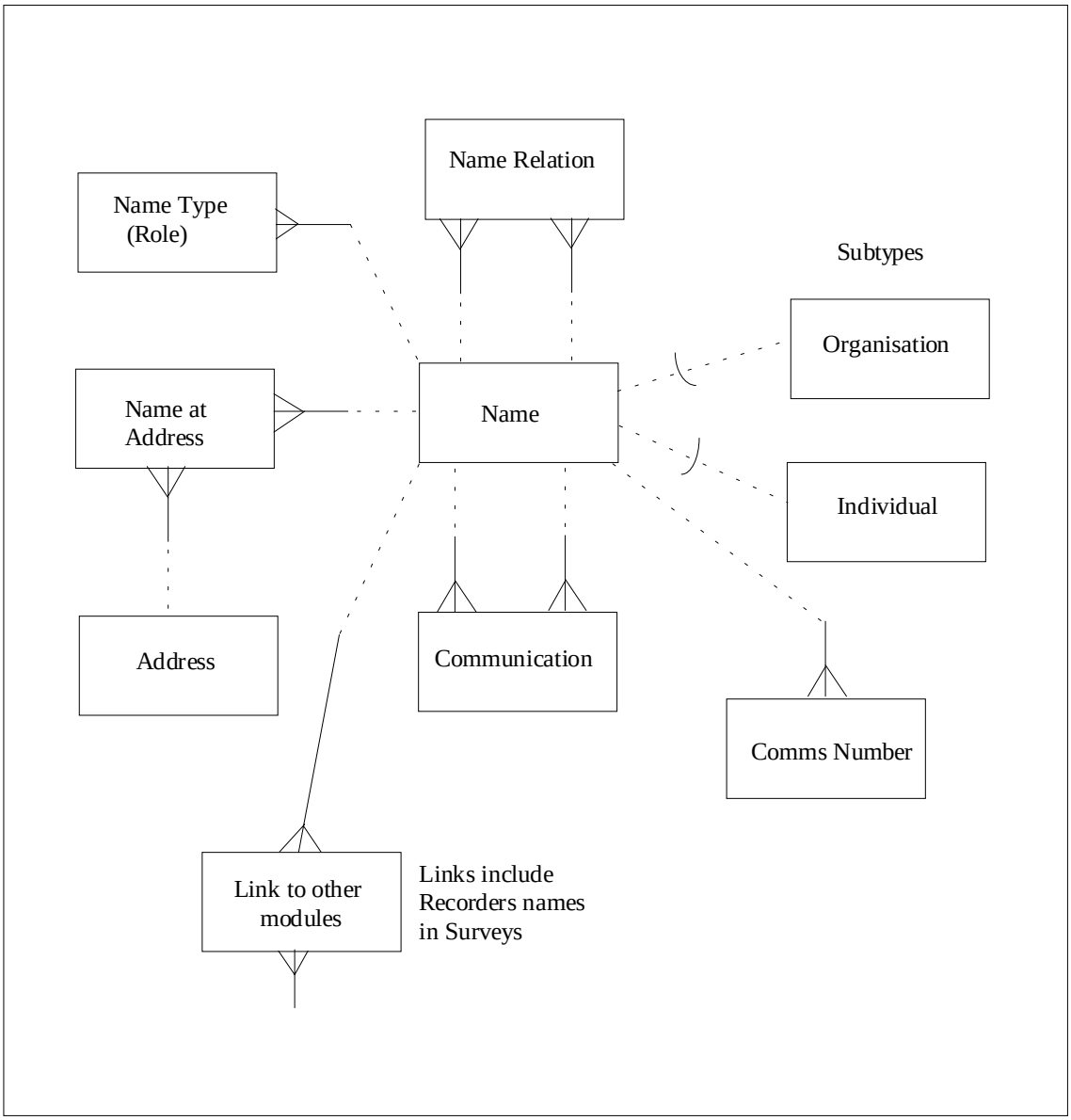


Figure 19: LDM for People and Organisations Module

9.7 Events Module Logical Data Model

The Events table is probably the least used part of Recorder at present. This is because Recorder is not generally used for site management or monitoring purposes and most records being submitted to record centres do not include details of visits/recording events that are not already part of the main taxon record. This may continue to be the case with the new version of Recorder although the extended data model would allow the application to be effectively used for management purposes. In the new model events are separated into two types which are handled differently. Events related to recording are stored in the Recording Module as Survey_Events, other locality related events (mostly management events) are stored in the Events Module which is linked to the location module.

The modelled structure, at present, is very simple. The central entity is the **Event** which includes detail of the date (start & end) , event type and description. This is linked to the Contact module by a linking entity (**Event_People**) and to one or more locations through another linking entity (**Event_Location**). This gives great flexibility in that any number of people or organisations can be linked to any number of locations by a single event.

9.8 Source Module Logical Data Model

The source module provides a means of tracking the origin of any of the information in the database, ranging from a whole dataset to individual items of data in the dictionaries. There can be many types of source ranging from word-of-mouth to collections of specimens. The information content of the source record may also need to change depending on what the source is referring to. This has been modelled using a simple **Source** entity which includes subtypes for specific purposes. The two subtypes included in the physical data model (Annex 3) cover the extra information needed for datasets (**Dataset_Source**) and museum collections (**Collection**).

The **Dataset_Source** record includes the dataset name, information on the owner of the data, what copy version this is, what validation has been used and what restrictions are placed on use. This comprises the metadata record for the dataset and this entity can provide the metadata summary of the whole database for network purposes. The **Collection** record gives the collection name, is and where it is housed. It could be extended to provide more extensive details if required although this is crossing over into museum application territory. Other forms of subtype can be added as they are identified.

The Source record can link to the references, images and contacts modules through link entities as required. This means that, for instance, the source of a taxon record could be a reference and also a source can be linked to people with whom agreements are documented in the **Communications** table.

The source record can be linked to any table and any attribute in the database through a generalised **Source_link** entity. In the physical model (Annex 3) in many of the places where a single source record will definitely be needed these have been included as attributes (Source_key) where this is most likely to be efficient in build terms.

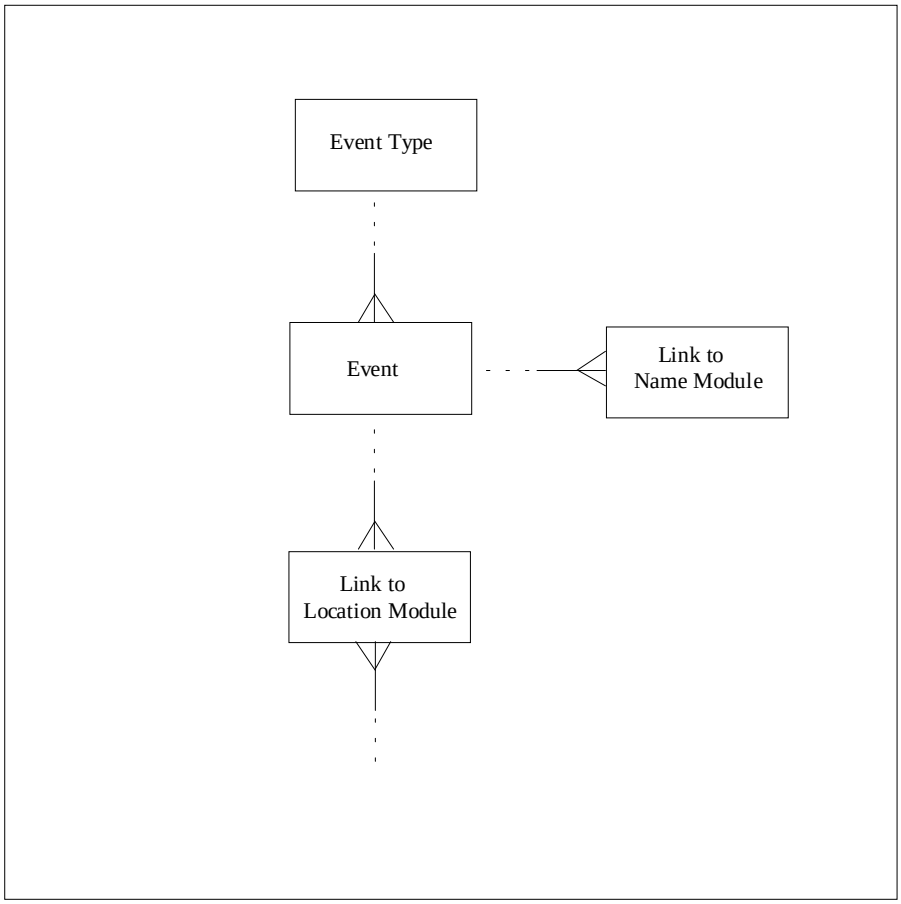


Figure 20 : LDM for Location-related Event 21 events and source

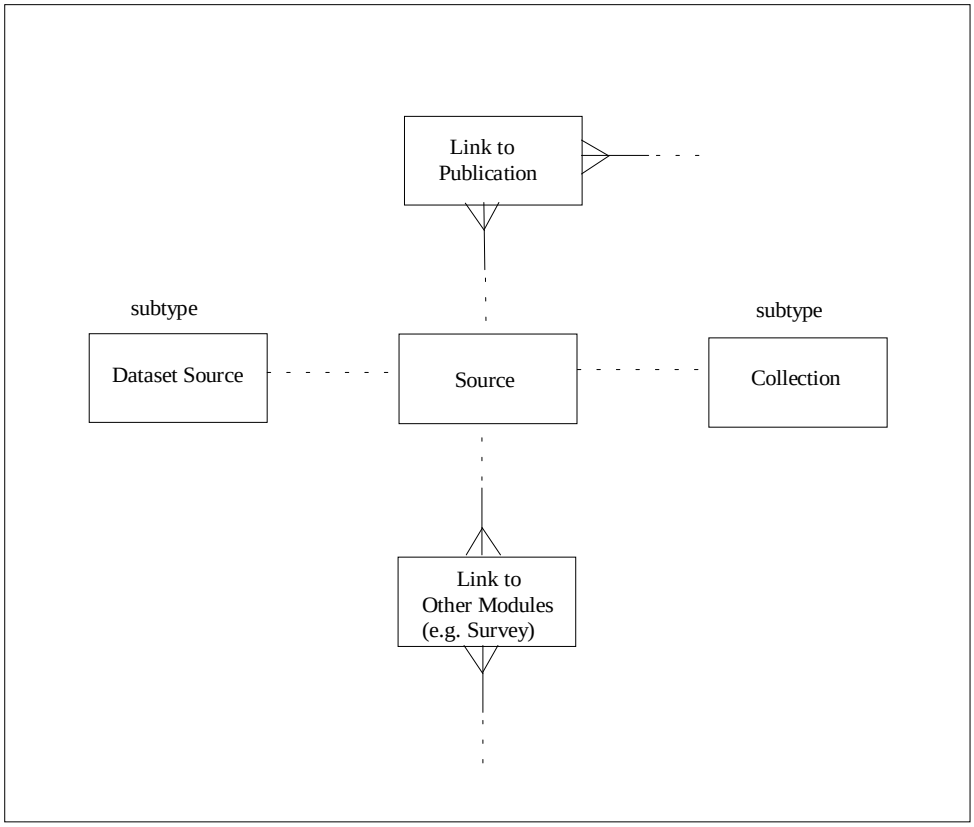


Figure 21: LDM for Source Module

9.9 Images Module Logical Data Model

The image module could become important in future applications as machines become better able to store and display electronic images and pictures would be integral to any attractive web-based delivery software. The image module offers an integrated way of dealing with images of all types from oil paintings and bookplates to digital video. The basic identifying information is maintained in the **Image** table which could also store images or pointers to images in other systems. The Image entity is subtyped to provide the appropriate attributes for different kinds of image, for instance **Moving_Image** includes information on format, duration and soundtrack whilst **Artwork_Image** would include information on the materials used and so on. Not all of the attributes of these subtypes have been elucidated so far, but much work has been done in this area by the MDA and the LASSI project which would provide most of what is needed.

In addition to subtype information, other entities are linked to the main image entity, including **Image_Dimensions** and **Image_Reference_Codes**. Images can be related to each other through an **Image_Relations** entity which would cover copies of images in different formats, prints from negatives and so on.

The model presented here uses three link entities to cover images in publications (**Image_In_Publication**), images of locations (**Image_of_Location**) and general links to any other table (**Image_Link**). These three could be merged into a single link table if desired although the decision may be based on build constraints.

9.10 Text and References Module Logical Data Model

The Text and References module is essentially similar to the Images Module in that it has a central entity (**Publication**) which could be sub-typed to match different types of publication and manuscript. In the

physical model (Annex 3) these subtypes are merged into one table. It would be up to the application builder to provide the interface logic which displays only the attributes relevant to the type of reference.

The model is essentially a very simple on which includes a dictionary of Journal and Serial names (**Serial**) to provide controlled data entry. **Publication_External_Number** allows various reference numbers to be associated with any publication or manuscript including shelf numbers, Library of Congress and ISBN numbers.

A **Publication_Keywords** entity is included because many users like to link publications to specific concepts such as a taxon and whether this is an identification text. Keywords are notoriously difficult to control and this area would benefit from a degree of controlled terminology.

References should be linkable to any other table and attribute in the database through a linking entity (Reference_Link). This is covered in the physical model although in some tables a direct link to publication has been included as a marker that a reference is needed, again something which would be a build decision. [i.e. do you need complete flexibility of reference linking or can it be pegged down to a fixed number of essential points.]

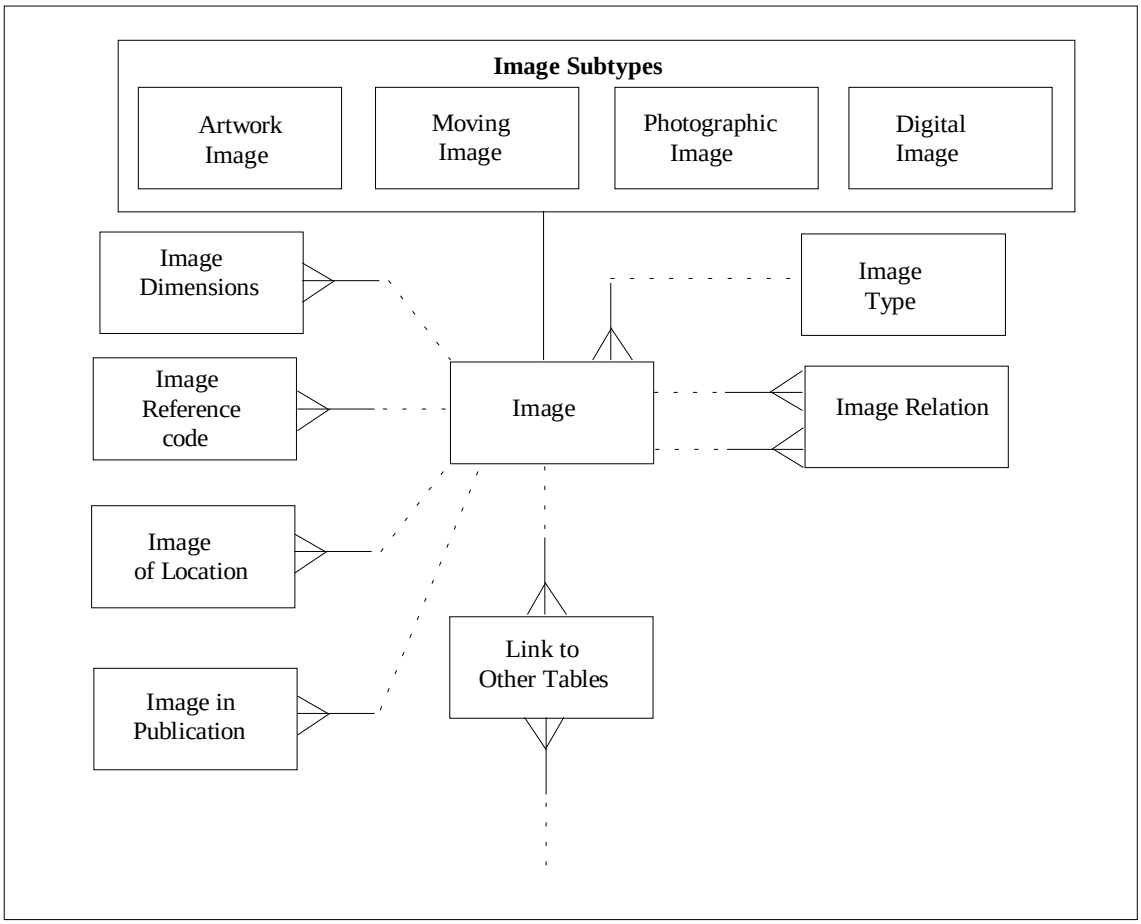


Figure 22: LDM for Image Module.

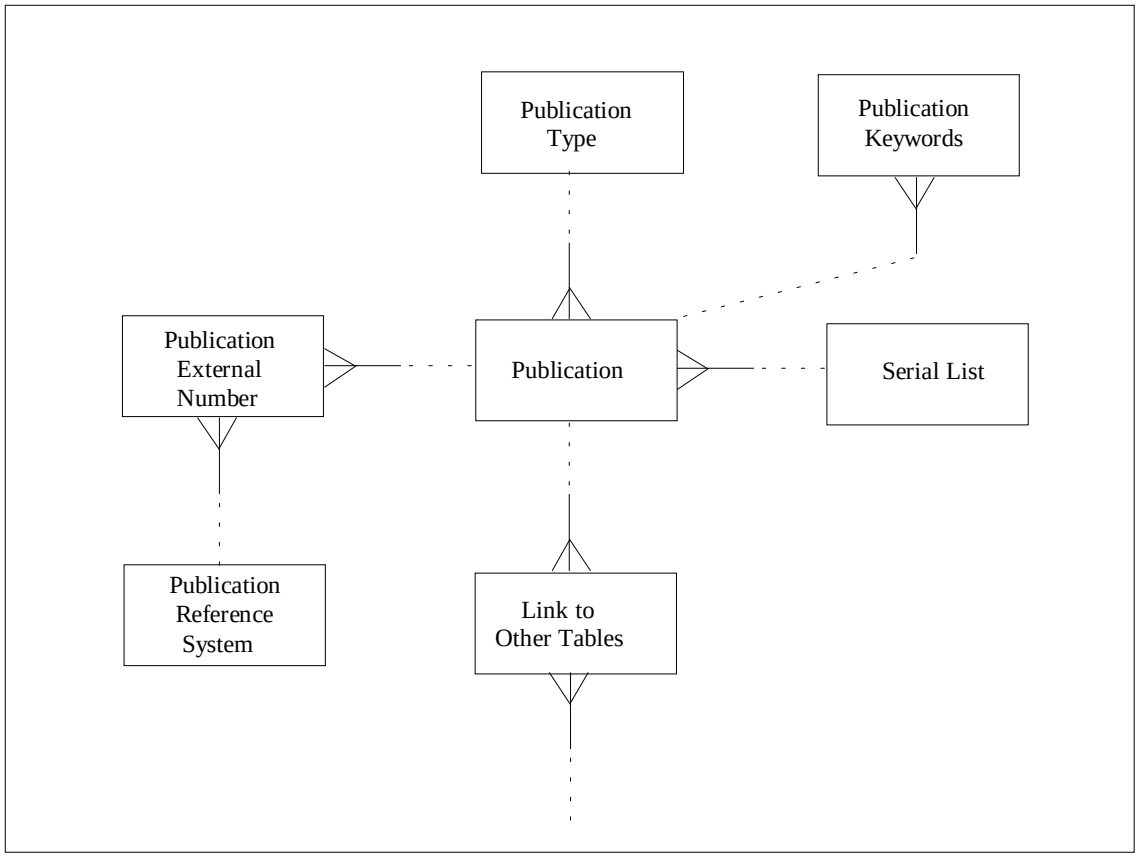


Figure 23: LDM for Publication & Text References Module

9.11 Biotopes Dictionary Module Logical Data Model

There are many biotope and landcover classifications in use in the UK. These include;

- Phase I (NCC/RSNC)
- National Vegetation Classification (NVC)
- CORINE
- Habits and Species Directive - Annex 1 Biotopes (EC Directive 92/43.EEC)
- Birks & Ratcliffe Upland Classification
- Shimwell Urban Habitats
- Peterken Woodland Stand Types
- ITE Baseline Classification (1994) - based on CS1990 Reporting classes
- Corine Land Cover (Satellite remote sensing)
- CS1990 - Field Survey
- CS1990 - Land Cover Map (Satellite remote sensing)
- Forestry Commission Census of Woodlands and Trees (Air Photo)
- Monitoring Landscape Change (E & W) (Air Photo)
- National Countryside Monitoring Scheme (Scotland) (Air Photo)
- Land Cover of Scotland (Air Photo)
- Northern Ireland Countryside Survey (Field Survey)
- MAFF Agricultural and Horticultural Census (Questionnaire Survey)
- MAFF Agricultural and Horticultural Census (England)/ Agricultural Census (Scotland)/ Welsh Office Agricultural and Horticultural Census (Wales)/ Agricultural Census (Northern Ireland)
- National Parks Monitoring Scheme (Air Photo)
- Environmentally Sensitive Areas (ESAs) Monitoring (Air Photo)
- UN/ECE statistical Classification of Land Use (Classification only)

- National Land Use Classification (Classification only)
- DOE Land Use Change Statistics (Field Survey)

An even wider range of classifications is in use worldwide ranging from global habitat classifications down to country/sub-continent vegetation classifications. Biotope classifications are generally based on a hierarchical code expanded by an equivalent term e.g.:

NVC structure

1. Aquatic communities
   - A Floating aquatic
     - A1 Lemna gibba community
     - A2 Lemna minor community
       - A2a Lemna minor - typical subcommunity
       - A2b Lemna trisulca subcommunity
       - A2c Riccia fluitans - Ricciocarpus natans subcommunity
     - A3 Spirodela polyrhiza ..... etc.

Each classification may exist in more than one version. Version differences may be extensive or small accretional changes. Some of the classifications in use have also accumulated undocumented changes over time from which complications can arise as copies of a classification distributed with applications do not get updated or are themselves altered. This has happened, for instance, with copies of the NVC installed with the VEGAN (Vegetation Analysis) database used in the UK country conservation agencies.

There is a keen interest in the correlation of specific habitat classifications e.g. matching site data recorded using NVC terminology to the Corine-based habitats used in the Sites and Species Directive . A valuable comparison of UK and European classifications has been done by ITE in relation to the DoE (DETR) Countryside Information System (CIS). To achieve this each of a number of common habitat and landcover classifications were correlated to a new ITE Baseline Classification (ITE 1994).

Many older surveys used classifications which have since been superseded, for instance the Birks & Ratcliffe Upland Habitats Classification has been superseded by the NVC and users will wish to translate old records into their newer equivalents for analysis and comparison with more recent surveys. This latter task is not that simple because most classifications will not have a direct one-to-one equivalence because they may be based on different criteria or set at different levels of 'lumping' or 'splitting'. A further complication can arise from the way that classifications may have been interpreted in different surveys or in different areas. In this case habitat translation may be specific to a country, region or even a single site.

The creation of biotope classifications has not stopped, new ones appear with great regularity (e.g. a scheme for use with the Biodiversity Action Plan , a standing waters classification and a marine habitats classification are just three recent additions). Widely used, existing classifications such as NVC and Corine are also being added to and modified. The Biotopes Dictionary must be able to provide the user with the right version of the classification for their purposes e.g. for a new application or understanding an older dataset. For this reason it will be necessary to track updates of the dictionaries and flag changes so that users do not lose information when updated.

For many purposes recorders may only need a simple 'flat-file' listing the biotope or landcover checklist which they favour and this may be all that is supplied with a simple data-capture programme. A more functional application will, as demonstrated, need access to a wider range of checklists and versions and be able to translate between them. The data model presented in figure 24 attempts to deal with all of the considerations listed above.

The heart of the model is the **Biotope** which refers to individual biotope or landcover terms. Biotopes are related to **Biotope classifications** (and more particularly **versions of Biotope Classifications**) by their appearance in individual **Checklists.** The order of biotopes within checklists may be recorded by a sort number and their hierarchical position by a parent term code [represented by the 'pigs ear' in the diagram].

Individual biotopes may carry one or more **Biotope Codes** which can be used for sorting or ease of reference although most will have a single code within the original classification which is probably best stored as an attribute of the Biotope.

Biotopes may be related to one another (e.g. for the purposes of mapping equivalents in different classifications) through a **Biotope Equivalent** entity. This entity acts as a link entity to lists of other biotopes, locations and administrative areas. In this way it is possible to record complex relationships such as ; in Area 1 , biotope A in classification X is equivalent to biotopes B, C & D in classification Y but in Area 2 it is equivalent to C, D & E. Unfortunately, the fact that it will be possible to record such fine levels of discrimination will not make it easy to write applications that can use this information!

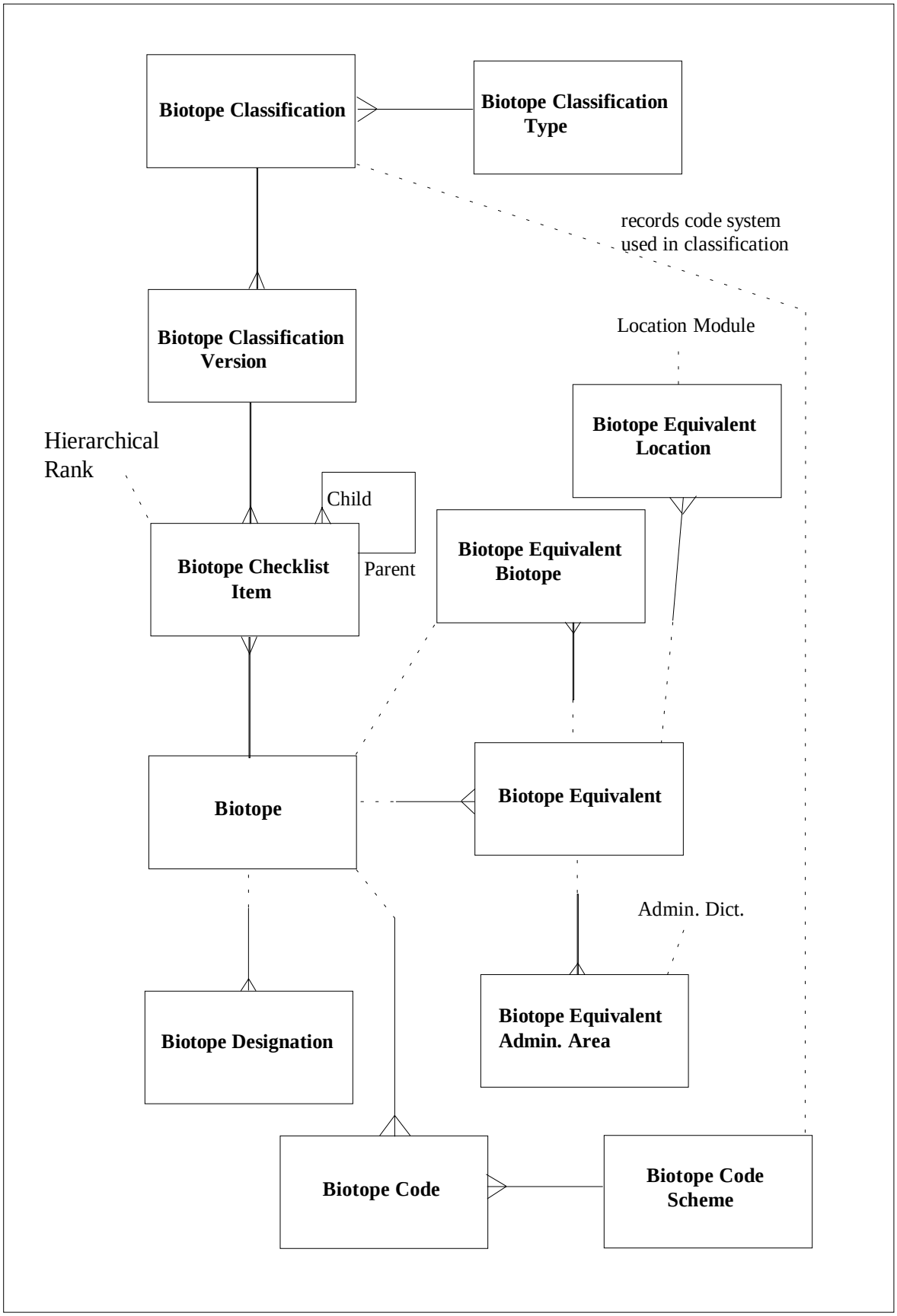

Biotope Classification
Biotope Classification Type
records code system used in classification
Biotope Classification Version
Location Module
Biotope Equivalent Location
Hierarchical Rank
Child
Biotope Checklist Item
Parent
Biotope Equivalent Biotope
Biotope
Biotope Equivalent
Admin. Dict.
Biotope Designation
Biotope Equivalent Admin. Area
Biotope Code
Biotope Code Scheme

Figure 24 : Logical Data Model for Biotope Dictionary

9.12 Taxon Dictionary Module Logical Data Model

A checklist of species is an essential requirement for any activity involved with biological recording, biodiversity or conservation. There is, at present, no official checklist of taxa occurring in the UK or its constituent countries and neither is there a readily accessible single source of checklists for individual groups of taxa although the Recorder species dictionary fulfills this role to some extent.. BRC receives requests on almost a daily basis for advice on species names or sources of checklists and independent projects for marketing of taxon lists such as the Darwyn Sumner Checklists of British Flora and Fauna attest to a perceived market for this information. A reliable taxon dictionary which includes and correlates checklists of British fauna will be an essential prerequisite of the NBN.

The most important feature of the Taxon Dictionary proposed in this analysis is that it will not be a single checklist of taxa but a mechanism for storing many checklists and versions of checklists together with the means for translating from one to another. This is what makes it very different from virtually all other taxonomic database projects. The importance of this is that biological records should be stored with their original determinations to which redeterminations may be added. It should be possible for the software to retrieve taxa using correspondences of names in alternative checklists. Needless to say this is a very ambitious target and will require immense work to achieve satisfactorily for all groups.

The proposed structure for a taxon checklist dictionary is given in figure 25. This model differs substantially from other taxonomic databases (e.g. the IOPI data model) because it is primarily concerned with the relationships of names in checklists so that essentially there is no single 'right' list of taxa although it is envisaged that there will be a 'Recorder' (or NBN) list which attempts to fulfill this role as a baseline reference for currently accepted terms.

In the model, **Taxon** holds all unique name and author combinations with date of introduction. This table should include all synonyms, genus/species combinations, infraspecific and subspecific names. These names are the raw material which is interpreted and related through other tables.

All unique taxonomic appellations have at least one version but the same term may be used in several contexts through the process of taxonomic revision (e.g. lumping and splitting). It is thus necessary to store taxa keys in a **Taxon Version** table so that the right 'meaning' of a taxon can be linked to specific **checklists** or **checklist version**. A checklist can be any defined grouping of taxa, most commonly a published list but it can also be an informal list used for some particular recording project or even locally used common names.

Earlier versions of the model held common names and informal groupings of taxa (e.g. the term waders) in a separate table linked to taxon but analysis shows that there is no difference between formal taxa (ones created within the rules of the taxonomic conventions) and informal ones in terms of versions, relationships and associated information. For instance, bird recording in the UK is almost exclusively carried out using common names and protected status, distribution facts and family relationships are all linked to the common names. In this version of the model all naming terms are therefore placed in taxon and taxon version. This does not preclude separation for convenience in particular applications.

Hierarchical relationships of taxa and taxon synonymies are functions of individual versions of checklists. It is quite common for 'competing' checklists/revisions to have quite different relationships for taxa. This is handled by representing each taxon in a particular checklist version in the **Checklist Item** table to which a **checklist item synonymy** table is linked. Hierarchical relationships within a checklist can be handled by a combination of declaring the taxon's rank (see **taxon rank** table), declaring the immediate parent term for the current item and storing a checklist item sort code to ensure listings come out in an appropriate order.

It is assumed here that for all practical purposes, facts about the taxon such as its association with given biotopes or other taxa and general information (biology, behaviour etc.) are linked to the taxon version (although most could be related to the taxon master entry). There may actually be information about a

taxon which is specific to an individual checklist (e.g. the scientific description) but this could be overcome by including a link to checklist item in the fact table in addition to the taxon version key.

A similar argument holds for **taxon codes** which for convenience are linked to taxon version although most codes are checklist specific and could therefore be stored under checklist item. This would, however, make it more difficult for retrieving a taxon name from a given code or finding all codes for a taxon. The best solution is to store the checklist version key as an attribute of taxon code and where necessary link coding scheme to checklist.

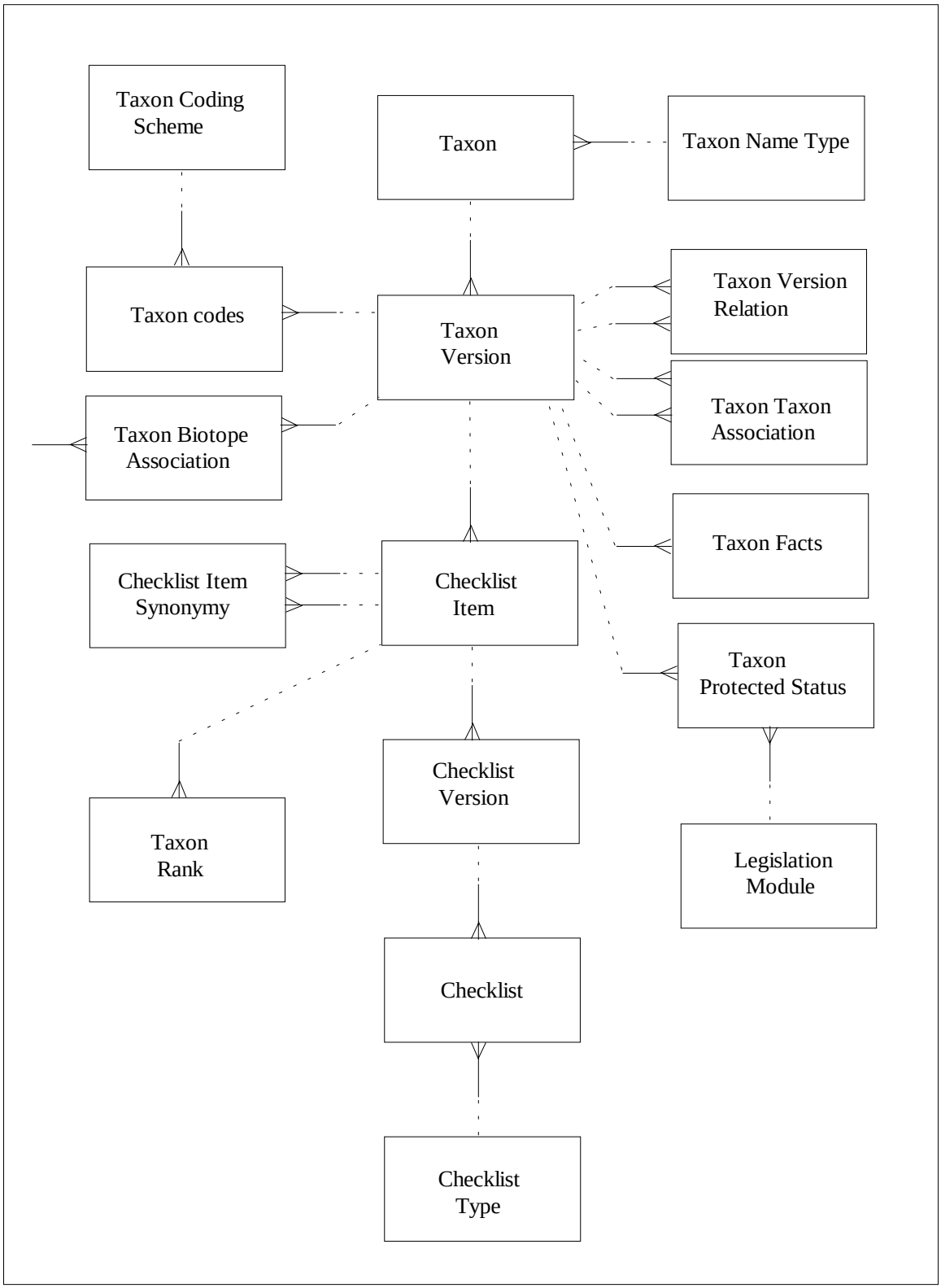


Figure 25: LDM for Taxon Dictionary Module

9.13 Protection and Legislation Dictionary Module Logical Data Model

The model presented here (see Figure 26) is strictly provisional and will require refinement before it can be used to maintain a master dictionary of legislation and protected status. Various models and databases already exist within the conservation agencies and JNCC although none at present (as far as I know) are comprehensive for sites, biotopes and taxa. The present model would be functional as a module within Recorder for storing basic information on the protected status of sites, species and biotopes and could probably be simplified in the build stage.

One difference between this model and existing legislation databases is that the 'core' item is the **Designation Type/Schedule** Table which holds the list of all protected status designations including those without legislative backing (e.g. GCR sites and County Wildlife Sites). It is the equivalent of the status 'popup' in most existing applications (e.g. for site status in Recorder or GD2). Designation terms include Annex references in European legislation and can be applied to species, biotopes, locations or earth science features and are linked through a linking entity (e.g. **Location designation**) which records details of date introduced and , if applicable, date rescinded.

Designations may be limited to one or more geographic areas (**Geographic Cover**) . For instance, ASSIs are limited to Northern Ireland and some taxon protection only covers part of the taxon's range.

Where status is backed by legislation the link is to a specific **Version/Amendment** of the **Legislation** so that additions and deletions from lists can be tracked in the case of taxa or biotopes listed in annexes to legislation. Individual items of legislation have an Authority (i.e. EC, UK parliament etc.) responsible for them and an area of jurisdiction (e.g. a list of countries).

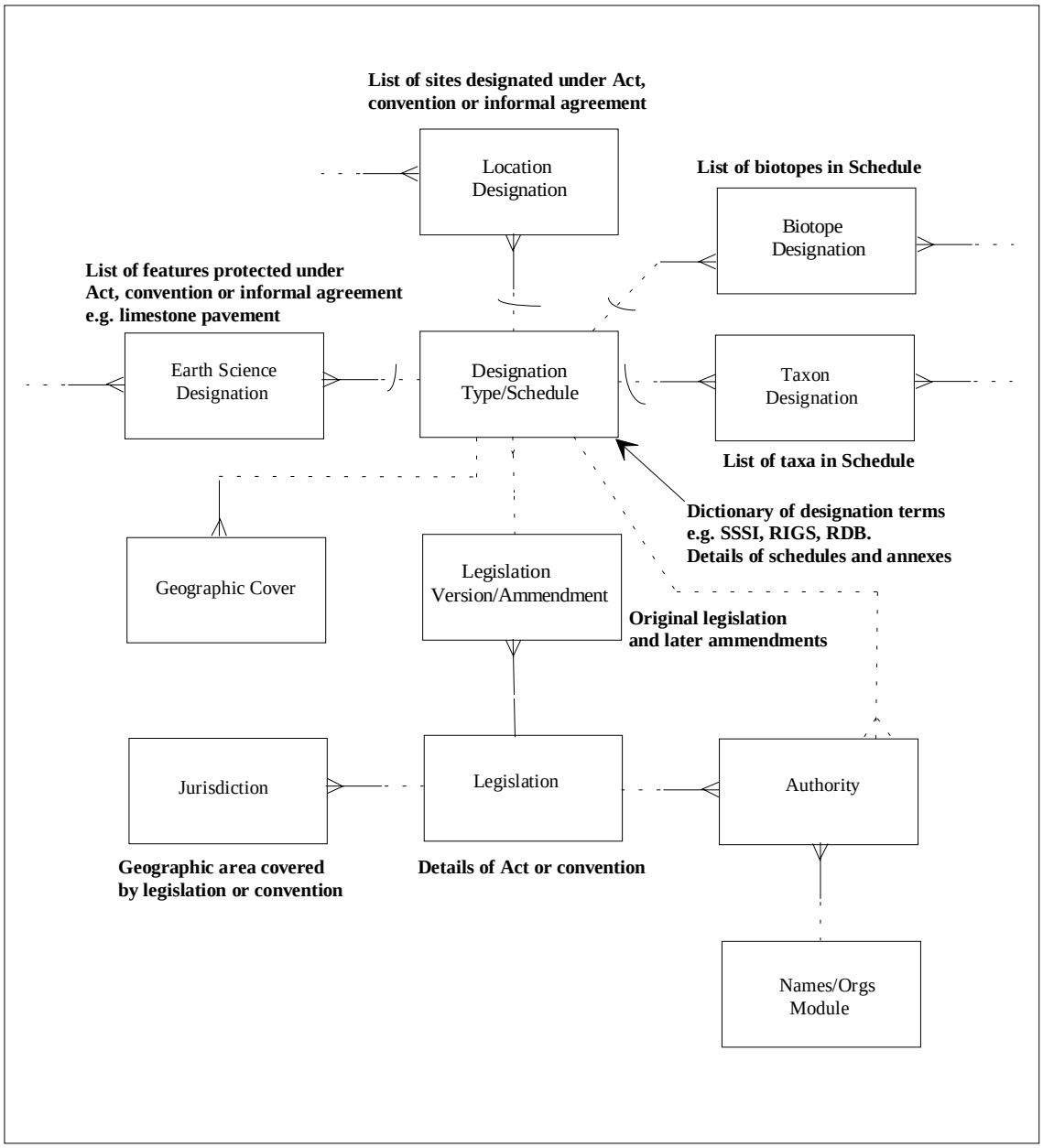


Figure 26: LDM for Protected Status and Legislation Module

9.14 Stratigraphy Dictionary Module Logical Data Model

A provisional model for a stratigraphy module is given in Figure 26. The nature and control of stratigraphic terminology is very similar to the control of names in taxonomy. There are internationally recognised rules governing the creation and specification of stratigraphic terms but there are also many 'informal terms' in use. The existence in stratigraphy of different types of classification (**Strat Term Types**) such as biostratigraphic, lithostratigraphic and chronostratigraphic and the way in which stratigraphic horizons often change nature and name over geographic areas means that there is an important requirement for recording relationships between terms.

Like taxa, **Stratigraphic Terms** may be redefined by later authors and thus must be represented by **Stratigraphic Term Versions** in the model. All terms and versions can be linked to the publication in which they are first described.

There are several **Stratigraphic Coding Schemes** in use including BGS Map Codes and Various Zonal codes in biostratigraphy. Any stratigraphic term version may, therefore, be linked to one or more **Stratigraphic Codes**.

Stratigraphic terms are commonly arranged and rearranged in publications which may be regarded as **Stratigraphic Checklists** and individual terms may appear as **Stratigraphic Checklist Items** in one or more **Stratigraphic Checklist Versions**. Items within checklists will have an order in which they should appear; normally youngest at the top. Sorting could be achieved using radiometric dates for the base of each horizon represented by the terms but this will not be known for all terms. For simplicity, sorting can be achieved in the same way as was proposed for the taxonomic model where, in this case, every checklist item is given a **stratigraphic rank** and includes a reference to its parent term and a checklist item sort code.

Correlation between stratigraphic terms should be done between checklist items. The correlation between statigraphic entities is rarely one-to-one or complete. The more usual situation is for a single 'name' to have several equivalents and partial equivalents and these may vary according to geographic area. In the model this is achieved by having a **Stratigraphic Relations** Entity linked to Strat Checklist and referring to separate **Strat_Rel_List** (list of related strat. terms) and **Strat_Rel_Geog List** (List of geographic areas) entities.

9.15 Controlled Termlists

In addition to dictionaries which include a variety of 'value-added' information, recorders need access to simple controlled lists of terms which may or may not include a basic definition of the term. Typical examples include lists of life stages, collection methods, record types , potentially damaging operations or even agreed 'keywords'. The data structure for such a list can be very simple consisting of a term table and a corresponding term type list. Most of the termlists needed for the Recorder rebuild are already available in the existing recorder and will simply need to be exported in a suitable format.

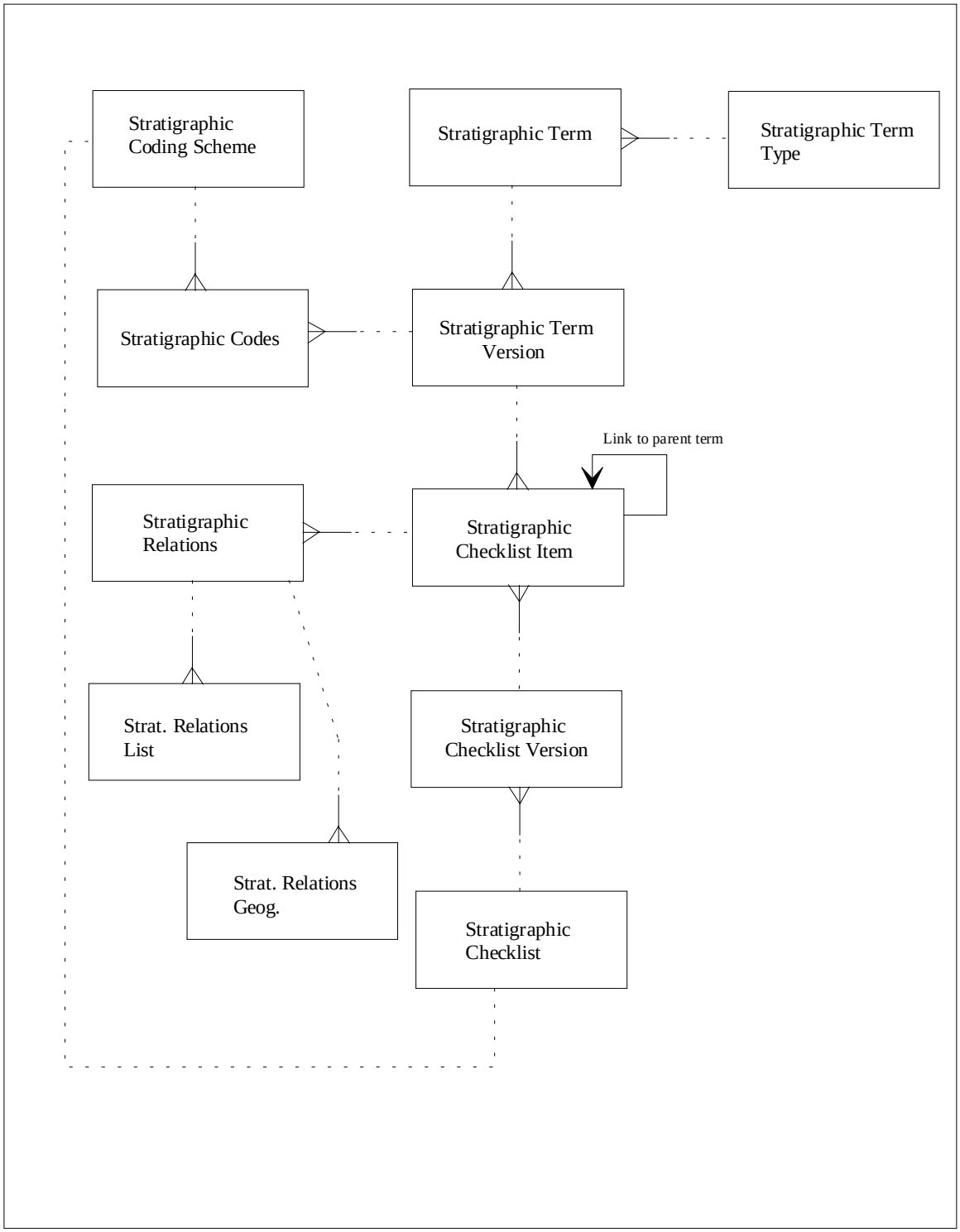


Figure 27: Logical Data Model for Stratigraphy Module

10. Outline Processes and System Functions

10.1 Update Functions

The relational data model developed in Annex 3 includes 135 tables but most of these are detail entities relating to masters within the individual modules. Every entity will need a maintenance screen (to add/edit/delete records) but only a few will need to be directly accessed from the application main menus. The candidates for inclusion as menu items and buttons on the speed bar are:

- **Survey**: Add/Edit details of surveys and metadata relating to records and drill down to add records through sample event and sample screens.
- **Site/Location**: Add/Edit details of named locations including links to site protection, ownership, site codes, relationships, management events and maps.
- **People & Organisations**: Add /Edit details of people and organisations including links to their addresses, telephone, fax, email numbers, relationships and roles.
- **Record Cards**: Add/Edit details of survey events, samples and details of physical features of the location, biotopes and taxa direct from record card images. (see Getting biological records into Recorder)
- **References**: Add/Edit details of published and manuscript text references.
- **Dictionaries**: Add/Edit local user parts of taxon, biotope and protected status dictionaries.

This analysis is taken further in Annex 4 which gives a listing of the likely layout and functionality for a 'slim' version of the new Recorder suitable for local naturalist's use.

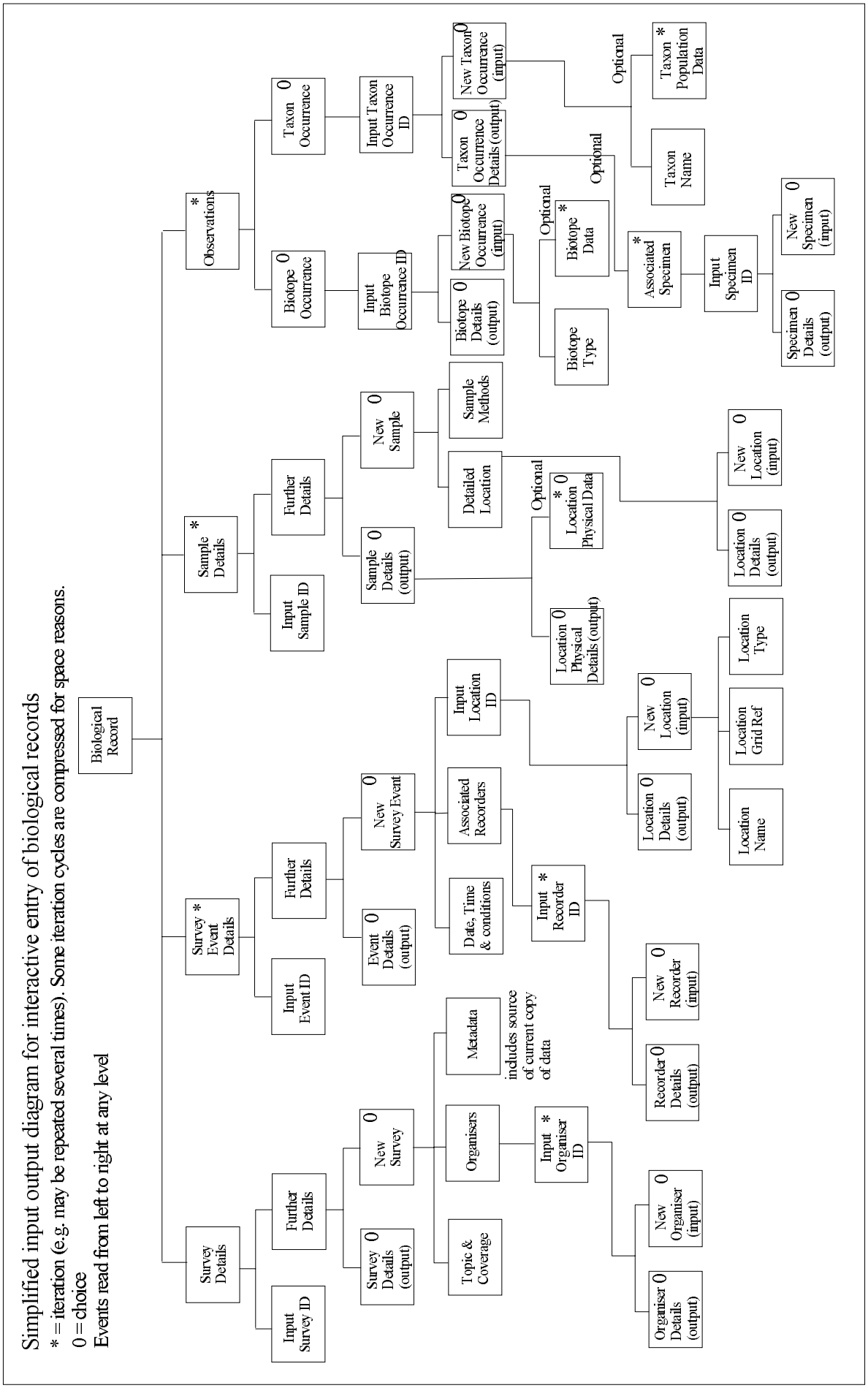
10.2 Getting Biological Records into Recorder

The analysis in the section on the anatomy of biological records (section 6) showed that although at its simplest a record might only be four items of information (who, what, where, when), the great variety of what can be recorded and the need to document source and quality means that the underlying database structure needed to manage the information is complex. Data entry will often involve transcription and translation of information from a relatively simple source structure (e.g. a record card or spreadsheet table) to the structure needed to manage the information within the LRC context. The nature of the input process that users might wish to employ will vary according to the type of data and the local arrangements. In some cases the best method to do this will be interactively, one record at a time, whilst in others more streamlined methods will be appropriate. Typical situations include;

- A general set of table maintenance screens that users can navigate e.g. Survey ⇒ Recording Event ⇒ Sample ⇒ Choice of generalised Biotope, Taxon or Physical Location records. This is essentially the same as using the Site and Species windows in the present Recorder. Figure 28 gives a simplified summary in the form of an input/output diagram of how the user would relate to the database when entering or editing biological records in this manner. An example of how this might physically be achieved in the windows environment is shown if figure 29 (taken from the CCW Habitats Database prototype built using the data model developed in this analysis) where access to individual entities is made via buttons on the speed bar and selection of individual records (e.g. survey site) is achieved through a selection screen. Addition of associated information to a major entity e.g. list of biotopes for a survey site is achieved through further windows accessed from buttons on the individual data entry window.

- Specific project data entry screen e.g. data entry screen designed for nest record with number of eggs, hatch rate and fledgling success. Note that most project specific recording would need to extend the number of attributes in the underlying tables. This does not exist in the current Recorder.

Quick entry of simple taxon lists using popup species lists based on known recording cards (e.g. BRC cards) or from user-defined lists. This is a much-used feature of the present Recorder and one that was generally seen as a 'must' for the new version. The brief and extended lists have a single screen for common data and then allow the entry of taxon specific information onto columns.


Simplified input output diagram for interactive entry of biological records
* = iteration (e.g. may be repeated several times). Some iteration cycles are compressed for space reasons.
0 = choice
Events read from left to right at any level
Biological Record
Survey Details
Input Survey ID
Further Details
Survey Details (output)
New Survey
Organisers
Input Organiser ID
Organiser Details (output)
New Organiser (input)
Topic & Coverage
Metadata
includes source of current copy of data
Survey Event Details
Input Event ID
Further Details
Event Details (output)
New Survey Event
Associated Recorders
Input Recorder ID
Recorder Details (output)
New Recorder (input)
Date, Time & conditions
Input Location ID
Location Details (output)
New Location (input)
Location Name
Location Grid Ref
Location Type
Location Physical Details (output)
Optional
Location Physical Data
Sample Details
Input Sample ID
Further Details
Sample Details (output)
New Sample
Detailed Location
Sample Methods
Observations
Biotope Occurrence
Input Biotope Occurrence ID
Biotope Details (output)
New Biotope Occurrence (input)
Optional
Biotope Type
Optional
Biotope Data
Associated Specimen
Input Specimen ID
Specimen Details (output)
New Specimen (input)
Taxon Occurrence
Input Taxon Occurrence ID
Taxon Occurrence Details (output)
New Taxon Occurrence (input)
Optional
Taxon Name
Optional
Taxon Population Data

- User defined speed entry facility essentially similar to the brief list in Recorder except that all information is in columns and may be user defined. Users set up a data entry template which displays in table view (like a spreadsheet). Field entries can be repeated from line to line (Figure X.). This facility is mainly useful for entering simple data such as long lists of taxa where location, date or recorder may change and is used extensively by BRC for inputting data from national recording schemes.

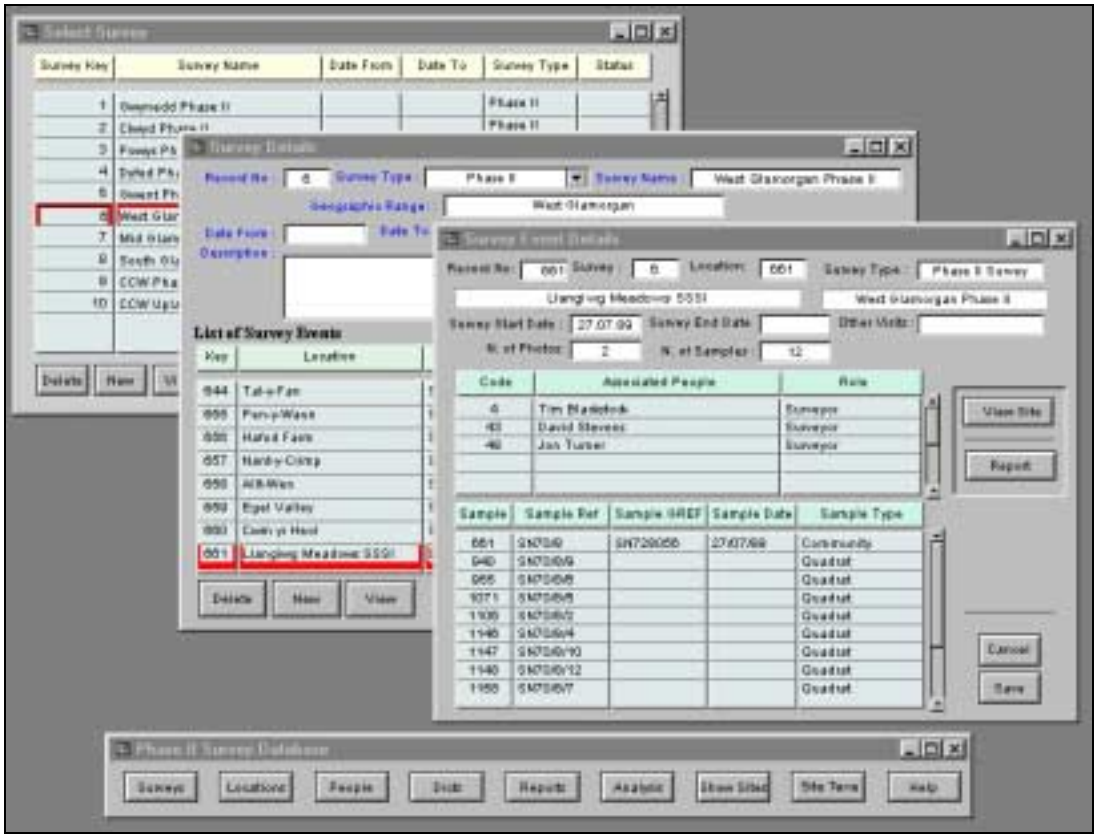


Figure 29: Example of data entry windows from the prototype CCW Habitats Database

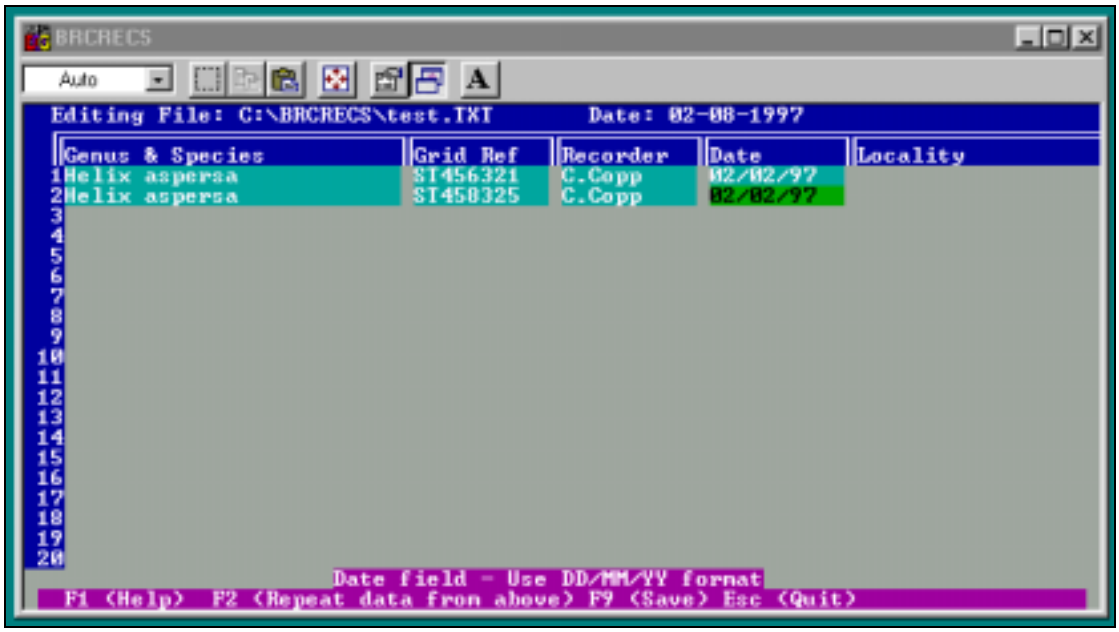


Figure 30 : BRCRECS data entry program as used by BRC. The column headings are user definable.

- The windows environment could also allow the development of a graphical form of the Recorder brief list using recording card facsimiles which could be filled in on-screen by typing text entries and clicking species presence. The most commonly used national scheme cards could be available either as part of Recorder or as extra add-ons. [These have been successfully modelled in recent prototyping test].

- Data entry direct from a map. Details of location boundaries can be kept as scanned pictures within the database or as polygons displayed on raster or vector maps within a GIS. Both can be calibrated to enable biological records to be located by clicking on the map. A number of small recording applications already have this facility and this would also be regarded as an essential feature of a more integrated Recorder/GIS setup.

- A number of schemes (e.g. BTO surveys) use optical character recognition to read data directly in from recording cards. To be reliable this relies on the extensive use of tick boxes. This could be a feature of Recorder or more, likely, could be developed for specific projects with a data transfer protocol for import of the scanned and validated records into Recorder.

- A growing number of local record centres use 'satellite' recorders to enter their own data and import the validated information. The number and range of small applications for capturing records is growing and the detailed attributes collected in different surveys will require a more open approach to data import. One possibility is to equip the new Recorder with preset import templates to take information from other Recorder systems and perhaps major survey software (e.g. Levana) and to include an 'applet' for defining import templates, probably in the same way as templates would be used for the speed data entry applet.

10.3 The Problem of Sites

Most existing database applications make a distinction between sites and administrative areas. Typically a site record will include fields for county, vice county, district and parish. This can be a convenient way to record recurring, useful information about the geographic context of a named site but use of fixed geographic attributes can be limiting. One problem which can arise is that of major changes to administrative classifications such as the ongoing change over from counties and districts to unitaries. Another is the fact that, other than size, spatially at least, there is no difference between a site and an administrative area. Both have boundaries and both may be linked to biotopes and taxa. Scheme recorders, for example, frequently wish to collect their data on a grid square basis related to a vice county. In this analysis both administrative areas and various classes of named sites (e.g. SSSIs, GCR sites, SINC etc.) are grouped together in the same set of entities in the Location Logical Model (figure) but are separated out in the Location Module of the physical model (see Annex 3). This is done because in practice it is more practical to separate centrally managed administrative and regional area names from discrete user-defined named sites.

It was also clear from the consultations that there is a continuing problem with the definition of sites and their relationship with biological records. It is this confusion which leads to the continued distinction between site and species records. The position developed in this analysis is that this distinction can be avoided by regarding the 'sample' as the key to all biological (and earth sciences) records and that sites or other geographic entities are definable attributes of the sample. This approach was fully developed in section 9.

One confusion arises from the different numbering of sites which may be used by recorders and the problems of merging records. Does Site 57 - Walton Common of Recorder A mean the same thing as Site 12 - Walton Common of Recorder B? Are their boundaries contiguous and how do they relate to Site 7 - Walton Down SSSI? These confusions relate to a number of factors;

- Use of site numbering codes as meaningful database keys
- Lack of accurate and agreed definition of named sites (e.g. by reference to a drawn boundary)

- Linking biological records to a site name without supplying a specific grid reference
- Use of inaccurate grid references e.g. a site centroid reference for a large site which may have within it smaller areas of particular conservation interest (e.g. where an SSSI only represents part of named area).

For current and new surveys, these problems could be largely overcome by simple measures.

All information which is candidate for inclusion on the database should be reviewed for its relevance and accuracy. There is not much point expending large amounts of effort on poor quality data if there is not a proven value to the exercise.

The most important improvement is to ensure that, wherever possible, all incoming records are related to a *user-supplied grid reference* and not related to a default site grid reference unless this is the clear intention of the recorder. To achieve this in the new Recorder each sample record should require a grid reference regardless of links to a site. The aim should ultimately be to access data spatially through a GIS and for this purpose accurate grid references are essential.

The context of the grid reference must be clear. Is it a point reference for an actual species occurrence?, is it the centroid or corner of an area?, is it the point where the recorder stood (e.g. the cliff top for sea watching)? The current Recorder facility for taking the site grid reference as default may well be an interpretation of the data and should be identifiable as such. In the new Recorder, each grid reference should be qualified with a statement of its context or accuracy.

Where possible each record should have an accurate grid reference but where sites are of interest (e.g. wildlife trust reserves) then survey organisers (in conjunction with the LRC or other principle local collator) should define a standard set of sites and make their boundaries known. A standard centroid grid reference should be agreed for the purposes of plotting on dot maps showing site distributions (e.g. locations of RIGS sites) but this should only be used for locating biological records where it is not possible to provide more accurate localisation.

There are sites, such as SSSIs and LNRs that have formally defined boundaries and about which collated information is required. SSSIs have legally defined boundaries and local Sites of Nature Conservation Importance will have locally agreed boundaries. Most of the information required will be new information and it should not be difficult in ensuring accuracy of location.

When importing records from recorders it is the onus of the data manager to establish the source of site names and numbers used. When a recorder has submitted site-related records but has not used an agreed list of site definitions or provided accurate grid references then it is the onus of the record collator to contact the recorder to obtain from them a definition of the area involved. The simplest method of achieving this is to send them a photocopy map to draw on the outline of their 'site' or actually mark recording points. If the user's interpretation of the site is different from an existing 'official' one then it may need to be entered onto the system as a new site and related to an overlapping 'official' site by site relationship record.

If new sites or more vague sites are submitted the data manager can review them for their relevance and if accepted, link them through 'site relationship records' to formal sites or broader areas. This would also solve the problem of old records (especially from the literature, notebooks and collections) which are typically given site names only. The relationship record may be one of partial overlap or possibility of being on the formal site. If this is the level of knowledge that is what should be recorded.

10.4 Report Functions

A major requirement which came out of the consultation and examination of the Recorder Questionnaire returns was the need to making reporting simpler for the user. This includes the need for a closer integration of the selection process with the output process and a simplified logic flow to choosing an appropriate report. The present version of Recorder is very powerful and offers numerous alternative ways of accessing data including system supplied query-by-example and SQL tools. Unfortunately very few of the users profess the time or inclination to develop their skills to use these various tools.

The information provided by users shows that there are a number of common data reporting requirements which could be efficiently provided within the application. These reports could include various degrees of user-selected customisation which would probably cover most everyday needs. These are listed below under Basic Report Functions. That said, when Recorder is run in the Windows environment, there will be many more opportunities for sharing information with other applications such as spreadsheets and wordprocessors and a number of users will want to acquire the skills for more direct access to their data including direct SQL interrogation, report generators such as query-by-example and a wide range of report writing software and access from GIS.

One important inclusion is a direct link to a dot distribution mapping application such as DMap for Windows. This facility is of universal interest to users, even those with access to more sophisticated GIS software. Users wish to see the distribution of sites, taxa and biotopes or coincidence between these features. If the software can provide further functionality such as selection of points to return a select list, then this would be very valuable.

The use of a graphical interface can go a long way to making report generation simpler to understand. Figure 31 shows an example of a report generator developed in Power Builder for the recently completed Inter Agency Earth Science Database. In this case the various entities about which users want to generate reports are placed on different tabbed windows and selection criteria are picked from drop down menus and by highlighting scrolling lists. The individual reports can be selected as page formatted printouts, lists or DMap output as appropriate. Tests with users showed that they found this a very simple method to follow.

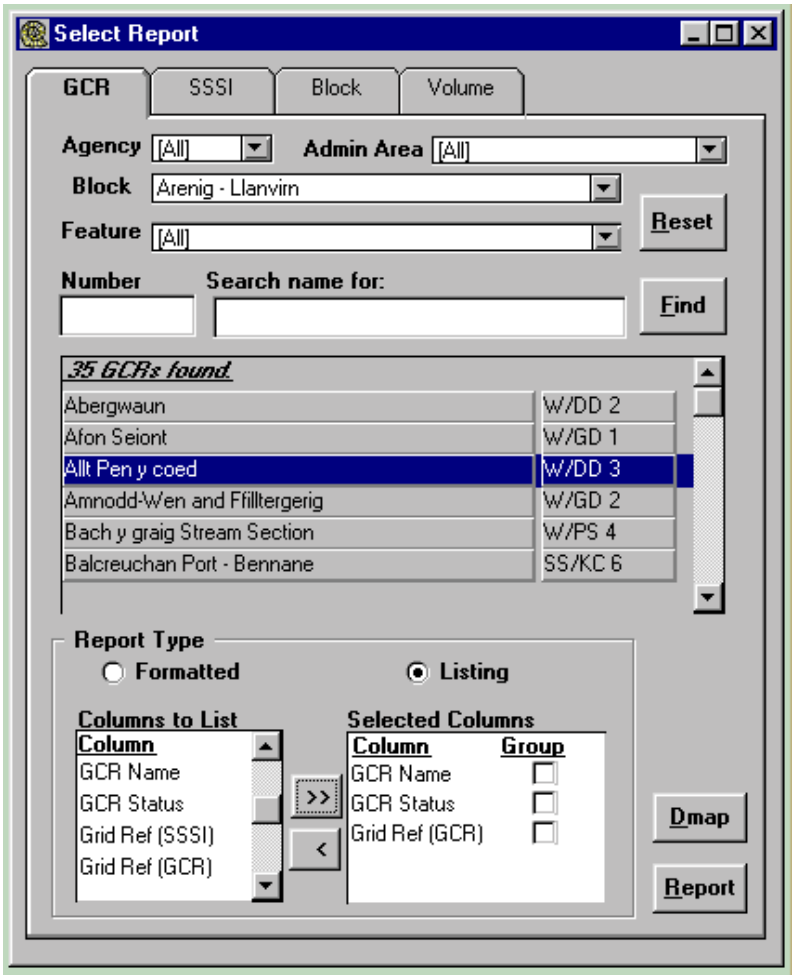


Figure 31: Sample report writer from the Inter Agency Earth Science Database

10.4.1 Geographic Area Reports

- List of sites in a geographic area (e.g. vice county, district, parish) - selected or sorted by type of site and/or protection status
- List of taxa for a chosen geographic area
- List of sites and records falling within a user-defined polygon [Requires a mapping or GIS interface]
- List of taxa by grid square (1K, tetrad and 10K)
- List of biotopes for a given geographic area
- List of biotopes by grid square (1K, tetrad and 10K)
- Map of distribution of a sites, taxa or biotopes for a geographic area displayed at differing grid square aggregations.

10.4.2 Site Related Reports

- Site description - formatted report. Choice of a default full report or selection of headings. Also option to include taxon and biotope lists.
- List of biotopes on a site - list or in formatted report [with or without associated taxon list]
- List of taxa for a site- list or in formatted report
- Distribution map of sites in a geographic area
- Report management events for sites
- Cross-tabulation of species status against sites e.g. how many taxa of each status type recorded from each site.
- Site statistics [number of taxa recorded by type, biotopes and areas, survey events, management events, etc.]

10.4.3 Survey Related Reports

- List of surveys on database
- Formatted report on individual survey
- List of recorders associated with a survey
- List of survey recording events (and associated samples)
- Survey statistics [number of recorders, number of sites, number of events, number of taxon and biotope records etc.]

10.4.4 Taxon Related Reports

- List of taxon occurrences in a geographic area
- List of sites for a taxon [optionally headed with details from the species dictionary]
- List of all records for a taxon [optionally headed with details from the species dictionary]
- Cross-tabulated report showing taxa for sites or grid squares
- Cross-tabulated report showing number of taxon records against given time divisions
- Distribution map of taxon in a geographic area
- Individual detailed record printout [e.g. to show origin, redeterminations etc.]
- Taxon statistics [number of records, number of sites, first and last dates etc.]
- Collection labels for specimens

10.4.5 Biotope Related Reports

- List of taxa occurring in a specific biotope sample
- Cross-tabulated report showing taxa per biotope sample [select site/area and range of biotopes]
- Cross-tabulated report showing biotopes for sites
- Biotope statistics [number of sites, stands, associated surveys etc.]

10.4.6 Recorder Related Reports

- List of records for a recorder
- List of taxa recorded by an individual or organisation
- List of sites recorded by an individual or organisation
- Formatted report of recorder details
- Address labels [might be better handled by exporting to word processor]
- Recorder statistics [number of records, surveys participated in, first and last dates etc.]
- Recorder League Table. [number of species in each status category recorded]

10.4.7 Reference and Source Related Reports

- List references by author (or author selection)
- List references for a taxon
- List sources for a taxon
- List references for a site or geographic area
- List sources for a geographic area or site
- List taxa from a source (e.g. published reference). This could be generalised to include any source of records e.g. a single data import, a survey, a museum collection.

10.4.8 Taxon Dictionary Reports

- Show taxon classification for a group and checklist
- Interpret a name using different checklists
- Report associated information for a taxon
- List taxa for a status e.g. national RDB [sort by taxon group]

10.5 Access to Reports:

In any application built from the model there will be a need to simplify and automate access to reports. This can be done in a number of ways including the programming of report generator forms. Details of these forms are not listed here as they are really part of the application programming but examples have been created as part of an accompanying prototype project.

1. General Report Generator using check boxes, quick selection forms, quicken-style type boxes and drop-down lists for setting variables in selection procedure.
2. Special report Generator(s) e.g. statistical analysis and graphical output [Needs a bit of thought! - I have established a means of output to spreadsheets and Cornell condensed Format for vegetation analysis]
3. Query-by-Example - QBE functionality will be provided by supplied system tools but we may need a form based system for saving and retrieving saved queries.
4. Map-based Reports. - Retrieval of saved distribution maps?

11. Business and Technical Options

11.1 Potential Markets

At present there are some 550 installed copies of Recorder and the recent (1996) Recorder user survey indicated that this represented a primarily non-avian dataset at least as large as that held by BRC (in excess of 6 million records). The Recorder Project has, therefore, both attracted users and delivered significant results.

There are two main market areas for the current version of Recorder;

- **Type 1**: Users collating information from a range of sources in order to provide planning and conservation information services e.g. local record centres and wildlife trusts
- **Type 2:** Users, primarily amateur naturalists, collating their own records or those for a taxon-based recording scheme

These are two quite different markets with user needs that partly differ in type but certainly differ in scale. At present Recorder has to satisfy the needs of both markets which accounts for some of the problems individual users experience with the product. The development options will need to examine how these two existing markets can be best served and whether there are other untapped markets which could also be attracted. It could be, for instance, that two different but complimentary applications are needed or that one application could be built with a wider range of customisable options.

Providing that a simple and inexpensive means of migrating from the AREV version to the new version of Recorder can be provided, it seems likely that most of the active users will take up the new product(s). Very few of those who responded to the 1996 questionnaire said that they wished to stay with the DOS Arev version. Most users would be attracted by the promise of better presentation of reports, easier access to their data and a more intuitive graphical interface. This would indicate that there is a 'guaranteed' minimum market of c. 450 copies (allowing for non-take-up), probably within the first two years of release.

In detail, I expect that the market for a 'full scale Record Centre style' Recorder product would initially be attractive to LRCs, (c.60), wildlife trusts (c.50) and county, metropolitan and larger unitary local authorities (c. 100). There would also be take up from a number of specialist societies and enthusiastic individuals (c.50). This implies that the medium-term UK market for a full LRC-style product is around 250 units. Many of the current individual users and scheme organisers, I believe, would opt for a cut-down version if available or at least choose a highly customised install if that were the option. This 'single user' and scheme organiser market would initially be around 350 but could be as high as 1000 if properly targeted and with the right, cost, support and marketing strategy. Specific customisation of the product for specialist groups could greatly extend this market e.g. to butterfly recorders, bat groups, badger groups, moth-trap recorders. Some care needs to be taken here in view of the possible perception of unfair competition which could arise from existing 'small-scale biological recording application' developers and specialist groups.

The current round of consultation shows that Recorder is not widely used by scientists in the country conservation and environmental agencies or larger NGOs. The main reasons given are:

- The inability of the current Recorder data model to handle much of the information handled by scientists in these organisations e.g. lack of sampling and repeated biotope observations. [This is also a frequently expressed problem arising from LRC & wildlife trust users]
- Lack of marine or adequate freshwater biotope and taxon coverage
- Lack of technical support - Arev and DOS are ceasing to be supported by these organisations
- Lack of time or inclination to acquire the skill needed to use it effectively
- A growing interest in the use of GIS and the need for integration with other data

There is no doubt that Recorder could be extended to cover sampling and biotope related recording and the extra taxa and biotope dictionary information added. The migration to a relational model fronted by a

more standard windows-based application would also make Recorder very much more attractive to these users. Recorder could then be effectively extended to a third market - **Type 3: ecologists and landuse**. Many ecologists in the LRC and local government sector are already using Recorder for other purposes and would welcome the extension. The ability to better handle landuse records and biotope sampling would attract a higher number of local authority users and also scientists within NERC/ITE, universities and consultants. Wider take up of Recorder in the Country Agencies and EAs alone could easily add 50-75 users (although number of copies would depend on the balance between network and stand-alone users). I have no figures at present for the potential academic market.

11.2 Business options

The fundamental business options come down to:

- Leave things as they are
- One general application to cover the whole of the existing market (Types 1 & 2)
- One general application extended to include a further market (Types 1, 2 and 3)
- One customisable application
- Individual applications to suit each market. (Of which one, two or three may be built)

These options could be achieved in the following ways:

11.2.1 Options based on an essentially text-based database model:

1. Do nothing other than present upgrades

Keep Recorder in Advanced Revelation for time being. The new data transfer module and improvements to the species dictionary will alleviate some of the current user problems.

Advantages: Saves money in the short term and gives time to wait for outcome of NBN Project.

Disadvantages: Some types of recording still not covered (e.g. biotope sampling). General user frustration with the perceived difficulty of using Advanced Revelation and lack of easy linkage to commonly used windows software. Increased number of potential users opting for other windows-based products - all based on different standards. Increasingly isolated development software with a diminishing resource of skilled support.

2. Rewrite Application in Advanced Revelation

Take the findings of the systems analysis and rewrite the Recorder application using a more relational model and to improve ability to record samples and biotopes.

Advantages: Extends the ability of Recorder to deal with various types of record and makes physical data model closer to a mainline relational model.

Disadvantages: As above plus the need to rewrite data entry screens, control structures and reporting programs. Therefore more expensive.

3. Rewrite Application in Open Insight

3a. Keep Advanced Revelation file structure but rewrite the application using RevTech's Open Insight windows-based software.

Advantages: Keeps the Advanced Revelation linear hash filing system which gives fast access to large data tables. Keeps Advanced Revelation's good facilities for dealing with long text fields and multi-values. Opens up a greater level of Windows compatibility.

Disadvantages: Tables using long text and multi-values, still not readily accessible to other software such as GIS. Open Insight is not a widely supported development environment and there would be problems

implementing it on a range of platforms. There are doubts on its reliability. The whole application would need rewriting to work in the windows environment and so the development costs would not be significantly less than opting for a main-stream database rebuild.

3b. Restructure data model as in option 2 but rebuild using Open Insight.

Advantages: Closer to a mainline relational database

Disadvantages: All the drawbacks of keeping the proprietary Advanced Revelation file structure. Note that it is possible to link Open Insight to file structures other than Advanced Revelation linear hash but if the application were redeveloped this way this would be no different than choosing to develop in any other windows application generator.

4. New Windows Database but with Minimal Rewrite

Accept the new data model as a basis for mapping Recorder to a new database management system with minimum changes to the functionality and cutting out any features which were specific to functioning under Advanced Revelation.
Advantages: Makes Recorder a more accessible windows-based application with standard relational data tables. The more open format will pave the way for future enhancements and will allow more ready access to the data e.g. by GIS programs (dependent on file structure chosen).

Disadvantages: The application would still not be able to cope with sampling and biotope-based surveys. Straight mapping into windows would still result in a large and complex application which does not address the different needs of amateur users. There would be some potential loss of flexibility in dealing with long text entries and the mapping of multi-valued fields to separate tables means that writing reports would be more complex due to the multiple joins needed.

5. New Windows Database with broader scope

Undertake a full rebuild based on the extended data model from the systems analysis (include samples and biotope-based surveys etc.). Use existing Recorder validation algorithms where possible. Examine the needs to improve data entry e.g. taxon specific data entry or more emphasis on 'popup recording cards'. Improve links to mapping, GIS and other windows software.

Advantages: Gives the opportunity to make better use of windows to design a more intuitive application. Broadens the scope and therefore the potential user base of Recorder. Easier access to the data from other applications. Considerably increases the range of products which could be used for the redevelopment and the number of developers who could tender.

Disadvantages: The size and complexity of the database will remain a problem for many amateur users. The development software may still have restrictions on what platform it will run on or the cost of run-time versions might be high.

6. New Windows Database with Customisable Features

Develop as for option 5 but include customisable features e.g. stripped down installation for local recorders. Customisation could include limits on the scope of species and Administrative Area dictionaries and some of the management functions. It should be possible to consider the development of two different , complimentary, pieces of software; one for LRC-type users and one for the individual naturalist or scheme recorder. This would be of great advantage to those centres which wish to run a central database collating information from 'satellite' recorders.

Advantages: Suits a greater range of users and ensures data compatibility.

Disadvantages: Higher development cost.

7. Modifiable System using Applets

As for 6 but include the ability to load modules, including third party ones, to and from the toolbar.

Advantage: Gives a highly modular and customisable product which still refers to a standard data model. The ability to write applets e.g. Taxon specific data capture screens, special purpose reports etc. could encourage third party 'enthusiast developers' to take on some of the special interest low volume development.

Disadvantage: May be more expensive to design and build in the first place (because of need to sort out the modularity to a higher degree). Requires very clear documentation and liaison with other developers.

8. Web-based Application

Undertake a major rewrite of Recorder to give general access and delivery using Intranet/Internet technology. Specifically develop web pages with dynamic links to underlying data tables and multi media sources. Develop LRC satellite links using the web as the means of networking. Write web page links between data tables and GIS functionality to allow spatial access to data.

Advantages: Builds on a rapidly growing area of technology which will take account of the need for simpler, wider access to data. An ideal basis for expansion into the National Biodiversity Network.

Disadvantages: This is still a relatively new area of software development and rapid changes mean there are few developers with real proven expertise. Many users will not yet have suitable hardware or wish to take advantage of this approach and a more traditional DBMS version will still be needed in the foreseeable future.

Other Possibilities

1. Make the data model and dictionaries freely available to third party developers to encourage a wider adoption of standards and the development of specialist applications. This might also solve the problem of writing smaller, simpler applications for local recorders.

2. Do any of the above but include foreign language versions.

11.2.2 Options based on an integrated GIS model:

1. Design an application from the ground up as an integrated GIS/database with the emphasis on data entry and spatial data selection through on-screen manipulation of maps. Make the map-base the principal user interface with 'drill-down' into the under-lying data.

Advantages: For many purposes the most accurate way to relate records to locations and certainly the most intuitive way to make spatial searches on datasets.

Disadvantages: Many GIS applications are not strong on text data validation (but usually good on spatial data) and the underlying databases are rarely approaching Recorder in sophistication. Good GIS systems are still expensive and even the cheaper PC versions are still prohibitive for amateur recorders. GIS mapbases can be very expensive and unless 'supplied' at low cost would not be an option for amateur users. Best use requires a higher spec. display (e.g. bigger high resolution screen) than a straight text-based database system.

2. Stick with the essentially text-based database but negotiate the inclusion of a cut-down GIS e.g. like the MapInfo in ExCel into the product and write specific (but more restricted) data entry and search routines into the package.

Advantages: Good underlying database with integrated basic GIS functionality at limited extra cost (other than programming and negotiation of 'freebie' licence).

Disadvantage: Obtaining detailed mapbase (e.g. 1:10,000 scale) still prohibitively expensive for most users. Potentially higher cost of hardware.

11.3 Technical Options - development environment

1. Use Advanced Revelation/Open Insight. The only option which would support the current system features of linear hash filing, multi-value fields and very long text fields.

2. Write everything in a standard database package e.g. Access or Paradox. Good for prototyping and probably a best option for a cut-down version for local recorders provided a free run-time is included to keep costs down. Probably not the best option for the full system build because some have proprietary file structures and applications may not be portable or perform well on different types of network.

3. Write in a programming language (e.g. Visual Basic, Fox Pro or C++) with a relatively simple file structure e.g. DBF files. Can produce good, fast, royalty free code. Could be good for a cut-down version but may not be the best way to produce large systems in the time scale.

4. Use an 'industrial strength' relational database system (e.g. Oracle/Oracle Forms, Informix 4GL). Can produce very large systems but very expensive to develop and the greater number of current users would be unlikely to want to go this route.

5. System independent client-server application based on SQL tables (e.g. Gupta, Oracle, WatCom) addressed by a front end written in an application generator (e.g. Power Builder, Delphi, Open Insight). Note that the back-end could include almost any database tables readable through ODBC (e.g. Access, Paradox or DBF). This is a very flexible solution which would be implementable on almost any platform. This option would not preclude writing a large-scale LRC application which could be configured to a cut-down local recorder version for more modest machines.

6. Use Intranet/Internet development software to develop the front-end and report delivery in addition to the more standard database approaches outlined in 1 - 5.

7. Use an object-oriented database to exploit that technology's inherent strengths of dealing with lists and hierarchies, very prevalent in biological data. Still not a well-known or well-supported technology.

8. Develop software on basis of 1 - 7 above and prepare a CD ROM version containing all programs and dictionaries. Include software for allowing customised installation.

9. Any of the above (2-8) integrated to a standard PC GIS e.g. Map Info, Arc View, Maps-in-Action.

Annex 1

People consulted during the analysis

Contacts at meetings

Full Name	Organisation	Meeting	Date
Charles Copp	EIM	ongoing	
Stuart Ball	JNCC	ongoing	
James Williams	SNH	ongoing	
Lawrence Way	JNCC	ongoing	
Iain Jamieson	GEDU	Gloucester	29 November 1996
Philippa Burrell	BRERC	Gloucester	29 November 1996
Keith Alexander	National Trust	Gloucester	29 November 1996
Tony Price	SERC	Gloucester	29 November 1996
Bill Butcher	SERC	Gloucester	29 November 1996
Adrian Spalding	CBRU	Gloucester	29 November 1996
Jim Asher	Butterfly Conservation	Gloucester	29 November 1996
Sue Goodfellow	Dartmoor National Park	Cheltenham	02 December 1996
Rod Gritten	Snowdonia National Park	Cheltenham	02 December 1996
Nia Roberts	Snowdonia National Park	Cheltenham	02 December 1996
Steve Preston	Northumberland National Park	Cheltenham	02 December 1996
Phil Taylor	Lake District National Park	Cheltenham	02 December 1996
Jan King	Brecon Beacons National Park	Cheltenham	02 December 1996
Roger Key	EN	Peterborough	05 December 1996
Dave Stone	EN	Peterborough	05 December 1996
Jennifer Laing	EN Northumberland Team	Peterborough	05 December 1996
Damian McFerran	CEDAR	Belfast	13 December 1996
Mike Meharg	NI Envt. & Heritage Service	Belfast	13 December 1996
Trevor Boyd	Butterfly Conservation (NI)	Belfast	13 December 1996
Carol Hegarty	Dept. of Appld Plant Science (NI)	Belfast	13 December 1996
Pamela Allen	NI Bat Group	Belfast	13 December 1996
Roy Anderson	Dept. of Agricult. & Env. Science	Belfast	13 December 1996
David Mitchell	Recorder	Belfast	13 December 1996
Brian Nelson	Recorder	Belfast	13 December 1996
Ralph Forbes	BSBI Recorder Fermanagh	Belfast	13 December 1996
Bernard Picton	Marine Conservation	Belfast	13 December 1996
Steve Garland	Bolton Museum & LRC	Bolton	17 December 1996
Steve Hewitt	Carlisle Museum & LRC	Bolton	17 December 1996
Nik Bruce	Lancashire County Council	Bolton	17 December 1996
Dave Dunlop	Lancashire Wildlife	Bolton	17 December 1996
Christine Bennett	Joint Countryside Advisory Service	Bolton	17 December 1996
Angus Gunn	Liverpool Museum	Bolton	17 December 1996
Steve McWilliam	Cheshire Wildlife Trust	Bolton	17 December 1996
Tony Smith	VC58 Bryophyte Recorder	Bolton	17 December 1996
Suzanne Waymont	Greater Manchester Ecology Unit	Bolton	17 December 1996
Cameron Crook	BSBI Coordinator	Bolton	17 December 1996
Stan Dobson	Spider Recorder	Bolton	17 December 1996
Bill Hardwick	EntRecs	Bolton	17 December 1996
Steve Clarke	Cheshire County Council	Bolton	17 December 1996
Paul Harding	BRC	Peterborough	9 January 1997
Peter Barnard	Natural History Nuseum	Peterborough	9 January 1997
Sara Hawkswell	Wildlife Trusts	Peterborough	9 January 1997
Bill Ely	Rotherham LRC	Rotherham	14 January 1997
Bob Marsh	Yorkshire Naturalists Union	Rotherham	14 January 1997
Mike Archer	BEWARS	Rotherham	14 January 1997
Paul Leonard	Rotherham Countryside Service	Rotherham	14 January 1997

Dave Wood	Rotherham County Planning	Rotherham	14 January 1997
Mick Longman	British Mycological Society	Rotherham	14 January 1997
Roger Key	Lincolnshire Naturalists Union	Rotherham	14 January 1997
John Dargie	SNH Aviemore	Battleby	16 January 1997
Tim Walsh	SNH - IS support	Battleby	16 January 1997
Pip Tabor	SNH Galashiels	Battleby	16 January 1997
David Phillips	SNH - RASD	Battleby	16 January 1997
Martin Gaywood	SNH - RASD	Battleby	16 January 1997
Ro. Scott	SNH NW Region	Battleby	16 January 1997
Mike Smedley	SNH NE Region	Battleby	16 January 1997
Rob Raynor	SNH NE Region	Battleby	16 January 1997
Thomas Huxley	National Water Bug Recorder	Glenrothes	17 January 1997
Richard Pankhurst	Royal Botanic Gardens Edinburgh	Glenrothes	17 January 1997
Scott Mathieson	SEPA	Glenrothes	17 January 1997
Anne Marie Smout	Fife Nature - LRC	Glenrothes	17 January 1997
Alistair Sommerville	Scottish Wildlife Trust	Glenrothes	17 January 1997
Steve Moran	Inverness Museum & LRC	Glenrothes	17 January 1997
William Penrice	Fife Nature	Glenrothes	17 January 1997
Paul Green	CCW IS	Bangor/Birmingham	23 January 1997
Mark Diggle	CCW IS	Bangor/Birmingham	23 January 1997
Sally Ellis	CCW ADO Anglesey	Bangor	23 January 1997
Adrian Fowles	CCW Ecologist	Bangor	23 January 1997
Mike Howe	CCW Invert. ecologist	Bangor	23 January 1997
Ruth Warren	CCW Mammal ecologist	Bangor	23 January 1997
Steve Parr	CCW Vertebrate ecologist	Bangor	23 January 1997
Phil Morgan	Welsh Water	Cardiff	29 January 1997
John Clarkson	Brecknock Wildlife Trust	Cardiff	29 January 1997
Peter Howlett	NMW Vertebrate curator	Cardiff	29 January 1997
Darren Mann	NMW Entomologist	Cardiff	29 January 1997
Brian Levey	NMW Entomologist	Cardiff	29 January 1997
Linda Wilkinson	CCW Cardiff Office	Cardiff	29 January 1997
Nigel Ajax Lewis	Glamorgan Wildlife Trust	Cardiff	29 January 1997
Bob Wardell	Cardiff Council	Cardiff	29 January 1997
Rob Jones	Bridgend Council	Cardiff	29 January 1997
Lin Gander	Dyfed Wildlife Trust	Cardiff	29 January 1997
Dave Gilmour	Moth Recorder	Cardiff	29 January 1997
Tony Pettitt	ExeGesis	Cardiff/Birmingham	29 January 1997
Martin Fitton	Brecon Beacon National Park	Birmingham	30 January 1997
Steve Bailey	Surrey County Council	London	07 February 1997
Gillie Sargent	Mammal Society	London	07 February 1997
Alistair Kirk	London Wildlife Trust	London	07 February 1997
Nicky court	Hampshire County Planning Dept.	London	07 February 1997
Adam Rowe	Hampshire County Planning Dept.	London	07 February 1997
Mike Thurner	Thurner Automation	London	07 February 1997
Alison Tutt	Surrey Wildlife Trust	London	07 February 1997

Contacts by letter, phone and Email include:

Full Name	Organisation	Form
Alan Morton	DMap	Email
Gillie Sarjent	Mammal Society	telephone
Darren Towers	Berkshire County Council	letter
A. R. Barker	West Yorks Ecol. Advisory Service	letter
Steve Lucas	Dyfed Wildlife Trust	Email
Paul Raven	Environment Agency	telephone
Stephen Mason	National Trust Scotland	letter
Alison Stewart	DERC	letter
Thomas Huxley	Water Bugs	letter
Nick Moyes	Derby Museum	telephone
Adrian Spalding	CBRU	letter
Bernard Picton	Ulster Museum	Email
Bill Hardwick	Entomologist	letter
Steve McWilliam	Cheshire Wildlife Trust	letter
Chris Vasey	Naturalist	Email
Alan Stubbs	Scheme Organiser	letter
Imogen Davenport	Dorset Wildlife Trust	Letter
Tony Sargeant	Denham Quarry Recorder	Email
Steve Hind	Lepidoptera Recorder	Letter
Mike Archer	BEWARS	letter
Kate van den Ende	Snowdonia National Park	letter
Martin Newman	Surrey Wildlife Trust	telephone
Mike Thurner	Thurner Automation	documents
John Martin	Avon Wildlife Trust	letter
N.P. Millar	Cambridgeshire Wildlife Trust	letter
Chris Wiltshire	Long Ashton Research Station	telephone
Gary Kennison	Broads Authority	letter
Michael Bickmore	BRISC	telephone
Eric Philp	Recorder User	letter
Lawrence Clemons	Scheme Organiser	telephone

Annex 2

Relationship of the New Data Model to the Current Recorder Tables

The following data maps show the relationship between fields (columns) in the Recorder database tables with entities and attributes in the new Logical/Physical Data Model. This is relatively straightforward for standard data fields (type F in AREV) but AREV tables also include other types of field and programs (Symbolic fields, Group Fields and Modified Filing Systems) which have to be handled in different ways by relational databases management systems. Group fields hold field names and format information for default list outputs to screen or printer whilst modified filing systems (MFS) can do many things such as control transaction logging and security on a table.

Recorder tables include many Symbolic (calculated) fields (type S in AREV) which act in various ways:

- Some symbolic fields act as relational links to other tables, for instance to look up a species name for a given species code, and as such would be represented by references (table joins) in the LDM.
- Other symbolic fields carry out calculations (e.g. convert an altitude given in feet to one in metres) or formatting upon data fields or data returned by other symbolic field (e.g. truncate and italiscise *Helix aspersa* to *H. aspersa*).
- Another set of symbolic fields act as relational indexes and store lists of keys to other tables (e.g. a list of record keys associated with a site).

Many of the symbolic fields in Recorder reflect the systems business rules or provide valuable aspects of the programs functionality much of which will still be needed in the new system . An attempt is, therefore, made in the data maps below to account for how these special fields would need to be handled in the new system although some specific solutions will be technical decisions left to the system builders.

Table X: Data Map from Recorder to the New Logical/Physical Model

Field Type Key:
First letter: F = data S = symbolic/calculated G = group
Second letter: S = single value M = multivalue

Data Tables					
Recorder Table	**Recorder Column**	**Field Type**	**Data Model Entity**	**Data Model Attribute**	**Comment**
RECORDS	REC_NUM	FS	SURVEY_SAMPLE TAXON_OCCURRENCE BIOTOPE_OCCURRENCE also possibly EARTH_SCIENCE_FEATURE_OCCURRENCE MINERAL_OCCURRENCE ROCK_OCCURRENCE	SAMPLE_KEY BIOTOPE_OCCURRENCE_KEY TAXON_OCCURRENCE_KEY	In Recorder a record is essentially a taxon occurrence which includes associated data that in a fully relational model would be held in other tables. In the new model it would be possible to record biotope occurrences in the same way as taxon reccords - related primarily to a survey event and then a location.
RECORDS	DATE_UPDATED	FS			Applicable to most records in most tables as an entry date and also to records which may be edited.
RECORDS	UPDATED_BY	FS			Applicable to any records that may be edited
RECORDS	STATUS	FS	TAXON_OCCURRENCE BIOTOPE_OCCURRENCE	CHECK_STATUS CHECK_STATUS ditto for Earth Science entries	In Recorder records, STATUS refers to the reliability of the taxon identification but it is not clear who is the authority for the STATUS. In the new model both taxon and Biotope occurrences will need a check stamp to say whether the record has been refereed or needs checking. Identifications are stored as one or more records which may carry comments e.g. explaining that the identification has been refined, for instance. Straight taxonomic name revisions should be avoided as these can be dealt with through the species dictionary.
RECORDS	START_DATE	FS	SURVEY_EVENT	SURVEY_EVENT_DATE	The date on which the survey event took place. In Recorder the date may be a range and may be incomplete or vague. This is handled by three fields (start, end, type). The same functionality will be required in the new database but the way it is achieved will be a build decision.
RECORDS	END_DATE	FS	SURVEY_EVENT	SURVEY_EVENT_DATE	see above
RECORDS	DATE_TYPE	FS	SURVEY_EVENT	SURVEY_EVENT_DATE	see above
RECORDS	SPECIES	FS	TAXON_OCCURRENCE TAXON_DETERMINATION	TAXON_OCCURRENCE_KEY TAXON_DETERMINATION_KEY and CHECKLIST_ITE	In the new model an observation of an organism is a taxon occurrence to which one or more determinations may be given over time. It is also possible to summarise

			also LOCATION_FEATURES	M_KEY LOCATION_FEATURE_KEY LOCATION_FEATURE_TYPE	chosen taxa (or all taxa) to the LOCATION_FEATURES table which will link selected natural features to management aims, threats etc. as used in the ENSIS database
RECORDS	SITE_CODE	FS	SURVEY_SAMPLE	LOCATION_KEY	The key to a location in the location table - this may be a named site, an administrative area or any other named, delimited area.
RECORDS	GRID	FS	SURVEY_SAMPLE	SAMPLE_GRID_REF SAMPLE_GRID_REF_SYSTEM	This attribute will need validation checks, as in the present Recorder. Hence need for attribute SAMPLE_GRID_CHECKED
RECORDS	ORIGINAL_GRID	FS	SURVEY_SAMPLE	SAMPLE_GRID_REF_SOURCE	Recorder flags the grid ref. to say if it is the original supplied or a later interpretation. This field allows a wider range of sources to be quoted
RECORDS	COLLECTOR	FM	SURVEY_RECORDER	NAME_KEY	Individuals associated with the original record. Link to People & Organisation Module.
RECORDS	REC_NATURE	FM	RECORD_TYPE	RECORD_TYPE	Linked to TAXON_OCCURRENCE.
RECORDS	DETERMINER	FM	TAXON_DETERMINATION BIOTOPE_DETERMINATION	NAME_KEY NAME_KEY	One or more determination records are allowed to be linked to either taxonomic or biotope occurrences.
RECORDS	YEAR_OF_DET	FM	TAXON_DETERMINATION BIOTOPE_DETERMINATION also in Earth Science records	TAXON_DETERMINATION_DATE BIOTOPE_DETERMINATION_DATE	Recorder has only the year but a more complete date should be allowed and an algorithm used to extract the year.
RECORDS	SEX_STAGE	FM	TAXON_OCCURRENCE_DATA subtype LIFE_STAGE	TAXON_MEASURE_TYPE TAXON_MEASURE	Taxon specific sex or stage can be stored as individual taxon occurrence data records which may be sub-typed according to the information requirement.
RECORDS	ABUNDANCE	FM	TAXON_OCCURRENCE_DATA	TAXON_MEASURE_TYPE TAXON_MEASURE	Abundance may be linked to the whole taxon occurrence, to specimens associated with the occurrence and to subdivisions of the occurrence e.g. by sex, colour form etc. Abundance may also be measured using a number of scales many of which are taxonomically restricted.
RECORDS	COMMENT	FS	TAXON_OCCURRENCE TAXON_DETERMINATION BIOTOPE_DETERMINATION	COMMENT TAXON_DETERMINATION_COMMENT BIOTOPE_DETERMINATION_COMMENT	Any text comment
RECORDS	HABITAT	FS	BIOTOPE_OCCURRENCE	BIOTOPE_KEY	Taxon records can be linked to biotopes through the Sample Record. The sample may cover any area from a quadrat to a whole named site so the link can be as specific or general as desired.
RECORDS	REFS	FM	REFERENCE_LIN	REFERENCE_LIN	In the new model, references

			K LINKED_TABLE_ NAME	K_KEY LINKED_TABLE_ KEY	and images (and possibly people) can be linked to any item of information through a reference_link record. In practice the number of places these records will occur will be limited by the need to design understandable applications!
RECORDS	CONFIDENTIAL	FS	TAXON_OCCUR RENCE	CONFIDENTIAL_ FLAG	This represents a simple user-set flag on the taxon record to mark whether it is confidential or not. In practice a number of other controls will be available e.g. the source_key for any survey data will lead to a metadata record containing information on confidentiality and copyright. The species, biotope and location dictionaries could also carry flags for globally flagging sensitive information.
RECORDS	SENT_TO_NCC	FS	None directly	None directly	The flagging of records for data transfer will need to be handled by a data transfer module. The situation will be more complex than the current Recorder because of the relationship between taxon, biotope and location records where for many purposes only partial records are being transferred. BRC and NCC will only be instances of a wider range of transfers including data supply to LRC users. The details of the data transfer and tracking module have not yet been established.
RECORDS	SENT_TO_BRC	FS	None directly	None directly	see above
RECORDS	ORIGINAL_REF	FM	SOURCE	SOURCE_KEY	All records entering the system will be linked to a source which will state whether this is a copy or the original
RECORDS	ASSOC_SP	FM	TAXON_OCCUR RENCE_RELATI ON	TAXON_OCCURE NCE_REL_KEY	Any individual observation of a taxon can be linked with any other taxon.
RECORDS	ASSOC_NATURE	FM	TAXON_OCCUR RENCE_RELATI ON	TAXON_OCCURE NCE_RELATION	Possibly picked from a controlled terminology list
RECORDS	CURATION	FS	TAXON_SPECIM EN SPECIMEN also Earth Science Specimen Entities	TAXON_SPECIM EN_NUMBER SPECIMEN_NUM BER	Any taxon occurrence record can be linked with any number of specimens which optionally may be linked to a curation module (not modelled here) which would give details of collection, preparation, conservation etc. Specimens may also be linked independently to determinations which may differ from the original field observation.
RECORDS	SUBSTRATE_CODE	FM	TAXON_OCCUR RENCE also SAMPLE_LOCAT ION_DATA	SUBSTRATE PHYSICAL_DATA	Substrate may be coded as in recorder and selected from a taxon specific list. Details of substrates are most likely to be linked to individual sample records under location data.

					e.g. a microniche (under bark) might be a related sample or a wider area survey sample.
RECORDS	SUBSTRATE_KEYWORD	FM	See above	See above	see above
RECORDS	LOCATION_NAME	FS	SURVEY_SAMPLE	LOCATION_KEY	All site and location names should be kept in the Location module and related to each other through location relation records.
RECORDS	ORIGINAL_NAME	FS	TAXON_DETERMINATION	CHECKLIST_ITEM_KEY and DETERMINATION_TYPE	The original name given by the recorder is just the first determination and flagged as such under DETERMINATION_TYPE.
RECORDS	DET_WORK	FM	TAXON_DETERMINATION or REFERENCE_LINK	DET_WORK or REFERENCE_LINK_KEY LINKED_TABLE_KEY	See Refs.
RECORDS	TEMP	FS	-	-	Application specific - not used
RECORDS	ALTITUDE	FS	SAMPLE_LOCATION_DATA	PHYSICAL_DATA_TYPE PHYSICAL_DATA	In Recorder, the altitude at which the species was observed. In the new model the altitude at which the sample (covering taxon, biotope and physical data) was made.
RECORDS	ABUNDANCE_L	SM	-	-	Relational link to a codes table
RECORDS	ABUNDANCE_STAGE	SS	-	-	application dependent output formatting
RECORDS	ADDITIONAL_INFO_WP	SS	-	-	application dependent
RECORDS	ALT30	SS	-	-	application dependent calculated field
RECORDS	ALT50	SS	-	-	application dependent calculated field
RECORDS	ASSOC_COMMON_L	SM	-	-	Link from Taxon_Determination to Taxon Module
RECORDS	ASSOC_NATURE_L	SM	-	-	Possible relational link from Taxon_Occurrence_Relation to a lookup table.
RECORDS	ASSOC_SP_L	SM	-	-	Link from Taxon_Determination to Taxon Module
RECORDS	BRC_ORDER	SS	-	-	Link from Taxon_Determination to Taxon Module
RECORDS	BRC_ORDER_L	SS	-	-	Link from Taxon_Determination to Taxon Module
RECORDS	BRIEF_NAME	SS	-	-	application dependent output formatting
RECORDS	COLLECTOR_L	SS	-	-	Relational link to People/Organisation Module
RECORDS	COMMON_AND_SCIENTIFIC	SS	-	-	application dependent output formatting
RECORDS	COMMON_NAME	SS	-	-	Link from Taxon_Determination to Taxon Module
RECORDS	CONF_L	SS	-	-	Application dependent
RECORDS	CONF_STATUS	SS	-	-	Application dependent processing
RECORDS	CONVERT_FEET_WP	SS	-	-	Application dependent data conversion function
RECORDS	COUNTY_CODE_L	SS	-	-	Application program using Relational link to Location Module

RECORDS	COUNTY_L	SS	-	-	Application program using Relational link to Location Module
RECORDS	DATE	SS	-	-	Application dependent data conversion function
RECORDS	DATE_STAMP_WP	SS	-	-	Application dependent function
RECORDS	DECADE_NUMBER	SS	-	-	Application dependent data conversion function
RECORDS	DETERMINER_L	SM	-	-	Relational link to People/Organisation Module
RECORDS	DET_WORK_L	SM	-	-	Relational link to References Module
RECORDS	DISPLAY_NAME	SS	-	-	Relational link to Taxon Module
RECORDS	DISTRICT_L	SS	-	-	Application program using Relational link to Location Module
RECORDS	FAMILY_L	SS			Relational link to Taxon module
RECORDS	FILE_CODE	SS	-	-	Relational link to Location module
RECORDS	FORTNIGHT	SS	-	-	Application dependent data conversion function
RECORDS	FULL_NAME	SS	-	-	Application dependent data conversion function
RECORDS	GB_STATUS	SS	-	-	Relational link to Taxon module
RECORDS	GB_STATUS_L	SS	-	-	Relational link to Taxon module
RECORDS	GENUS_L	SS	-	-	Relational link to Taxon module
RECORDS	GET_100KM	SS	-	-	Application dependent data conversion function
RECORDS	GET_100M	SS	-	-	Application dependent data conversion function
RECORDS	GET_10K	SS	-	-	Application dependent data conversion function
RECORDS	GET_1KM	SS	-	-	Application dependent data conversion function
RECORDS	GET_500M	SS	-	-	Application dependent data conversion function
RECORDS	GET_5KM	SS	-	-	Application dependent data conversion function
RECORDS	GET_TETRAD	SS	-	-	Application dependent data conversion function
RECORDS	GRID_IN_CIRCLE_WP	SS	-	-	Application function
RECORDS	GRID_IN_RECTANGLE	SS	-	-	Application function
RECORDS	GRID_L	SS	-	-	Relational link to Location module. Application function for supplying suggested default grid reference.
RECORDS	HABITAT_L	SS	-	-	Relational link to Biotopes module
RECORDS	ITALIC_NAME	SS	-	-	application dependent output formatting
RECORDS	LOCALITY	SS			application dependent output formatting
RECORDS	MASTER_L	SS	-	-	Relational link to Location module
RECORDS	MONTH	SS	-	-	Application function
RECORDS	MONTH_N	SS	-	-	Application function
RECORDS	NAME	SS	-	-	Application function using relational link to Taxon module
RECORDS	NAME_AND_STATUS	SS	-	-	Application function using relational link to Taxon module
RECORDS	NON_LIT_SOURCE	SS	-	-	Application function linked to

	WP				reports
RECORDS	NUMBERS	SS	-	-	Application function
RECORDS	OLD_CODE	SS	-	-	Relation link to Taxon module - codes
RECORDS	ORDER_FAMILY	SS	-	-	output formatting on data derived from Taxon module
RECORDS	ORDER_L	SS	-	-	Relational link to Taxon module
RECORDS	PARISH_CODE	SS	-	-	Relational link to Location module
RECORDS	PARISH_L	SS	-	-	Relational link to Location module
RECORDS	QORDER	SS	-	-	stored under checklists in Taxon module
RECORDS	RECORDER	SM	-	-	Index function
RECORDS	RECORDER_L	SM	-	-	handled by relational link to Name table
RECORDS	RECORDER_XREF	SM	-	-	Index function
RECORDS	REC_NATURE_L	SM	-	-	Relational link to Record Type
RECORDS	REC_STATUS_L	SM	-	-	application function based on checking status value
RECORDS	REFERENCE	SM	-	-	Handled by Reference Link Table
RECORDS	REFERENCE_FULL	SM	-	-	Formatted output function and relational link to References
RECORDS	REFERENCE_L	SM	-	-	Relational link to References
RECORDS	REFERENCE_XREF	SM	-	-	Index function
RECORDS	SEASON	SS	-	-	Application function
RECORDS	SEASON_N	SS	-	-	Application function
RECORDS	SEX_STAGE_L	SM	-	-	Relational link to appropriate lookup table
RECORDS	SHORT_NAME	SS	-	-	Output formatting function on relational link to Taxon module
RECORDS	SITE_DESCRIPTION	SS	-	-	Relational link to Location module
RECORDS	SITE_GRID	SS	-	-	Application function
RECORDS	SITE_L	SS	-	-	Relational link to Location module
RECORDS	SITE_STATUS	SM	-	-	Relational link to Location module - Location Protection Status
RECORDS	SKIP_LOCATION_NAME_WP	SS	-	-	Application data entry window function
RECORDS	SORT_DATE	SS	-	-	Application function
RECORDS	SORT_DOCUMENT	SM	-	-	Application function linked to reports
RECORDS	SOURCE_L	SS	-	-	Relational link to Survey and Source Tables.
RECORDS	SPECIES_L	SS	-	-	Relational link to Taxon Module
RECORDS	SPN	SS	-	-	Relational link to Taxon Module - Codes
RECORDS	SP_ACCOUNT	SS	-	-	Relational link to Taxon Module
RECORDS	SP_CODE	SS	-	-	Relational link to Taxon Module - Codes
RECORDS	STATUS_AND_CODE	SS	-	-	Relational link to Taxon Module with output formatting
RECORDS	STATUS_CODE_L	SS	-	-	Application function working on relational link to Taxon Module
RECORDS	STATUS_L	SS	-	-	Relational link to Taxon Module - Taxon Designation
RECORDS	SUBSTRATE_L	SM	-	-	Relational lookup
RECORDS	VCN	SS	-	-	Application function using relational link to Location

					module
RECORDS	VCOUNTY	SS	-	-	Relational link to Location module
RECORDS	VCOUNTY_L	SS	-	-	Relational link to Location module
RECORDS	VETTING_WP	SS	-	-	Application function
RECORDS	WEEK_N	SS	-	-	Application function
RECORDS	YEAR	SS	-	-	Output formatting application function

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
SITES	SITE_CODE	FS	LOCATION	LOCATION_KEY	In the new model all locations (sites, admin. areas, regions etc.) are stored in the Location table.
SITES	DATE_UPDATED	FS			Applicable to all editable tables
SITES	UPDATED_BY	FS			Applicable to all editable tables
SITES	NAME	FM	LOCATION	LOCATION_NAME	This needs to be more fully resolved. Recorder allows a site to have many names in a multi-value field. At present the new model is limited to one but this could be resolved by using a Location - Location Version two table relationship or making name a separate table.
SITES	GRID	FM	LOCATION	LOCATION_SPATIAL_REF SPATIAL_REF_TYPE LOC_SPATIAL_REF_ACCURACY	In Recorder grid references are stored in a multi-valued field and application functions are provided for lat./long to NGR conversion etc. In the new model the original grid is stored with details of what system is used and what sort of reference it is e.g. centroid, approximation, corners of site. For practical purposes only one entry is modelled but in an application this may allow several refs on one line with separators. For international use it is necessary to allow for different grid systems but for
SITES	VCOUNTY	FM	LOCATION LOCATION_RELATION	LOCATION_RELATION_KEY	All locations and bounded areas can be maintained in a single table and associated through Location Relation records.
SITES	PARISH	FM	LOCATION LOCATION_RELATION	LOCATION_RELATION_KEY	as above
SITES	MASTER	FS	LOCATION LOCATION_RELATION	LOCATION_RELATION_1_TO_2 could also be flagged in LOCATION LOCATION_TYPE	The master to a set of subsites is identified through a relationship record.
SITES	LAST_RECORD_ADDED	FS	LOCATION	LAST_RECORD_ADDED	Application function will need to write a date to this field whenever new records are made in the Recording module. It would be possible, though time consuming to cascade this date upwards to all 'containing' locations (e.g.

					for county containing site). May need several versions of the field e.g. for taxa, biotopes, earth sciences - Not at present included in data model.
SITES	STATUS	FM	LOCATION_DESIGNATION	LOCATION_DESIGNATION_KEY	Location Designation is a linking entity to the Protection and Legislation module
SITES	HABITAT	FM	SURVEY_SAMPLE BIOTOPE_OCCURRENCE also LOCATION_FEATURES	SAMPLE_KEY BIOTOPE_OCCURRENCE_KEY LOCATION_FEATURE_KEY LOCATION_FEATURE_TYPE	Biotope and habitat records for any location will be associated with survey samples. This will allow for repeated surveillance and multiple samples within a site. Listing biotopes for a site will therefore be more complicated than previously because the answer will relate to dates and surveys (allowing forms of analysis not presently available in Recorder) although a list of all habitats ever recorded from a location could be achieved through an appropriate report for unique values. This should work for locations at any scale if there is a retrieval function which can 'walk' the location relations table. Selected Biotopes deemed to be of interest (or all biotopes) can be summarised to the LOCATION_FEATURES table.
SITES	DESCRIPTION	FS	LOCATION	LOCATION_DESCRIPTION	Other descriptions of the location, including computer text files, images, videos or other media can be linked to a location through the References/Images modules. It would be possible to add further descriptive fields to match conservation databases e.g. a LEGAL_ACCOUNT for the SSSI Statement or an EXPLANATORY NOTE for use in producing simplified site accounts.
SITES	AREA	FS	LOCATION_BOUNDARY	LOCATION_AREA MEASUREMENT_UNITS	This will vary according to changes in boundary and could be derived from a GIS. The units used will depend on the size of the location and age of the data (could be in acres) so conversion functions will be needed for output and calculations..
SITES	SUBSITES	FM	LOCATION_RELATION	LOCATION_RELATION_KEY LOCATION_RELATION_2_TO_1	Subsites may be noted as a relationship to a master site and could be named as such in LOCATION.LOCATION_TYPE Subsites may have their own subsites *ad infinitum.*
SITES	OTHER_CODES	FM	LOCATION_CODE	LOCATION_CODE_KEY	A site may have many codes under various coding systems including Recorder codes (e.g. for counties).
SITES	HABITAT_AREA	FM	BIOTOPE_OCCU	BIOTOPE_AREA	Each biotope record can have

			RRENCE	MEASUREMENT _UNITS	an area measurement. Calculation of total areas would be done for individual habitat/biotope classifications. The system design will need to take into account the difference between whole site records at a date and individual sub-samples (e.g. stands and quadrats). Theoretically it should be possible to plot area changes of competing biotopes through time.
SITES	ASSOC_PEOPLE	FM	Links through various entities including TENURE EVENTS SURVEY_EVENTS possibly a more generalised linking entity to People/Organisations module	Appropriate linking Keys	Theoretically it should be possible to link people to any table and any attribute using a universal linking entity to the people/organisation module. In practice this may be resolved as a number of more specific linking tables. Both exist in the current relational model.
SITES	COMMENT	FS	LOCATION	COMMENT	long text field - not on model but could be added. See LOCATION_DESCRIPTION
SITES	ASSOCIATES	FM	-	-	Indexing function
SITES	ASSOC_SITES	FM	-	-	Report function on Location Relation table
SITES	ASSOC_NATURE	FM	See ASSOC_PEOPLE above	e.g. EVENT_PERSON _ROLE	Link entities include a role/relation attribute.
SITES	PARCEL_NO	FM	LAND_PARCEL	LOCATION_KEY LAND_PARCEL_ NUMBER	Several named sites might share land parcel numbers
SITES	TOPOGRAPHY	FM	EARTH_SCIENCE _FEATURE_OCC URRENCE	FTR_TERM	Topographic keywords may be entered as a data type under Earth Science Feature Occurrence OR could be entered as SAMPLE_LOCATION_DAT A to allow for qualifications of topographic terms.
SITES	ALTITUDE_MIN	FS	SAMPLE_LOCAT ION_DATA	PHYSICAL_DATA _TYPE PHYSICAL_DATA	Physical measurements are linked to a data type e.g. altitude which stores details of the units used.
SITES	REFS	FM	As for REFS in Species		See REFS in Species
SITES	FILE_CODE	FS	LOCATION_COD E	LOCATION_COD E LOCATION_COD E	Any number of codes can be linked to a location, including user filing codes, Other organisation reference codes etc.
SITES	GEOLOGY	FM	EARTH_SCI_FTR _OCCURRENCE STRATIGRAPHIC _OCCURRENCE MINERAL_OCCU RRENCE ROCK_TYPE_OC CURRENCE	FTR_OCCURREN CE_KEY STRATIGRAPHIC _OCCURRENCE_ KEY MINERAL_OCCU RRENCE_KEY ROCK_OCCURRE NCE_KEY	For the purposes of Recorder it may be possible to lump most earth science related information into the EARTH_SCI_FTR_OCCUR RENCE table although for practical purposes and linking to other databases this may be better separated out.
SITES	PEDOLOGY	FM	see GEOLOGY	see GEOLOGY	
SITES	HISTORY	FS	EVENT	EVENT_KEY	Many items of location history will be recorded as Events e.g. Planning Applications. If a general history of the site is required

					as opposed to part of the LOCATION_DESCRIPTION this could be added as an extra attribute or linked memo.
SITES	PICTURE_ID	FM	IMAGE_LINK	IMAGE_LINK_KEY	Any number of images of any type can be linked to any table in the database. It will also be possible to include an image viewer to actually look at stored images.
SITES	PICTURE_DESC	FM	IMAGE	IMAGE_DESCRIPTION and numerous other attributes in various image subtypes.	See above.
SITES	ALTITUDE_MAX	FS	SAMPLE_LOCATION_DATA	PHYSICAL_DATA	see notes for ALTITUE_MIN
SITES	USE	FM	LOCATION_USE	LOCATION_USE_KEY and associated attributes	This entity extends the ability of the Recorder Use field by allowing for classifications of use e.g. educational use, current use, potential use.
SITES	MANAGEMENT	FS	LOCATION_FEATURES MANAGEMENT_AIMS also EVENTS	LOCATION_FEATURE_KEY MANAGEMENT_AIM_KEY EVENT_KEY	Management aims and strategies can be recorded linked to the features of the location to which they refer. Actual management activities are recorded under Events.
SITES	NEW_ITEM	FS	-	-	Not in model but could have a CHECK_STATUS attribute as for occurrence records
SITES	REF_TYPE	FM	REFERENCES_LINK	REFERENCE_LINK_TYPE	References can be linked to any table or attribute although in the build this may be restricted.
SITES	HYDROLOGY	FM	See GEOLOGY above		
SITES	MANAGEMENT_AIMS	FS	MANAGEMENT_AIMS	MANAGEMENT_AIM_KEY and associated attributes	See management above
SITES	ASSOC_NATURE_L	SM	-	-	Relational lookup
SITES	ASSOC_PEOPLE_L	SM	-	-	Relational lookup
SITES	ASSOC_SITES_L	SM	-	-	Relational lookup
SITES	CHECK_ALTITUDE_WP	SS	-	-	Application validation function
SITES	CHECK_AREA_WP	SS	-	-	Application validation function. Needs to take account of how biotope occurrences are recorded (e.g.. classifications and repeated samples)
SITES	CONVERT_ACRES_WP	SS	-	-	Application function
SITES	COUNTIES	SM	-	-	Lookup using LOCATION_RELATION
SITES	COUNTY	SS	-	-	Relational lookup
SITES	COUNTY_L	SS	-	-	Relational lookup
SITES	DATE_STAMP_WP	SS	-	-	Application function
SITES	DEFAULT_PD_WP	SS	-	-	Application function
SITES	DEFAULT_SITE_WP	SS	-	-	Application function
SITES	DEFAULT_VC_WP	SS	-	-	Application function
SITES	DEPTH	SS	-	-	Application function
SITES	DISTRICT_L	SM	-	-	Relational lookup
SITES	EVENTS	SM	-	-	Relational report/lookup
SITES	GET_100M	SM	-	-	Application function
SITES	GET_10K	SM	-	-	Application function
SITES	GET_1KM	SM	-	-	Application function
SITES	GET_1KMS	SM	-	-	Application function
SITES	GET_500M	SM	-	-	Application function

SITES	GET_5KM	SM	-	-	Application function
SITES	GET_5KMS	SM	-	-	Application function
SITES	GET_TETRAD	SM	-	-	Application function
SITES	GET_TETRADS	SM	-	-	Application function
SITES	GRID_SORT	SS	-	-	Application function
SITES	HABITAT_L	SM	-	-	Relational lookup
SITES	HIERARCHY	SM	-	-	Application function
SITES	ID_TOP	SS	-	-	Application function
SITES	INDENT_NAME	SS	-	-	Application function
SITES	LEN_ID	SS	-	-	Application function
SITES	LNR	SS	-	-	Application function
SITES	MAIN_GRID	SS	-	-	Application function
SITES	MAIN_NAME	SS	-	-	Application function
SITES	MASTER_ID	SS	-	-	Application function/relational lookup
SITES	MASTER_L	SS	-	-	relational lookup
SITES	MASTER_NAME	SS	-	-	Application function/relational lookup
SITES	NAME_CODE	SM	-	-	Application function
SITES	NAME_CODE_XREF	SM	-	-	Indexing function
SITES	NNR	SS	-	-	Application function
SITES	N_EVENTS	SS	-	-	Application function
SITES	N_HIERARCHY	SS	-	-	Application function
SITES	N_RECORDS	SS	-	-	Application function - but see new definition of records (e.g. samples and occurrences)
SITES	N_SPECIES	SS	-	-	Application function - as above
SITES	PARISH_L	SM	-	-	Relational lookup
SITES	RECORDS	SM	-	-	Relational lookup
SITES	REFULL_L	SM	-	-	Relational lookup function
SITES	REFERENCE_FULL	SM	-	-	see above
SITES	REFERENCE_L	SM	-	-	see above
SITES	SITE_STATUS	SS	-	-	Application dependent function
SITES	SITE_SUBSITE_SORT	SS	-	-	Application dependent function
SITES	SITE_TYPE	SS	LOCATION	LOCATION_TYPE	Information stored for all locations.
SITES	SKIP_ASSOC_WP	SS	-	-	Application data input function
SITES	SOUNDEX	SM	-	-	Application dependent function
SITES	SP_LIST	SM	-	-	Relational lookup to Occurrences or to Location Features.
SITES	SP_LIST_L	SM	-	-	see above
SITES	SSSI	SS	-	-	Application function
SITES	STATUS_L	SM	-	-	Relational lookup
SITES	SUBSITE_OF	SS	-	-	Application function
SITES	TENK	SS	-	-	Application function but also could be looked up from the GRID_SQUARES table
SITES	TENKS	SM	GRID_SQUARES	GRID_SQUARE	see above
SITES	TOP_SITE	SS	-	-	Application function
SITES	TOTAL_HABITAT_AREA	SS	-	-	Application function
SITES	TOTAL_RECORDS	SS	-	-	Application function - See new definition of records.
SITES	VCOUNTY_FIRST	SS	-	-	Application function
SITES	VCOUNTY_FIRST_L	SS	-	-	Application function
SITES	VCOUNTY_L	SM	-	-	Application function/relational lookup

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment

PERSONAL	ID	FS	NAME	NAME_KEY	System number for any individual or organisation. This entity is subtyped to Organisation and to Person which allows for recording more detailed attributes than in the Recorder table and linking people, organisations, addresses and communications in a more efficient manner.
PERSONAL	DATE_UPDATED	FS	-	-	standard date stamping will be applied to all tables
PERSONAL	UPDATED_BY	FS	-	-	see above
PERSONAL	SURNAME	FM	PERSON also ORGANISATION	PERSON_SURNAME ORGANISATION_FULL_NAME	NAME is subtyped to cover individuals and organisations.
PERSONAL	INITIALS	FS	PERSON	PERSON_INITIALS PERSON_TITLE	Recorder includes Title with initials.
PERSONAL	FIRST_NAME	FS	PERSON	FIRST_NAME	Used in the same way as Recorder
PERSONAL	ADDRESS	FM	NAME_AT_ADDRESS	ADDRESS_KEY and associated attributes	Recorder uses a multi-valued field to store the lines of the address. This model uses separate attributes but also includes attributes for the type of address (work or home) and dates
PERSONAL	POSITION	FM	NAME_RELATION NAME_ROLE	BAME_RELATIONS_KEY NAME_ROLE_KEY	A person's or organisations role/position can be described either as a role record e.g. BRERC is an LRC (role) or as a relation e.g. S.Ball works for JNCC
PERSONAL	TEL_HOME	FS	COMMS_NUMBER	NAME_KEY and associated attributes	The model allows for any form of communication number (phone, fax, email) to be linked to any person or organisation.
PERSONAL	TEL_WORK	FS	see above	see above	see above
PERSONAL	YEAR	FM	COMMS_NUMBER	ADDRESS_KEY DATE	perhaps date at which Comms number was valid? link to address for dates likely to be valid
PERSONAL	REFERENCE	FM	REFERENCE_LINK	REFERENCE_LINK_KEY	see previous notes on references
PERSONAL	BIOGRAPHY	FS	PERSON ORGANISATION	COMMENT	but could be extended to include specific attributes such as biography.
PERSONAL	START_DATE_DOB	FS	PERSON ORGANISATION	PERSON_DATE_BORN ORGANISATION_DATE_FOUNDED	Recorder uses several fields for coping with vague dates. Application specific function
PERSONAL	END_DATE_DOB	FS	see above	see above	see above
PERSONAL	DATE_TYPE_DOB	FS	see above	see above	see above
PERSONAL	START_DATE_DOD	FS	PERSON ORGANISATION	PERSON_DATE_DIED ORGANISATION_DATE_ENDED	See above
PERSONAL	END_DATE_DOD	FS	see above	see above	see above
PERSONAL	DATE_TYPE_DOD	FS	see above	see above	see above
PERSONAL	AGE	SS	-	-	Application function
PERSONAL	CHECK_DOB_WP	SS	-	-	Application validation function
PERSONAL	CHECK_DOD_WP	SS	-	-	Application validation function
PERSONAL	CHECK_YEAR_WP	SS	-	-	Application function
PERSONAL	DATE_OF_BIRTH	SS	-	-	Application function
PERSONAL	DATE_OF_DEATH	SS	-	-	Application function

PERSONAL	DATE_STAMP_WP	SS	-	-	System date stamping of records
PERSONAL	DECEASED	SS	-	-	Application function
PERSONAL	EVENTS	SM	NAME_RELATIO N	NAME_RELATIO N_KEY	Links between named people or organisations but also see Recorders. People & Events etc.
PERSONAL	FORMAT.ADDRESS	SS	-	-	Application report function
PERSONAL	FORMAT_ADDRESS	SS	-	-	as above
PERSONAL	FORMAT_NAME	SS	-	-	Application function
PERSONAL	INFORMAL_NAME	SS	-	-	Probably PERSON_FORENAME
PERSONAL	INITS	SM	-	-	PERSON_INITIALS
PERSONAL	LIST_ADDRESS	SS	-	-	Application report function
PERSONAL	NAME	SS	-	-	Application function
PERSONAL	N_EVENTS	SS	-	-	Relational lookup
PERSONAL	N_RECORDS	SS	-	-	Relational lookup but see new definition of records - probably number of survey events and count occurrences
PERSONAL	N_SPECIES	SS	-	-	Application function - quite complicated as needs to select all associated occurrences then remove duplicate species names (table view)
PERSONAL	RECORDS	SM	-	-	see N_RECORDS
PERSONAL	REFERENCE_L	SM	-	-	Relational lookup
PERSONAL	SITES	SM	-	-	Relational lookup
PERSONAL	SORT_NAME	SS	-	-	Application function
PERSONAL	SP_LIST	SM	-	-	see N_SPECIES
PERSONAL	SURNAME_XREF	SM	-	-	Index function

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
EVENTS	CODE	FS	EVENT SURVEY_EVENT	EVENT_KEY SURVEY_EVENT _KEY	Events mainly relates to site oriented actions such as planning applications and management event. Participation in recording is handled by Survey Events.
EVENTS	EVENT_TYPE	FM	EVENT SURVEY_EVENT	EVENT_TYPE SURVEY_TYPE	as above
EVENTS	PEOPLE	FM	EVENT_PEOPLE SURVEY_RECOR DER	NAME_KEY NAME_KEY	allows multivalued lists of people(or organisations) linked to events and surveys.
EVENTS	COMMENT	FS	EVENT SURVEY_EVENT	EVENT_COMME NT	Survey event includes separate attribute for weather description
EVENTS	REFS	FM	See previous notes on REFS	-	-
EVENTS	SITE_CODE	FM	EVENT_LOCATI ON SURVEY_SAMPL E	LOCATION_KEY LOCATION_KEY	Ordinary events are linked to one or more locations through a link entity. Recording events link to a location through a survey event sample.
EVENTS	START_DATE	FS	EVENT SURVEY_EVENT	EVENT_DATE_F ROM SURVEY_EVENT _DATE_FROM	
EVENTS	END_DATE	FS	EVENT SURVEY_EVENT	EVENT_DATE_T O SURVEY_EVENT _DATE_TO	
EVENTS	DATE_TYPE	FS	-	-	Application specific requirement
EVENTS	TEMP	FS	-	-	Application specific, not

					used.
EVENTS	DATE	SS	-	-	Application function
EVENTS	DATE_STAMP_WP	SS	-	-	Application specific
EVENTS	GRID	SM	-	-	Relational lookup
EVENTS	GRID_L	SM	-	-	as above
EVENTS	INITIALS	SM	-	-	Application function or is this the lookup from PERSONAL?
EVENTS	PEOPLE_L	SM	-	-	Relational lookup
EVENTS	REFERENCE_L	SM	-	-	Relational lookup
EVENTS	SITE_L	SM	-	-	Application function/relational lookup
EVENTS	TENK	SM	-	-	Relational lookup
EVENTS	TYPE_L	SM	-	-	Relational lookup
EVENTS	YEAR	SS	-	-	Application function

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
LITERATURE	LIT_CODE	FS	PUBLICATION	PUBLICATION_KEY	same as Recorder
LITERATURE	DATE_UPDATED	FS	-	-	Standard system date stamping
LITERATURE	UPDATED_BY	FS	-	-	as above
LITERATURE	AUTHOR	FM	PUBLICATION	AUTHORS	Same as Recorder except Recorder uses multi-valued field and I suggest entering these as a single string.
LITERATURE	YEAR	FS	PUBLICATION	PUBLICATION_DATE	
LITERATURE	REFERENCE	FS	PUBLICATION	PUBLICATION_TITLE and many other attributes according to PUBLICATION_TYPE	Recorder stores the full reference as a single attribute in the format it will be printed. This model subtypes references and has many separate attributes which would be concatenated as necessary by an application function.
LITERATURE	TYPE	FS	PUBLICATION	PUBLICATION_TYPE	uses controlled list
LITERATURE	LOCATION	FS	PUBLICATION_EXTERNAL_NUMBER	EXTERNAL_REF_NUMBER	This entity and attribute allows the referencing of the publication not only to storage location but to any bibliographic referencing system e.g. ISBN etc.
LITERATURE	KEYWORDS	FM	PUBLICATION_KEYWORDS	KEYWORD_ID	The equivalent of Recorder's multi-valued field
LITERATURE	ABBRV_REFERENCE	SS	-	-	Application function
LITERATURE	AUTHOR_XREF	SM	-	-	Indexing function
LITERATURE	CHECK_YEAR_WP	SS	-	-	Application function
LITERATURE	DATE_STAMP_WP	SS	-	-	Application function
LITERATURE	EVENTS	SM	-	-	Relational lookup - REFERENCE_LINK
LITERATURE	FIRST_LINE	SS	PUBLICATION	PUBLICATION_TITLE	Application function
LITERATURE	FULL_REFERENCE	SS	-	-	Application function
LITERATURE	N_EVENTS	SS	-	-	Application function
LITERATURE	N_RECORDS	SS	-	-	Application function
LITERATURE	N_SPECIES	SS	-	-	Application function
LITERATURE	PERSONAL	SM	-	-	Relational lookup
LITERATURE	RECORDS	SM	-	-	Application function/relational lookup
LITERATURE	SITES	SM	-	-	Application function/relational lookup
LITERATURE	SORT_NAME	SS	-	-	Application function

LITERATURE	SPECIES	SM	-	-	Application function/relational lookup
LITERATURE	SP_LIST	SM	-	-	Application function/relational lookup
LITERATURE	SP_LIT_CODE	SM	-	-	-
LITERATURE	TYPE_L	SS	-	-	Relational lookup

Dictionary Tables					
Recorder Table	**Recorder Column**	**Field Type**	**Data Model Entity**	**Data Model Attribute**	**Comment**
SPECIES	NUMBER	FS	TAXON TAXON_VERSION CHECKLIST_ITEM	TAXON_KEY TAXON_VERSION_KEY CHECKLIST_ITEM_KEY	Recorder uses a single taxon table whereas the new model uses three tables to store taxon names, versions of taxon names and their inclusion in checklists.
SPECIES	UPDATED	FS	-	-	Standard system record tracking
SPECIES	UPDATED_BY	FS	-	-	as above
SPECIES	VERSION	FS	TAXON_VERSION	TAXON_VERSION_KEY	Not quite the same as Recorder because Recorder does not store previous versions of names. Update control is given by maintaining versions and date checking them.
SPECIES	BRC_ORDER	FS	TAXON_CODES	TAXON_CODE_KEY	The model allows any number of codes from any number of coding systems to be linked to a taxon.
SPECIES	FAMILY	FS	CHECKLIST_ITEM_RELATION CHECKLIST_ITEM	CHECKLIST_ITEM_REL_KEY TAXON_RANK	Relationships between taxa are a feature of the checklist and are stored as relationships within that checklist.
SPECIES	BRC_ORDER	FS	TAXON_CODES	TAXON_CODE_KEY	See Taxon Codes above
SPECIES	GENUS_N	FS	TAXON_CODES	TAXON_CODE_KEY	See Taxon Codes above
SPECIES	SPECIES_N	FS	TAXON_CODES	TAXON_CODE_KEY	See Taxon Codes above
SPECIES	BINOMIAL	FM	TAXON	TAXON	Taxon name including Infra taxa
SPECIES	AUTHORITY	FM	TAXON	TAXON_AUTHORITY	as Recorder
SPECIES	STATUS_LIST	FM	TAXON_DESIGNATION	TAXON_DESIGNATION_KEY DESIGNATION_KEY	Link to the Protection and Legislation module. This module allows the recording of national and local designations. Legal and informal.
SPECIES	REGION_LIST	FM	as above	as above	as above
SPECIES	OTHER_NUMBERS	FM	TAXON_CODES	TAXON_CODE_KEY	See Taxon Codes above
SPECIES	OTHER_NUMBER_SOURCE	FM	TAXON_CODES CODING_SCHEME	CODING_SCHEME SOURCE_KEY	
SPECIES	COMMENT	FS	TAXON_VERSION	TAXON_VERSION_COMMENT	The model allows for original descriptions, national

			TAXON_FACTS	TAXON_ACCOUNT	summaries and local accounts.
SPECIES	COMMON	FM	TAXON_ CHECKLIST_ITEM CHECKLIST_ITEM_RELATION	TAXON TAXON_NAME_TYPE CHECKLIST_ITEM_KEY CHECKLIST_ITEM_REL_KEY	In information terms, there is little difference in common names and scientific names other than the formality of control involved. Common names are therefore associated with Latin names by relations within the checklist table (checklist of common names and checklist of Latin names)
SPECIES	BIBLIOGRAPHY	FM	other notes on Refs.	-	-
SPECIES	REF_TYPE	FM	as above	-	-
SPECIES	OLD_STATUS	FM	TAXON_DESIGNATION	TAXON_DESIGNATION_KEY TX_DESIGNATION_DATE_FROM TX_DESIGNATION_DATE_TO	The Taxon Designation table holds attributes for when status was applied and removed so old status designations can be looked up.
SPECIES	STATUS_CHANGED	FM	see above	see above	see above
SPECIES	ALIEN	FS	TAXON_VERSION	TAXON_UK_NATIVE	Flags for native rather than Alien
SPECIES	RDB	FS	TAXON_DESIGNATION	DESIGNATION_KEY	RDB status can be looked up from Designation table. This enables both national and local RDB status to be recorded.
SPECIES	INFRASPECIES_N	FS	TAXON_CODES	TAXON_CODE	not quite sure of the function of this in Recorder.
SPECIES	HABITAT	FM	TAXON_BIOTOPE_ASSOCIATION	TAXON_VERSION_KEY BIOTOPE_KEY	Replaces Recorder's multivalued field with a table containing several attributes.
SPECIES	H_REGION	FM	TAXON_BIOTOPE_ASSOCIATION	LOCATION_KEY	association can be linked with any location large or small.
SPECIES	POTENTIAL	FM	TAXON_BIOTOPE_ASSOCIATION	TX_BT_ASS_STRENGTH	see HABITAT
SPECIES	ENDEMIC	FS	TAXON_FACT	TAXON_ACCOUNT	Endemism can be linked to any sort of area. However, in an application it might prove more convenient to add an attribute to Taxon Version for UK Endemic (not many of them though!)
SPECIES	INTERNATIONAL_STATUS	FS	TAXON_DESIGNATION	DESIGNATION_KEY	Model allows any number of international status designations to be linked to a taxon version
SPECIES	WCA_SCHEDULES	FS	LEGISLATION_VERSION	LEGISLATION_VERSION_KEY and other attributes	Details of legislation and conventions are held in the Legislation Module
SPECIES	ABBREVIATION	SM	-	-	Application Function?
SPECIES	ABBRV_OPTION_WP	SS	-	-	Application function
SPECIES	ASSOCIATES	SM	TAXON_TAXON_ASSOCIATION	TX_TX_ASS_KEY and associated attributes	Associations between species can be recorded for any location large or small. Recorder looks up Local Species Table for this information.
SPECIES	BF_N	SS	TAXON_CODES	TAXON_CODE_KEY	Bradley & Fletcher may also be a checklist.
SPECIES	BIBLIOGRAPHY_L	SM	-	-	Report Function
SPECIES	BINOMIAL_XREF	SM	-	-	Index function
SPECIES	BRC_ORDER_L	SS	-	-	Relational lookup
SPECIES	CHECK_FAMILY_WP	SS	-	-	Application function
SPECIES	CHECK_FAM_WP	SS	-	-	Application function
SPECIES	CHECK_ORDER_WP	SS	-	-	Application function
SPECIES	CHECK_TYPE_WP	SS	-	-	Application function

SPECIES	COMMON_AND_SCIENTIFIC	SS	-	-	Report Function/ Application function
SPECIES	COMMON_NAME	SS	-	-	Application function
SPECIES	COMMON_XREF	SM	-	-	Application function
SPECIES	COUNT_SQUARES	SS	-	-	Application function
SPECIES	CS_NAME	SS	-	-	Application function
SPECIES	DATE_STAMP_WP	SS	-	-	Application function
SPECIES	DISPLAY_NAMES	SM	-	-	Application function
SPECIES	FAMILY_CODE	SS	-	-	Relational lookup
SPECIES	FAMILY_L	SS	-	-	Relational lookup
SPECIES	FULL_NAME	SS	-	-	Application function
SPECIES	GB_STATUS	SS	-	-	Relational lookup
SPECIES	GB_STATUS_L	SS	-	-	Relational lookup
SPECIES	GENUS	SS	-	-	Application function
SPECIES	HABITAT_L	SM	-	-	Relational lookup
SPECIES	H_REGION_L	SM	-	-	relational lookup
SPECIES	ITALIC_NAME	SS	-	-	Application specific function
SPECIES	LOCAL_DETAILS	SS	NA	NA	Model does not use a Local Species Table
SPECIES	LOCAL_STATUS	SS	as above	as above	as above
SPECIES	LOCAL_STATUS_L	SS	as above	as above	as above
SPECIES	MERGE_COMMENT	SS	-	-	Application specific
SPECIES	NAME	SS	-	-	Application function
SPECIES	N_RECORDS	SS	-	-	Application function
SPECIES	N_SQUARES	SS	-	-	Application function
SPECIES	OLD_CODE	SS	TAXON_CODES	TAXON_CODE	-
SPECIES	OTHER_NUMBER_L	SS	-	-	Attributes of TAXON CODES
SPECIES	PREVIOUS_STATUS_L		-	-	Relational lookup
SPECIES	RECORDS	SM	-	-	Application function
SPECIES	REFERENCE_L	SM	-	-	Relational lookup
SPECIES	REFS	SM	-	-	as above
SPECIES	REFS_L	SM	-	-	as above
SPECIES	REGION	SM	-	-	Relational lookup
SPECIES	REGION_L	SM	-	-	as above
SPECIES	REGION_LIST_L	SM	-	-	as above
SPECIES	SOUNDEX	SM	-	-	Application specific function
SPECIES	SPECIES	SM	-	-	Application function
SPECIES	SP_CODE	SS	CHECKLIST_ITEM	CHECKLIST_ITEM_SORT_CODE	Each checklist maintains its own sort order.
SPECIES	STATUS	SM	-	-	Relational lookup
SPECIES	STATUS_L	SM	-	-	as above
SPECIES	STATUS_LIST_L	SM	-	-	as above
SPECIES	STATUS_TEXT	SS	-	-	Report Function
SPECIES	TEMP	SS	-	-	Not used
SPECIES	TYPE	SM	-	-	lookup

Note: Recorder has a local species file which is editable and can store details of local/regional status and local accounts. It includes many symbolic fields for accessing national information from the main species dictionary and also for accessing species records. In the new model all taxon 'dictionary' information is kept in the same set of tables but is flagged according to its type and so many of the symbolic fields listed below would be redundant as they are already listed above for national accounts etc.

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
LOCAL_SPECIES	NUMBER	FS	TAXON	TAXON_KEY	Recorder uses a separate Local Species Table which is editable by users.
LOCAL_SPECIES	LAST_RECORD_ADDED	FS	-	-	Application Function
LOCAL_SPECIES	LOCAL_DETAILS	FS	TAXON_FACTS	TAXON_ACCOUNT TAXON_ACCOUNT_TYPE	Local taxon accounts have a type Local which is editable by the user.
LOCAL_SPECIES	LOCAL_STATUS	FM	TAXON_DESIGNATION	DESIGNATION_KEY	Linked to the Designation table which holds local and

					national status types
LOCAL_SPECIES	LOCAL_REGION	FM	GEOGRAPHIC_COVER	LOCATION_KEY	Linked to the Designation table to describe the coverage of different status designations including local ones.
LOCAL_SPECIES	LOCAL_REFS	FM	See REFS	-	See earlier account of use of references_link table
LOCAL_SPECIES	LOCAL_REF_TYPE	FM	see above	-	see above
LOCAL_SPECIES	LOCAL_ABBRV	FS	TAXON_CODES	TAXON_CODE	An abbreviation is a form of coding.
LOCAL_SPECIES	NEW_ITEM	FS	-	-	Application specific record tracking function.
LOCAL_SPECIES	CRITICAL	FS	TAXON_VERSION	TAXON_VALIDATION_LEVEL	Presumed to be set nationally for standard dictionary entries.
LOCAL_SPECIES	ABBRV_OPTION_WP	SS	-	-	Application specific function
LOCAL_SPECIES	ASSOCIATES	SM	-	-	Relational lookup to the Taxon_Taxon_Association Table
LOCAL_SPECIES	BRC_ORDER_L	SS	-	-	Relational lookup
LOCAL_SPECIES	CHECK_REGION_WP	SS	-	-	Application function - set in options
LOCAL_SPECIES	CHECK_STATUS_WP	SS	-	-	Application function - set in options
LOCAL_SPECIES	CHECK_TYPE_WP	SS	-	-	Application function
LOCAL_SPECIES	COMMON_NAME	SS	-	-	Look up common names through relations in Checklist Item
LOCAL_SPECIES	DISPLAY_NAME	SS	-	-	Report formatting function
LOCAL_SPECIES	FAMILY_L	SS	-	-	Lookup
LOCAL_SPECIES	FULL_NAME	SS			Lookup
LOCAL_SPECIES	GB_STATUS_L	SS	-	-	Relational lookup
LOCAL_SPECIES	LOCAL_REFS_L	SM	-	-	Relational lookup
LOCAL_SPECIES	N_RECORDS	SS	-	-	Application function
LOCAL_SPECIES	N_SQUARES	SS	-	-	Application function
LOCAL_SPECIES	RECORDS	SM	-	-	Relational lookup - somewhat more complicated than recorder because of samples and occurrences arrangement.
LOCAL_SPECIES	REGION_L	SM	-	-	Relational lookup
LOCAL_SPECIES	SPECIES_REGION	SM	-	-	Relational lookup
LOCAL_SPECIES	SPECIES_STATUS	SM	-	-	Relational lookup
LOCAL_SPECIES	SP_CODE	SS	CHECKLIST_ITEM	CHECKLIST_ITEM_SORT_CODE	Local species accounts etc. are in the same tables as national ones.
LOCAL_SPECIES	STATUS_L	SM	-	-	Relational lookup
LOCAL_SPECIES	STATUS_LIST_L	M	-	-	Relational lookup
LOCAL_SPECIES	UPDATED_BY_L	SS	-	-	Standard system record stamping
LOCAL_SPECIES	UPDATE_L	SS	-	-	Standard system record stamping
LOCAL_SPECIES	VERSION_L	SS	-	-	Standard system record stamping
LOCAL_SPECIES	WRAP_UP_WP	SS	-	-	Application specific

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
STATUS_REGION	REGION	FS	LOCATION_CODE	LOCATION_CODE	Status Regions are just another form of location
STATUS_REGION	LABEL	FS	LOCATION	LOCATION_NAME	as above
STATUS_REGION	COUNTIES	FM	LOCATION_RELATION	LOCATION_RELATION_KEY	Counties are associated with regions through relationship records
STATUS_REGION	COUNTY_L	SM	LOCATION	LOCATION_NAM	Application function steps

				E	through relations and returns names.

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
HABITATS	CODE	FS	BIOTOPE BIOTOPE_CODE	BIOTOPE_ORIGINAL_CODE BIOTOPE_CODE_KEY BIOTOPE_CODE	Most biotopes are given codes when first defined and it can be useful to store this separately. Biotopes can, however, have any number of codes assigned to them and details are kept in a separate codes table.
HABITATS	LABEL	FS	BIOTOPE	BIOTOPE_FULL_TERM BIOTOPE_SHORT_TERM	The name of the Biotope can be very long e.g. in NVC so both long and short forms of the name should be available.
HABITATS	SYSTEM	FS	BIOTOPE_CLASSIFICATION_SCHEME BIOTOPE_CLASSIFICATION_VERSION	BIOTOPE_CLASSIFICATION_KEY BT_CL_VERSION	Biotopes may be identified in various classification schemes each of which may have several versions.
HABITATS	PARENT	FS	BIOTOPE_CHECKLIST_ITEM	BIOTOPE_SORT_CODE BIOTOPE_RANK	A Biotopes position in a particular sort code is given by its internal sort code and the next parent up the list can be recognised from its Rank. Relationships can also be defined through BIOTOPE_RELATIONS
HABITATS	UPDATED	FS	-	-	Standard system record tracking
HABITATS	UPDATED_BY	FS	-	-	Standard system record tracking
HABITATS	NCC_RSNC	FS	BIOTOPE_RELATIONS	BIOTOPE_RELATION_KEY	Biotopes can be equated through the relations table. Possibly need a Biotope Checklist Item Relation table to be more specific.
HABITATS	EXPLANATION	FS	BIOTOPE	BIOTOPE_DEFINITION	as Recorder
HABITATS	NVC_CODE	FS	See NCC_RSNC above	-	Biotope Relations
HABITATS	REAL_CODE	FS	BIOTOPE	BIOTOPE_ORIGINAL_CODE	as Recorder
HABITATS	CHILD	FM	-	-	Application function working on Biotope Sort Code and Rank or could be done through Relations.
HABITATS	CATOGORY_CHECK_WP	SS	-	-	Application function
HABITATS	CATEGORY_ID	SS	-	-	Application function
HABITATS	CATEGORY_L	SS	-	-	Application function
HABITATS	DATE_STAMP_WP	SS	-	-	Standard system record tracking
HABITATS	ENTRY_TYPE	SS	-	-	Index function
HABITATS	HAS_CHILD	SS	-	-	Application specific function
HABITATS	PARENTS	SM	-	-	Application specific function
HABITATS	SYSTEM_ID	SS	-	-	Not used
HABITATS	SYSTEM_L	SS	BIOTOPE_CLASSIFICATION_SCHEME	BIOTOPE_CLASSIFICATION	Part of the dictionary

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
CODES	CODE	FS	TERMLIST	TERM_CODE	Term and Term Code are not used singly as keys in this

					table
CODES	LABEL	FS	TERMLIST	TERM	Recorder calls this a label
CODES	DATE_UPDATE	FS	-	-	Standard system record tracking
CODES	UPDATED_BY	FS	-	-	Standard system record tracking
CODES	TAXON	FM	-	-	Not in model at present - needs a TAXON_TERM_LINK entity
CODES	EXPLANATION	FS	TERMLIST	DEFINITION	As Recorder
CODES	DATE_STAMP_WP	SS	-	-	Standard system record tracking
CODES	ENTRY_TYPE	SS	-	-	Application specific function
CODES	NSTRIP	SS	-	-	Application specific function
CODES	SKIP_TAXON_WP	SS	-	-	Application specific function
CODES	STRIP	SS	-	-	Application specific function
CODES	TAXON_L	SS	-	-	Application specific function

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
DISTRICT_PARISH	CODE	FS	LOCATION_CODE	LOCATION_CODE	Recorder District_Parish codes are just another coding system
DISTRICT_PARISH	NAME	FS	LOCATION	LOCATION_NAME	Districts and Parishes are locations
DISTRICT_PARISH	TENK	FM	GRID_SQUARES	GRID_SQUARE LOCATION_KEY	Any number of grid squares including 10K squares can be associated with a location
DISTRICT_PARISH	PARISHES	FM	LOCATION_RELATION	LOCATION_RELATION_KEY and attributes	Parishes can be linked to Districts through location relation records
DISTRICT_PARISH	CORRECT_TYPE_WP	SS	-	-	Application function
DISTRICT_PARISH	COUNTY_L	SS	-	-	Application specific function
DISTRICT_PARISH	DISTRICT	SS	-	-	Application specific function
DISTRICT_PARISH	DISTRICT_L	SS	-	-	Application specific function
DISTRICT_PARISH	NAME_XREF	SM	-	-	Indexing function
DISTRICT_PARISH	NEXT_ID_WP	SS	-	-	Application specific function
DISTRICT_PARISH	N_SITES	SS	-	-	Report function
DISTRICT_PARISH	REC_TYPE	SS	LOCATION	LOCATION_TYPE	handled directly in the location module
DISTRICT_PARISH	SITES	SM	-	-	Application specific function
DISTRICT_PARISH	WRAP_UP_WP	SS	-	-	Application specific function

Recorder Table	Recorder Column	Field Type	Data Model Entity	Data Model Attribute	Comment
ORDER_FAMILY	TAXA_CODE	FS	TAXON_CODES	TAXON_CODE CODING_SCHEME	Orders and families are taxa which are included in the Taxon table and represented in various checklists
ORDER_FAMILY	NAME	FS	TAXON	TAXON	as above
ORDER_FAMILY	ENGLISH	FS	TAXON	TAXON	as above
ORDER_FAMILY	BRC_ORDER	SS	TAXON_CODES	TAXON_CODE CODING_SCHEME	Just another code system
ORDER_FAMILY	NAMES	SM	-	-	Application function
ORDER_FAMILY	SINGULAR	SS	-	-	Application function?
ORDER_FAMILY	TYPE	SS	CHECKLIST_ITEM	TAXON_RANK	Type of entry or rank is dependent on the checklist in question.

Annex 3

Documentation of
Physical Data Model
Recorder_2_Provisional

Project Name	:	Recorder Rebuild
Project Code	:	RECORDER_REBUILD
Database	:	Watcom SQL 4.0
Name	:	Recorder_2_Provisional
Code	:	RECORDER_2_PROVISIONAL
Label	:	Recorder - Provisional Model
Author	:	C.Copp Version : 4.2
Created On	:	19/11/96 14:20 Modified On : 06/02/98 12:52

Description:
Over a period of years the development of Recorder has been contributed to by many naturalists, computer specialists and staff of the statutory conservation agencies. It now includes a number of de facto standards recognised by a significant proportion of the biological recording community and in its record validation it is unequalled by any other biological recording software. Recorder is currently used by over 450 organisations and individual naturalists and a recent survey showed that the 114 users who replied held nearly 5 million records so it is likely that a high percentage of the non-bird records in the UK are held on Recorder.

Recorder is a powerful and sophisticated application but its underlying software (Advanced Revelation) is rapidly becoming obsolete and there is a consequent need to redevelop Recorder using a more up-to-date product. This ties in well with the project to set up a National Biodiversity Network and also gives us the opportunity to think more widely about the structure of biological and earth science records and how applications relate to the needs of different users. It is for this reason that JNCC have commissioned Charles Copp to carry out a systems analysis aimed at defining the data model upon which the new version of Recorder will be built. In this work he will be liaising closely with Stuart Ball who developed Recorder.

This data model is part of the effort to rebuild Recorder for the next generation of users. It represents a relational view of the logical models developed during the Systems Analysis. This model is not yet a Required Systems Physical Model. The final model will be developed on the basis of the selected business and technical options and a re-analysis of the relational model to create a more efficent system. This reanalysis will involve the combining of code tables into a single reference table and the revaluation of subtypes in terms of database efficiency.

Name	Code	Number
Address	ADDRESS	50000
Admin	ADMIN	15000
Admn_Boundary	ADMN_BOUNDARY	50000
AdmnType	ADMNTYPE	500
Artwork_Image	ARTWORK_IMAGE	10000
Authority	AUTHORITY	1000
Biotope	BIOTOPE	10000
Biotope_Checklist_Item	BIOTOPE_CHECKLIST_ITEM	10000
Biotope_Classification_Scheme	BIOTOPE_CLASSIFICATION_SCHEME	200
Biotope_Classification_Type	BIOTOPE_CLASSIFICATION_TYPE	100
Biotope_Classification_Version	BIOTOPE_CLASSIFICATION_VERSION	1000
Biotope_Code	BIOTOPE_CODE	50000
Biotope_Code_Scheme	BIOTOPE_CODE_SCHEME	1000
Biotope_Designation	BIOTOPE_DESIGNATION	10000
Biotope_Determination	BIOTOPE_DETERMINATION	100000
Biotope_Occurrence	BIOTOPE_OCCURRENCE	100000
Biotope_Occurrence_Data	BIOTOPE_OCCURRENCE_DATA	100000
Biotope_Rank	BIOTOPE_RANK	100000
Biotope_Relations	BIOTOPE_RELATIONS	20000
Cards	CARDS	2000
Checklist	CHECKLIST	1000
Checklist_item	CHECKLIST_ITEM	100000
Checklist_Item_Synonomy	CHECKLIST_ITEM_SYNONOMY	100000
Checklist_Type	CHECKLIST_TYPE	1000
Checklist_Version	CHECKLIST_VERSION	300
Coding_Scheme	CODING_SCHEME	300
Collection	COLLECTION	10000
Comms Number	COMMS_NUMBER	10000
Communication	COMMUNICATION	10000
Damage_Occurrence	DAMAGE_OCCURRENCE	100000
Dataset_Source	DATASET_SOURCE	20000
Designation_Type	DESIGNATION_TYPE	1000
Digital_Image	DIGITAL_IMAGE	100000
Earth_Sci_Ftr_Occurrence	EARTH_SCI_FTR_OCCURRENCE	100000
Earth_Sci_Ftr_Type	EARTH_SCI_FTR_TYPE	1000
Earth_Science_Feature	EARTH_SCIENCE_FEATURE	100000
Event	EVENT	50000
Event_Location	EVENT_LOCATION	50000
Event_People	EVENT_PEOPLE	10000
Event_Type	EVENT_TYPE	1000
Geographic_Cover	GEOGRAPHIC_COVER	10000
Grid_Squares	GRID_SQUARES	200000
Image	IMAGE	10000
Image_Dimensions	IMAGE_DIMENSIONS	100000
Image_In_Publication	IMAGE_IN_PUBLICATION	10000

Name	Code	Number
Image_link	IMAGE_LINK	50000
Image_Reference_Code	IMAGE_REFERENCE_CODE	10000
Image_Relations	IMAGE_RELATIONS	10000
Image_Type	IMAGE_TYPE	100
Jurisdiction	JURISDICTION	1000
Land_Parcel	LAND_PARCEL	100000
Legislation	LEGISLATION	1000
Legislation_Version	LEGISLATION_VERSION	1000
Loc_Admn	LOC_ADMN	100000
Location	LOCATION	30000
Location_Boundary	LOCATION_BOUNDARY	
Location_Code	LOCATION_CODE	100000
Location_Code_System	LOCATION_CODE_SYSTEM	10000
Location_Designation	LOCATION_DESIGNATION	50000
Location_Features	LOCATION_FEATURES	10000
Location_Relation	LOCATION_RELATION	50000
Location_Type	LOCATION_TYPE	1000
Location_Use	LOCATION_USE	100000
Management_Aims	MANAGEMENT_AIMS	100000
Mineral_Determination	MINERAL_DETERMINATION	100000
Mineral_Occurrence	MINERAL_OCCURRENCE	100000
Moving_Image	MOVING_IMAGE	10000
Name	NAME	5000
Name at Address	NAME_AT_ADDRESS	5000
Name Relation	NAME_RELATION	10000
Name_Code	NAME_CODE	100000
Name_Code_System	NAME_CODE_SYSTEM	10000
Name_Role	NAME_ROLE	10000
Numbers_Applied_To_Specimen	NUMBERS_APPLIED_TO_SPECIMEN	100000
Organisation	ORGANISATION	2000
Person	PERSON	3000
Photographic_Image	PHOTOGRAPHIC_IMAGE	10000
Physical_Data_Type	PHYSICAL_DATA_TYPE	1000
Potential_Threats	POTENTIAL_THREATS	100000
Publication	PUBLICATION	20000
Publication_External_Number	PUBLICATION_EXTERNAL_NUMBER	100000
Publication_Keywords	PUBLICATION_KEYWORDS	200000
Publication_Reference_System	PUBLICATION_REFERENCE_SYSTEM	300
Publication_Type	PUBLICATION_TYPE	10000
Record_Type	RECORD_TYPE	1000
Reference_Link	REFERENCE_LINK	50000
Rock_Type_Occurrence	ROCK_TYPE_OCCURRENCE	100000
Role	ROLE	500
Sample_Location_Data	SAMPLE_LOCATION_DATA	100000
Sample_Relation	SAMPLE_RELATION	100000
Serial	SERIAL	2000

Name	Code	Number
Source	SOURCE	50000
Source_Link	SOURCE_LINK	100000
Specimen	SPECIMEN	100000
Strat_checklist_Item	STRAT_CHECKLIST_ITEM	100000
Strat_Checklist_Version	STRAT_CHECKLIST_VERSION	20000
Strat_Codes	STRAT_CODES	100000
Strat_Coding_Scheme	STRAT_CODING_SCHEME	200
Strat_Occurrence_Data	STRAT_OCCURRENCE_DATA	100000
Strat_Rank	STRAT_RANK	1000
Strat_Rel_Geog	STRAT_REL_GEOG	100000
Strat_Rel_List	STRAT_REL_LIST	100000
Strat_Relations	STRAT_RELATIONS	100000
Strat_Term	STRAT_TERM	20000
Strat_Term_Type	STRAT_TERM_TYPE	100
Strat_Term_Version	STRAT_TERM_VERSION	100000
Stratigraphic Checklist	STRATIGRAPHIC_CHECKLIST	10000
Stratigraphic_Occurrence	STRATIGRAPHIC_OCCURRENCE	100000
Survey	SURVEY	10000
Survey_Event	SURVEY_EVENT	100000
Survey_Method	SURVEY_METHOD	1000
Survey_Recorder	SURVEY_RECORDER	10000
Survey_Sample	SURVEY_SAMPLE	100000
Survey_Type	SURVEY_TYPE	1000
Taxon	TAXON	100000
Taxon_Biotope_Association	TAXON_BIOTOPE_ASSOCIATION	100000
Taxon_Codes	TAXON_CODES	100000
Taxon_Designation	TAXON_DESIGNATION	100000
Taxon_Determination	TAXON_DETERMINATION	100000
Taxon_Facts	TAXON_FACTS	100000
Taxon_Name_Type	TAXON_NAME_TYPE	1000
Taxon_Occ_Data_Type	TAXON_OCC_DATA_TYPE	1000
Taxon_Occurrence	TAXON_OCCURRENCE	100000
Taxon_Occurrence_Data	TAXON_OCCURRENCE_DATA	100000
Taxon_Occurrence_Relation	TAXON_OCCURRENCE_RELATION	
Taxon_Rank	TAXON_RANK	300
Taxon_Skill	TAXON_SKILL	10000
Taxon_Specimen	TAXON_SPECIMEN	100000
Taxon_Taxon_Association	TAXON_TAXON_ASSOCIATION	100000
Taxon_Version	TAXON_VERSION	100000
Taxon_Version_Relation	TAXON_VERSION_RELATION	100000
Tenure	TENURE	100000
Term_Type	TERM_TYPE	500
Termlist	TERMLIST	100000
Threats	THREATS	500

Name : Address

Code : ADDRESS

Label : Details of individual and organisation addresses

Number : 50000

Description:
Details of an actual address- as required for mailing etc.

Column Name	Code	Type	P	M
Address_key	ADDRESS_KEY	integer	Y	Y
Address_1	ADDRESS_1	char		
Address_2	ADDRESS_2	char		
Address_town	ADDRESS_TOWN	char		
Address_county	ADDRESS_COUNTY	char		
Address_Country	ADDRESS_COUNTRY	char		
Address_postcode	ADDRESS_POSTCODE	char		

Referenced By	Foreign Key	Primary Key
NAME_AT_ADDRESS	ADDRESS_KEY	ADDRESS_KEY

Name : Admin

Code : ADMIN

Label : Standard list of administrative areas

Number : 15000

Description:
Standard dictionary of administrative area terms e.g. English 1974 counties, New Unitaries, Parishes etc.

Column Name	Code	Type	P	M
Admin_Key	ADMIN_KEY	integer	Y	Y
Admin_Name	ADMIN_NAME	char		Y
Admin_Type	ADMIN_TYPE	char		Y
Source_Key	SOURCE_KEY	integer		

Reference To	Primary Key	Foreign Key
ADMNTYPE	ADMIN_TYPE	ADMIN_TYPE

Referenced By	Foreign Key	Primary Key
LOC_ADMN	ADMIN_KEY	ADMIN_KEY
ADMN_BOUNDARY	ADMIN_KEY	ADMIN_KEY

Name : Admn_Boundary

Code : ADMN_BOUNDARY

Label : Versions of administrative areas defined by boundaries

Number : 50000

Column Name	Code	Type	P	M
Admn_Boundary_Key	ADMN_BOUNDARY_KEY	integer	Y	Y
Admin_Key	ADMIN_KEY	integer		
Date_From	DATE_FROM	char		
Date_To	DATE_TO	char		
Authority	AUTHORITY	char		
Source_Key	SOURCE_KEY	integer		

Reference To	Primary Key	Foreign Key
ADMIN	ADMIN_KEY	ADMIN_KEY

Name : AdmnType

Code : ADMNTYPE

Label : Lookup list of Administrative area types (classifications)

Number : 500

Description:
List of types of admin area in the standard dictionary e.g. countries, parishes etc.

Column Name	Code	Type	P	M
Admin_Type	ADMIN_TYPE	char	Y	Y
Date_From	DATE_FROM	char		
Date_To	DATE_TO	char		
Admin_Type_Definition	ADMIN_TYPE_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
ADMIN	ADMIN_TYPE	ADMIN_TYPE

Name : Artwork_Image

Code : ARTWORK_IMAGE

Label : Original images such as drawings and paintings

Number : 10000

Description:
Subtype of image. Pieces of original artwork such as drawings, sketches and paintings

Column Name	Code	Type	P	M
Image_Key	IMAGE_KEY	integer	Y	Y
Material	MATERIAL	char		

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Authority

Code : AUTHORITY

Label : Authority responsible for legislation

Number : 1000

Description:
Legislation and international conventions may be controlled by numerous organisations including the UK government and the EC.

Column Name	Code	Type	P	M
Legislation_Key	LEGISLATION_KEY	integer	Y	Y
Name_key	NAME_KEY	integer	Y	Y
Role_Term	ROLE_TERM	char		

Reference To	Primary Key	Foreign Key
LEGISLATION	LEGISLATION_KEY	LEGISLATION_KEY

Name : Biotope

Code : BIOTOPE

Label : Table of Biotope, land-cover and land-use terms

Number : 10000

Description:
Controlled terminology entity listing the various terms in biotope, land-use and land-cover classifications. It can also carry extra information about the terms to provide 'added value' to users.

Column Name	Code	Type	P	M
Biotope_key	BIOTOPE_KEY	integer	Y	Y
Bt_Cl_Version	BT_CL_VERSION	integer		Y
Biotope_Original_Code	BIOTOPE_ORIGINAL_CODE	char		
Biotope_Full_Term	BIOTOPE_FULL_TERM	char		Y
Biotope_Short_Term	BIOTOPE_SHORT_TERM	char		
Biotope_Definition	BIOTOPE_DEFINITION	char		
Term_status	TERM_STATUS	char		
Source_Key	SOURCE_KEY	integer		
Date_Added	DATE_ADDED	date		

Referenced By	Foreign Key	Primary Key
BIOTOPE_CHECKLIST_ITEM	BIOTOPE_KEY	BIOTOPE_KEY
BIOTOPE_RELATIONS	BIOTOPE_KEY_1	BIOTOPE_KEY
BIOTOPE_RELATIONS	BIOTOPE_KEY_2	BIOTOPE_KEY
BIOTOPE_CODE	BIOTOPE_KEY	BIOTOPE_KEY

Name : Biotope_Checklist_Item

Code : BIOTOPE_CHECKLIST_ITEM

Label : Biotopes occurring in versions of classifciations

Number : 10000

Description:
Biotopes may come and go between version of checklists. This entity holds the list of biotopes for any version.

Column Name	Code	Type	P	M
Biotope_Checklist_Item_Key	BIOTOPE_CHECKLIST_ITEM_KEY	integer	Y	Y
Bt_Cl_Version	BT_CL_VERSION	integer		
Biotope_key	BIOTOPE_KEY	integer		
Biotope_Rank	BIOTOPE_RANK	integer		
Biotope_Sort_Code	BIOTOPE_SORT_CODE	integer		Y

Reference To	Primary Key	Foreign Key
BIOTOPE_CLASSIFICATION_VERSION	BT_CL_VERSION	BT_CL_VERSION
BIOTOPE	BIOTOPE_KEY	BIOTOPE_KEY
BIOTOPE_RANK	BIOTOPE_RANK	BIOTOPE_RANK

Referenced By	Foreign Key	Primary Key
BIOTOPE_DESIGNATION	BIOTOPE_CHECKLIST_ITEM_KEY	BIOTOPE_CHECKLIST_ITEM_KEY

Name : Biotope_Classification_Scheme

Code : BIOTOPE_CLASSIFICATION_SCHEME

Label : Various schemes for classifying land-use and habitats

Number : 200

Description:
List of the various schemes used to classify land-cover, land-use and habitats.
includes:
Corine Land Cover
National Land-use Classification
Phase I
NVC
etc.

Column Name	Code	Type	P	M
Biotope_Classification_Key	BIOTOPE_CLASSIFICATION_KEY	integer	Y	Y
Biotope_Classification	BIOTOPE_CLASSIFICATION	char		Y
Biotope_Classification_Type	BIOTOPE_CLASSIFICATION_TYPE	char		Y
Bt_Cl_Commissed_by	BT_CL_COMMISSED_BY	char		
BT_Cl_Created_by	BT_CL_CREATED_BY	char		
Bt_Cl_Created_Date	BT_CL_CREATED_DATE	char		
Bt_Cl_Objectives	BT_CL_OBJECTIVES	char		

Reference To	Primary Key	Foreign Key
BIOTOPE_CLASSIFICATION_TYPE	BIOTOPE_CLASSIFICATION_TYPE	BIOTOPE_CLASSIFICATION_TYPE

Referenced By	Foreign Key	Primary Key
BIOTOPE_CLASSIFICATION_VERSION	BIOTOPE_CLASSIFICATION_KEY	BIOTOPE_CLASSIFICATION_KEY

Name : Biotope_Classification_Type

Code : BIOTOPE_CLASSIFICATION_TYPE

Label : List of different types of land classification

Number : 100

Description:
A controlled terminology entity which lists the different types of classification used e.g. general, land cover, land use, biotope, satellite imagery etc.

Column Name	Code	Type	P	M
Biotope_Classification_Type	BIOTOPE_CLASSIFICATION_TYPE	char	Y	Y
Bt_Cl_Type_Definition	BT_CL_TYPE_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
BIOTOPE_CLASSIFICATION_SCHEME	BIOTOPE_CLASSIFICATION_TYPE	BIOTOPE_CLASSIFICATION_TYPE

Name : Biotope_Classification_Version

Code : BIOTOPE_CLASSIFICATION_VERSION

Label : Versions of available biotope classifications

Number : 1000

Description:
Versions of particular biotope and landcover checklists. This is important as some classifications change significantly over time.

Column Name	Code	Type	P	M
Bt_Cl_Version	BT_CL_VERSION	integer	Y	Y
Biotope_Classification_Key	BIOTOPE_CLASSIFICATION_KEY	integer		
Bt_Cl_Revision_Number	BT_CL_REVISION_NUMBER	char		
Bt_Cl_Revision_Date	BT_CL_REVISION_DATE	char		

Reference To	Primary Key	Foreign Key
BIOTOPE_CLASSIFICATION_SCHEME	BIOTOPE_CLASSIFICATION_KEY	BIOTOPE_CLASSIFICATION_KEY

Referenced By	Foreign Key	Primary Key
BIOTOPE_CHECKLIST_ITEM	BT_CL_VERSION	BT_CL_VERSION

Name : Biotope_Code

Code : BIOTOPE_CODE

Label : Codes applied to Biotopes

Number : 50000

Description:
Individual biotopes may have one or more codes applied to them

Column Name	Code	Type	P	M
Biotope_Code_Key	BIOTOPE_CODE_KEY	integer	Y	Y
Biotope_Code	BIOTOPE_CODE	char		Y
Biotope_code_scheme_Key	BIOTOPE_CODE_SCHEME_KEY	char		Y
Biotope_key	BIOTOPE_KEY	integer		Y

Reference To	Primary Key	Foreign Key
BIOTOPE	BIOTOPE_KEY	BIOTOPE_KEY
BIOTOPE_CODE_SCHEME	BIOTOPE_CODE_SCHEME_KEY	BIOTOPE_CODE_SCHEME_KEY

Name : Biotope_Code_Scheme

Code : BIOTOPE_CODE_SCHEME

Label : Coding systems used for biotopes

Number : 1000

Description:
Biotopes may have several coding schemes applied to them

Column Name	Code	Type	P	M
Biotope_code_scheme_Key	BIOTOPE_CODE_SCHEME_KEY	char	Y	Y
Date_Introduced	DATE_INTRODUCED	char		
Name_key	NAME_KEY	integer		
Comment	COMMENT	char		
Source_Key	SOURCE_KEY	integer		

Referenced By	Foreign Key	Primary Key
BIOTOPE_CODE	BIOTOPE_CODE_SCHEME_KEY	BIOTOPE_CODE_SCHEME_KEY

Name : Biotope_Designation

Code : BIOTOPE_DESIGNATION

Label : Protected status applied to biotopes and habitats

Number : 10000

Description:
Biotopes and habitats may be covered under national or international legislation and may also be locally protected under non-legislative arrangements

Column Name	Code	Type	P	M
Biotope_Checklist_Item_Key	BIOTOPE_CHECKLIST_ITEM_KEY	integer	Y	Y
Designation_Key	DESIGNATION_KEY	char	Y	Y
Biotope_Designation_From	BIOTOPE_DESIGNATION_FROM	char		Y
Biotope_Designation_To	BIOTOPE_DESIGNATION_TO	char		
Biotope_Designation_Comment	BIOTOPE_DESIGNATION_COMMENT	char		
Entry_Date	ENTRY_DATE	char		Y

Reference To	Primary Key	Foreign Key
BIOTOPE_CHECKLIST_ITEM	BIOTOPE_CHECKLIST_ITEM_KEY	BIOTOPE_CHECKLIST_ITEM_KEY
DESIGNATION_TYPE	DESIGNATION_KEY	DESIGNATION_KEY

Name : Biotope_Determination

Code : BIOTOPE_DETERMINATION

Label : Who identified the Biotope as what

Number : 100000

Description:
Each occurrence of a biotope that is recorded may have one or more identifications linked to it. In some applications it is a necessary part of quality control to know who made the identification.

Column Name	Code	Type	P	M
Biotope_Determination_key	BIOTOPE_DETERMINATION_KEY	integer	Y	Y
Biotope_Occurrence_Key	BIOTOPE_OCCURRENCE_KEY	integer		Y
Biotope_key	BIOTOPE_KEY	integer		Y
Name_key	NAME_KEY	integer		Y
Determination_Date	DETERMINATION_DATE	char		Y
Determination_Type	DETERMINATION_TYPE	char		Y
Publication_Key	PUBLICATION_KEY	integer		
Determination_Comment	DETERMINATION_COMMENT	char		

Reference To	Primary Key	Foreign Key
BIOTOPE_OCCURRENCE	BIOTOPE_OCCURRENCE_KEY	BIOTOPE_OCCURRENCE_KEY

Name : Biotope_Occurrence

Code : BIOTOPE_OCCURRENCE

Label : Record of a biotope in relation to a sampling event

Number : 100000

Description:
A linking entity which associates a biotope with a particular set of observations.

A particular sample may link to more than one type of biotope record e.g. the recorder may wish to record that the sampling area was ancient woodland but also that this particular sample also related to coppiced hazel.

This could be a biotope record for a particular location or land parcel in a PHase I survey or it could be a habitat note related to a point at which taxon observations were made e.g. linking Herb Paris to an ancient woodland.

Column Name	Code	Type	P	M
Biotope_Occurrence_Key	BIOTOPE_OCCURRENCE_KEY	integer	Y	Y
Sample_Key	SAMPLE_KEY	integer		Y
Biotope_Area	BIOTOPE_AREA	char		
Measurement_Units	MEASUREMENT_UNITS	char		
Check_Status	CHECK_STATUS	integer		Y
Comment	COMMENT	char		
Determination_Type	DETERMINATION_TYPE	char		
Determination_Date	DETERMINATION_DATE	char		
Name_key	NAME_KEY	integer		
Date_Added	DATE_ADDED	date		
Surveyors_Ref	SURVEYORS_REF	char		

Reference To	Primary Key	Foreign Key
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY

Referenced By	Foreign Key	Primary Key
BIOTOPE_OCCURRENCE_DATA	BIOTOPE_OCCURRENCE_KEY	BIOTOPE_OCCURRENCE_KEY
BIOTOPE_DETERMINATION	BIOTOPE_OCCURRENCE_KEY	BIOTOPE_OCCURRENCE_KEY

Name : Biotope_Occurrence_Data

Code : BIOTOPE_OCCURRENCE_DATA

Label : Measurements and info relating to a biotope sample

Number : 100000

Description:
Any biotope sample may have a number of observations and measurements related to it. For instance a grassland quadrat may record maximum and minimum sward height. A phase I type survey may record management, threat, damage or use keywords relatingf to an individual biotope parcel e.g. storm damage in an area of broad-leaved woodland.

Column Name	Code	Type	P	M
Biotope_Data_key	BIOTOPE_DATA_KEY	integer	Y	Y
Biotope_Occurrence_Key	BIOTOPE_OCCURRENCE_KEY	integer		Y
Biotope_Data_Type	BIOTOPE_DATA_TYPE	char		Y
Biotope_Data	BIOTOPE_DATA	char		
Measurement_Units	MEASUREMENT_UNITS	char		

Reference To	Primary Key	Foreign Key
BIOTOPE_OCCURRENCE	BIOTOPE_OCCURRENCE_KEY	BIOTOPE_OCCURRENCE_KEY

Name : Biotope_Rank

Code : BIOTOPE_RANK

Label : Hierarchical level within a biotope checklist

Number : 100000

Description:
Many checklists have a hierchical ranking system or set of levels e.g. woodlands, broad-leaved woodlands, oak-ash woodlands.

Column Name	Code	Type	P	M
Biotope_Rank	BIOTOPE_RANK	integer	Y	Y
List_Indent	LIST_INDENT	decimal		
List_font	LIST_FONT	char		
List_font_size	LIST_FONT_SIZE	integer		
List_font_style	LIST_FONT_STYLE	char		

Referenced By	Foreign Key	Primary Key
BIOTOPE_CHECKLIST_ITEM	BIOTOPE_RANK	BIOTOPE_RANK

Name : Biotope_Relations

Code : BIOTOPE_RELATIONS

Label : Relationships between Biotopes

Number : 20000

Description:
Biotopes may relate to each other in a hierarchical way within classifications and may be equivalent or overlap between classifications. This could be a very useful entity for enabling the translation of records linked to one biotope to another classification for analysis or transfer.

Column Name	Code	Type	P	M
Biotope_Relation_Key	BIOTOPE_RELATION_KEY	integer	Y	Y
Biotope_Key_1	BIOTOPE_KEY_1	integer		
Biotope_Key_2	BIOTOPE_KEY_2	integer		
Biotope_Relation_1_to_2	BIOTOPE_RELATION_1_TO_2	char		
Biotope_Relation_Comment	BIOTOPE_RELATION_COMMENT	char		

Reference To	Primary Key	Foreign Key
BIOTOPE	BIOTOPE_KEY	BIOTOPE_KEY_1
BIOTOPE	BIOTOPE_KEY	BIOTOPE_KEY_2

Name : Cards

Code : CARDS

Label : Table listing details of recording cards

Number : 2000

Description:
One of the features of the new Recorder application will be the ability to enter data from recording card images.

Column Name	Code	Type	P	M
Card_Key	CARD_KEY	integer	Y	Y
Card_Name	CARD_NAME	char		Y
Card_Ref_No	CARD_REF_NO	char		
Originator	ORIGINATOR	char		
Purpose	PURPOSE	char		
Form_Name	FORM_NAME	char		
Card_Version	CARD_VERSION	char		

Name : Checklist

Code : CHECKLIST

Label : Taxonomic Checklist

Number : 1000

Description:
A published or informal list of taxa ranging from very large e.g. the preferred Recorder list to very small e.g. a BRC recording card for a small group. In practice almost any collection of names can be a checklist. There will be one checklist - the dictionary checklist which maintains every taxon in the dictionary.

Column Name	Code	Type	P	M
Checklist	CHECKLIST	char	Y	Y
Checklist_Detail	CHECKLIST_DETAIL	char		
Checklist_Type	CHECKLIST_TYPE	char		Y
Name_key	NAME_KEY	integer		

Reference To	Primary Key	Foreign Key
CHECKLIST_VERSION	CHECKLIST	CHECKLIST
CHECKLIST_TYPE	CHECKLIST_TYPE	CHECKLIST_TYPE

Name : Checklist_item

Code : CHECKLIST_ITEM

Label : Taxa occurring in a single checklist

Number : 100000

Description:
This entity links particular usage (versions) of taxon names with particular versions of checklists. It is this entity which provides the list of taxa in any checklist and to which biological record observations are linked.

Column Name	Code	Type	P	M
Checklist_Item_Key	CHECKLIST_ITEM_KEY	integer	Y	Y
Taxon_Version_Key	TAXON_VERSION_KEY	integer		Y
Checklist_Version_Key	CHECKLIST_VERSION_KEY	integer		Y
Taxon_Rank	TAXON_RANK	char		Y
Checklist_Item_Status	CHECKLIST_ITEM_STATUS	char		Y
Checklist_Item_Sort_Code	CHECKLIST_ITEM_SORT_CODE	numeric		Y

Reference To	Primary Key	Foreign Key
CHECKLIST_VERSION	CHECKLIST_VERSION_KEY	CHECKLIST_VERSION_KEY
TAXON_RANK	TAXON_RANK	TAXON_RANK
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY

Referenced By	Foreign Key	Primary Key
CHECKLIST_ITEM_SYNONOMY	CHECKLIST_ITEM_KEY_1	CHECKLIST_ITEM_KEY
CHECKLIST_ITEM_SYNONOMY	CHECKLIST_ITEM_KEY_2	CHECKLIST_ITEM_KEY

Name : Checklist_Item_Synonomy

Code : CHECKLIST_ITEM_SYNONOMY

Label : Relationships between taxa in a checklist

Number : 100000

Description:
Table for maintaining the nomenclatural links between taxa e.g. for listing synonyms of preferred species names in any version of a checklist.

Column Name	Code	Type	P	M
Checklist_Item_Rel_Key	CHECKLIST_ITEM_REL_KEY	integer	Y	Y
Checklist_Item_Key_1	CHECKLIST_ITEM_KEY_1	integer		Y
Checklist_Item_Key_2	CHECKLIST_ITEM_KEY_2	integer		Y
Checklist_Item_Relation	CHECKLIST_ITEM_RELATION	char		Y

Reference To	Primary Key	Foreign Key
CHECKLIST_ITEM	CHECKLIST_ITEM_KEY	CHECKLIST_ITEM_KEY_1
CHECKLIST_ITEM	CHECKLIST_ITEM_KEY	CHECKLIST_ITEM_KEY_2

Name : Checklist_Type

Code : CHECKLIST_TYPE

Label : Type of Checklist

Number : 1000

Description:
The checklist may be an original paper, a treatise, memoir, a union checklist, a recording card or even an electronic dictionary preferred list.

Column Name	Code	Type	P	M
Checklist_Type	CHECKLIST_TYPE	char	Y	Y
Checklist_Type_Comment	CHECKLIST_TYPE_COMMENT	char		

Referenced By	Foreign Key	Primary Key
CHECKLIST	CHECKLIST_TYPE	CHECKLIST_TYPE

Name : Checklist_Version

Code : CHECKLIST_VERSION

Label : Version of Checklist in use

Number : 300

Description:
Checklist may be published in many versions with updates, alterations and corrections.

Column Name	Code	Type	P	M
Checklist_Version_Key	CHECKLIST_VERSION_KEY	integer	Y	Y
Checklist	CHECKLIST	char		Y
Checklist_Version	CHECKLIST_VERSION	char		Y
Checklist_Version_Authority	CHECKLIST_VERSION_AUTHORITY	char		
Checklist_Ver_Date_Start	CHECKLIST_VER_DATE_START	char		
Checklist_Ver_Date_Ended	CHECKLIST_VER_DATE_ENDED	char		
Checklist_Version_Detail	CHECKLIST_VERSION_DETAIL	char		
Source_Key	SOURCE_KEY	integer		

Referenced By	Foreign Key	Primary Key
CHECKLIST_ITEM	CHECKLIST_VERSION_KEY	CHECKLIST_VERSION_KEY
CHECKLIST	CHECKLIST	CHECKLIST

Name : Coding_Scheme

Code : CODING_SCHEME

Label : Details of the coding scheme used in any checklist

Number : 300

Description:
A coding scheme is any collection of alphanumeric or numeric identifiers used for referring to taxa either in computer systems, checklists or recording cards. Typical examples are the Recorder taxon codes, BRC codes and Nordic codes. Most codes are used to save on space and to allow hierarchical taxonomic sorting - which cannot be done using the original names.

Column Name	Code	Type	P	M
Coding_Scheme	CODING_SCHEME	char	Y	Y
Comment	COMMENT	char		
Name_key	NAME_KEY	integer		
Date_Introduced	DATE_INTRODUCED	char		
Source_Key	SOURCE_KEY	integer		Y

Referenced By	Foreign Key	Primary Key
TAXON_CODES	CODING_SCHEME	CODING_SCHEME

Name : Collection

Code : COLLECTION

Label : Details of a museum or private collection

Number : 10000

Description:
Specimens used as a source of records may be housed in a private or museum collection. This is a summary entity and does not seek to replace the full functionality of a curation database.

Column Name	Code	Type	P	M
Source_Key	SOURCE_KEY	integer	Y	Y
Collection_ID	COLLECTION_ID	char		Y
Collection_Name	COLLECTION_NAME	char		
Institution_Name	INSTITUTION_NAME	integer		

Referenced By	Foreign Key	Primary Key
SOURCE	SOURCE_KEY	SOURCE_KEY

Name : Comms Number

Code : COMMS_NUMBER

Label : Electronic communication numbers

Number : 10000

Description:
Electronic communication numbers including telephones, fax, Email etc.

Column Name	Code	Type	P	M
Comms_number_key	COMMS_NUMBER_KEY	integer	Y	Y
Name_key	NAME_KEY	integer		Y
Comms_numbers_prefix	COMMS_NUMBERS_PREFIX	char		
Comms_numbers_number	COMMS_NUMBERS_NUMBER	char		Y
Comms_numbers_type	COMMS_NUMBERS_TYPE	char		Y
Comms_numbers_constraints	COMMS_NUMBERS_CONSTRAINTS	char		

Reference To	Primary Key	Foreign Key
NAME	NAME_KEY	NAME_KEY

Name : Communication

Code : COMMUNICATION

Label : Record of communications between individuals & orgs

Number : 10000

Description:
Table holding details of communications between names (individuals and/or organisations). This might be used to track data supply agreements between a record centre and data suppliers or letters covering the use of data by third parties.

Column Name	Code	Type	P	M
Communication_Key	COMMUNICATION_KEY	integer	Y	Y
Name_Key_1	NAME_KEY_1	integer		Y
Name_Key_2	NAME_KEY_2	integer		Y
Communication_Type	COMMUNICATION_TYPE	char		
Communication_Content	COMMUNICATION_CONTENT	char		
Communication_File_Ref	COMMUNICATION_FILE_REF	char		

Reference To	Primary Key	Foreign Key
NAME	NAME_KEY	NAME_KEY_2
NAME	NAME_KEY	NAME_KEY_1

Name : Damage_Occurrence

Code : DAMAGE_OCCURRENCE

Label : Damage to a feature of the site

Number : 100000

Description:
Allows the recording of damage to a specific feature of the site. Features must have been recorded as an occurrence under records.

Column Name	Code	Type	P	M
Damage_Occurrence_Key	DAMAGE_OCCURRENCE_KEY	integer	Y	Y
Location_Feature_Key	LOCATION_FEATURE_KEY	integer		Y
Threat_Key	THREAT_KEY	integer		Y
Sample_Key	SAMPLE_KEY	integer		Y
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
THREATS	THREAT_KEY	THREAT_KEY
LOCATION_FEATURES	LOCATION_FEATURE_KEY	LOCATION_FEATURE_KEY

Name : Dataset_Source

Code : DATASET_SOURCE

Label : Metadata describing the source of datasets copied into the database

Number : 20000

Description:
Records and data items may be linked to a source describing ownership, updates and transfer dates. Important for quality and ownership issues. e.g. source of various checklists incorporated into species dictionary or source of a group of taxon records.
Datasets can include any kind of survey and other material such as termlists for dictionaries or collections of photographs.

Column Name	Code	Type	P	M
Source_Key	SOURCE_KEY	integer	Y	Y
Survey_Key	SURVEY_KEY	integer		
Dataset_Copy_Name	DATASET_COPY_NAME	char		
Source_Version	SOURCE_VERSION	integer		Y
Dataset_Owner	DATASET_OWNER	integer		Y
Dataset_Copy_Origin	DATASET_COPY_ORIGIN	integer		
Source_Date	SOURCE_DATE	char		Y
Dataset_Status	DATASET_STATUS	char		
Dataset_Validation	DATASET_VALIDATION	char		
Dataset_Restrictions	DATASET_RESTRICTIONS	char		
Publication_Key	PUBLICATION_KEY	integer		

Referenced By	Foreign Key	Primary Key
SOURCE	SOURCE_KEY	SOURCE_KEY

Name : Designation_Type

Code : DESIGNATION_TYPE

Label : Designation or protected status

Number : 1000

Description:
Under legislation and conventions protection is usually given under a protected status name such as SSSI, SAC, SPA, ESA. There are also numerous informal designations which are widely recognised for conservation purposes including RIGS and SINC.

Column Name	Code	Type	P	M
Designation_Key	DESIGNATION_KEY	char	Y	Y
Designation_Full_Name	DESIGNATION_FULL_NAME	char		Y
Designation_Description	DESIGNATION_DESCRIPTION	char		
Designation_Type	DESIGNATION_TYPE	char		
Name_key	NAME_KEY	integer		
Legislation_Version_Key	LEGISLATION_VERSION_KEY	integer		

Reference To	Primary Key	Foreign Key
LEGISLATION_VERSION	LEGISLATION_VERSION_KEY	LEGISLATION_VERSION_KEY

Referenced By	Foreign Key	Primary Key
GEOGRAPHIC_COVER	DESIGNATION_KEY	DESIGNATION_KEY
TAXON_DESIGNATION	DESIGNATION_KEY	DESIGNATION_KEY
BIOTOPE_DESIGNATION	DESIGNATION_KEY	DESIGNATION_KEY

Name : Digital_Image

Code : DIGITAL_IMAGE

Label : Any image stored in computer digital format

Number : 100000

Description:
Subtype of image - An image may be stored in any number of computer formats. This also includes digitised video formats. In this case there will need to be a link to Moving Image for attributes relating to run-length

Column Name	Code	Type	P	M
Image_Key	IMAGE_KEY	integer	Y	Y
Digital_Image_Format	DIGITAL_IMAGE_FORMAT	char		
Digital_Image_Format_Vs	DIGITAL_IMAGE_FORMAT_VS	char		
Digital_Image_Pixels	DIGITAL_IMAGE_PIXELS	char		
Digital_Image_Colours	DIGITAL_IMAGE_COLOURS	char		
Digital_Image_File_Size	DIGITAL_IMAGE_FILE_SIZE	decimal		

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Earth_Sci_Ftr_Occurrence

Code : EARTH_SCI_FTR_OCCURRENCE

Label : Occurrence of a feature at a sample location

Number : 100000

Description:
A sample may include references to one or more earth science features e.g. geomorphological or hydrological terms.

Column Name	Code	Type	P	M
Ftr_Occurrence_Key	FTR_OCCURRENCE_KEY	integer	Y	Y
Sample_Key	SAMPLE_KEY	integer		
Ftr_Term	FTR_TERM	char		
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
EARTH_SCIENCE_FEATURE	FTR_TERM	FTR_TERM
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY

Name : Earth_Sci_Ftr_Type

Code : EARTH_SCI_FTR_TYPE

Label : Classifications of earth science feature

Number : 1000

Description:
controlled terminology entity - Various groups of earth science terms may be recorded about a location including geomorphology, hydrology, structure etc.

Column Name	Code	Type	P	M
Earth_Sci_Ftr_Type	EARTH_SCI_FTR_TYPE	char	Y	Y
Ftr_Definition	FTR_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
EARTH_SCIENCE_FEATURE	EARTH_SCI_FTR_TYPE	EARTH_SCI_FTR_TYPE

Name : Earth_Science_Feature

Code : EARTH_SCIENCE_FEATURE

Label : Earth science features associated with the sample

Number : 100000

Description:
Earth science features cover most of the geomorphological, structural and similar features on the site.

Column Name	Code	Type	P	M
Ftr_Term	FTR_TERM	char	Y	Y
Ftr_Term_Definition	FTR_TERM_DEFINITION	char		
Earth_Sci_Ftr_Type	EARTH_SCI_FTR_TYPE	char		

Reference To	Primary Key	Foreign Key
EARTH_SCI_FTR_TYPE	EARTH_SCI_FTR_TYPE	EARTH_SCI_FTR_TYPE

Referenced By	Foreign Key	Primary Key
EARTH_SCI_FTR_OCCURRENCE	FTR_TERM	FTR_TERM

Name : Event

Code : EVENT

Label : Events relating to localities

Number : 50000

Description:
Various events may be recorded for a locality e.g. a management event, a development etc. This entity could also be used to store other events such as Planning Applications. Recording events are stored unde Survey Event

Column Name	Code	Type	P	M
Event_Key	EVENT_KEY	integer	Y	Y
Event_Type	EVENT_TYPE	char		
Event_Date_From	EVENT_DATE_FROM	char		
Event_Date_To	EVENT_DATE_TO	char		
Event_Comment	EVENT_COMMENT	char		

Reference To	Primary Key	Foreign Key
EVENT_TYPE	EVENT_TYPE	EVENT_TYPE

Referenced By	Foreign Key	Primary Key
EVENT_PEOPLE	EVENT_KEY	EVENT_KEY
EVENT_LOCATION	EVENT_KEY	EVENT_KEY

Name : Event_Location

Code : EVENT_LOCATION

Label : Place or places linked to an event

Number : 50000

Description:
An event usually takes place at a single lopcation but it may involve several e.g. a planning application which affects several adjacent sites

Column Name	Code	Type	P	M
Event_Key	EVENT_KEY	integer	Y	Y
Location_key	LOCATION_KEY	integer	Y	Y
Location_Feature_Key	LOCATION_FEATURE_KEY	integer		
Event_Location_Relation	EVENT_LOCATION_RELATIO N	char		

Reference To	Primary Key	Foreign Key
EVENT	EVENT_KEY	EVENT_KEY

Name : Event_People

Code : EVENT_PEOPLE

Label : People/Organisations involved in an event

Number : 10000

Description:
Events usually involve people e.g. carrying out management, assessing damage etc.

Column Name	Code	Type	P	M
Event_Key	EVENT_KEY	integer	Y	Y
Name_key	NAME_KEY	integer	Y	Y
Event_Person_Role	EVENT_PERSON_ROLE	char		

Reference To	Primary Key	Foreign Key
EVENT	EVENT_KEY	EVENT_KEY

Name : Event_Type

Code : EVENT_TYPE

Label : List of event types

Number : 1000

Description:
Events can be classed according to type e.g. management

Column Name	Code	Type	P	M
Event_Type	EVENT_TYPE	char	Y	Y
Event_Definition	EVENT_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
EVENT	EVENT_TYPE	EVENT_TYPE

Name : Geographic_Cover

Code : GEOGRAPHIC_COVER

Label : Geographic range of a specific protected status

Number : 10000

Description:
An individual status may not cover the full geographic range of the legislation authority. Some informal legislations cover only a county but are repeated for many counties under different controlling authorities.

Column Name	Code	Type	P	M
Designation_Key	DESIGNATION_KEY	char	Y	Y
Location_key	LOCATION_KEY	integer	Y	Y
Geographic_Cover_Comment	GEOGRAPHIC_COVER_COMMENT	char		

Reference To	Primary Key	Foreign Key
DESIGNATION_TYPE	DESIGNATION_KEY	DESIGNATION_KEY

Name : Grid_Squares

Code : GRID_SQUARES

Label : List of grid squares for locations

Number : 200000

Description:
This table reflects the ability of the current Recorder to store a list of 10K squares for a Parish. In a GIS operated system this would be unnecessary but is included here as such a table could add useful functionality in text-based retrieval and validation.

Column Name	Code	Type	P	M
Grid_Square	GRID_SQUARE	char	Y	Y
Location_key	LOCATION_KEY	integer	Y	Y
Grid_Square_Type	GRID_SQUARE_TYPE	integer		Y

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY

Name : Image

Code : IMAGE

Label : Pictures, photographs and scanned images

Number : 10000

Description:
Images refers to all non-text references such as drawings, book-plates, photographs, slides, video, scanned maps and site plans. All may be linked to locations and species occurrences or other entities such as names. It will be possible to store links to the actual images in an electronic system either by storing the image directly or its directory or web address.

Column Name	Code	Type	P	M
Image_Key	IMAGE_KEY	integer	Y	Y
Image_Type_Key	IMAGE_TYPE_KEY	integer		Y
Image_Title	IMAGE_TITLE	char		
Image_By	IMAGE_BY	char		
Image_Person_Role	IMAGE_PERSON_ROLE	char		
Image_Date	IMAGE_DATE	char		
Image_Description	IMAGE_DESCRIPTION	char		
Image_stored_image	IMAGE_STORED_IMAGE	binary		
Image_original	IMAGE_ORIGINAL	char		
Image_Ownership	IMAGE_OWNERSHIP	char		

Reference To	Primary Key	Foreign Key
IMAGE_TYPE	IMAGE_TYPE_KEY	IMAGE_TYPE_KEY

Referenced By	Foreign Key	Primary Key
IMAGE_REFERENCE_CODE	IMAGE_KEY	IMAGE_KEY
ARTWORK_IMAGE	IMAGE_KEY	IMAGE_KEY
PHOTOGRAPHIC_IMAGE	IMAGE_KEY	IMAGE_KEY
IMAGE_RELATIONS	IMAGE_KEY_1	IMAGE_KEY
IMAGE_RELATIONS	IMAGE_KEY_2	IMAGE_KEY
MOVING_IMAGE	IMAGE_KEY	IMAGE_KEY
IMAGE_LINK	IMAGE_KEY	IMAGE_KEY
DIGITAL_IMAGE	IMAGE_KEY	IMAGE_KEY
IMAGE_IN_PUBLICATION	IMAGE_KEY	IMAGE_KEY

Referenced By	Foreign Key	Primary Key
IMAGE_DIMENSIONS	IMAGE_KEY	IMAGE_KEY

Name : Image_Dimensions

Code : IMAGE_DIMENSIONS

Label : Any physical measurements made of the image

Number : 100000

Description:
Physical dimensions of an image - usually length and breadth but also depth, weight etc.

Column Name	Code	Type	P	M
Image_Dimension_Key	IMAGE_DIMENSION_KEY	integer	Y	Y
Image_Key	IMAGE_KEY	integer		
Image_Dimension	IMAGE_DIMENSION	char		
Image_Dimension_Units	IMAGE_DIMENSION_UNITS	char		
Image_Part	IMAGE_PART	char		

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Image_In_Publication

Code : IMAGE_IN_PUBLICATION

Label : Occurrence of an image in a publication

Number : 10000

Description:
Links a particular image to a publication. e.g. a site plan showing the layout of a butterfly transect may occur as a figure in a paper describing surveying at a locality.

Column Name	Code	Type	P	M
Image_In_Publ_Key	IMAGE_IN_PUBL_KEY	integer	Y	Y
Image_Key	IMAGE_KEY	integer		Y
Publication_Key	PUBLICATION_KEY	integer		Y
Image_In_Publ_Relation	IMAGE_IN_PUBL_RELATION	char		

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Image_link

Code : IMAGE_LINK

Label : Links an image with any other data item

Number : 50000

Description:
Allows users to link images to any data item in any other table e.g. photograph of person, site or species. Sketch map of trap line etc.

Column Name	Code	Type	P	M
Image_Link_Key	IMAGE_LINK_KEY	integer	Y	Y
Linked_Table_Name	LINKED_TABLE_NAME	char		Y
Linked_Table_Key	LINKED_TABLE_KEY	integer		Y
Image_Key	IMAGE_KEY	integer		Y
Reference_Link_Type	REFERENCE_LINK_TYPE	char		

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Image_Reference_Code

Code : IMAGE_REFERENCE_CODE

Label : Reference numbers applied to this image

Number : 10000

Description:
Images may have a variety of numbers applied to them e.g. accession numbers, negative number, print number, version number, edition number.

Column Name	Code	Type	P	M
Image_Ref_Code_Key	IMAGE_REF_CODE_KEY	integer	Y	Y
Image_Key	IMAGE_KEY	integer		Y
Image_Reference_Code	IMAGE_REFERENCE_CODE	char		Y
Image_Ref_Code_Type	IMAGE_REF_CODE_TYPE	char		Y

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Image_Relations

Code : IMAGE_RELATIONS

Label : Relationship between different images

Number : 10000

Description:
A linking entity which relates images e.g. a published version of original artwork e.g. a portrait or landscape.

Column Name	Code	Type	P	M
Image_Relation_Key	IMAGE_RELATION_KEY	integer	Y	Y
Image_Key_1	IMAGE_KEY_1	integer		Y
Image_Key_2	IMAGE_KEY_2	integer		Y
Image_Relation	IMAGE_RELATION	char		Y

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY_1
IMAGE	IMAGE_KEY	IMAGE_KEY_2

Name : Image_Type

Code : IMAGE_TYPE

Label : List of image types

Number : 100

Description:
Controlled terminology entity listing types of non text image.

Column Name	Code	Type	P	M
Image_Type_Key	IMAGE_TYPE_KEY	integer	Y	Y
Image_Type	IMAGE_TYPE	char		Y
Image_Type_Definition	IMAGE_TYPE_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
IMAGE	IMAGE_TYPE_KEY	IMAGE_TYPE_KEY

Name : Jurisdiction

Code : JURISDICTION

Label : Area covered by the legislation

Number : 1000

Description:
Legislation may cover one or more countries.

Column Name	Code	Type	P	M
Legislation_Key	LEGISLATION_KEY	integer	Y	Y
Location_key	LOCATION_KEY	integer	Y	Y
Jurisdiction_Comment	JURISDICTION_COMMENT	char		

Reference To	Primary Key	Foreign Key
LEGISLATION	LEGISLATION_KEY	LEGISLATION_KEY

Name : Land_Parcel

Code : LAND_PARCEL

Label : Ordnance Survey Land Parcel Numbers

Number : 100000

Description:
In the UK many pieces of land can be ascribed land parcel numbers from the Ordnance Survey large scale maps

Column Name	Code	Type	P	M
Location_key	LOCATION_KEY	integer	Y	Y
Land_Parcel_Number	LAND_PARCEL_NUMBER	char	Y	Y
Map_System	MAP_SYSTEM	char		Y

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY

Name : Legislation

Code : LEGISLATION

Label : Details of legislation affecting sites, taxa and conservation

Number : 1000

Description:
Details of parliamentary acts, EU Directives and international conventions which give protected or conservation status to sites, species or biotopes.

Column Name	Code	Type	P	M
Legislation_Key	LEGISLATION_KEY	integer	Y	Y
Legislation_Name	LEGISLATION_NAME	char		Y
Legislation_Date	LEGISLATION_DATE	char		Y
Comment	COMMENT	char		

Referenced By	Foreign Key	Primary Key
LEGISLATION_VERSION	LEGISLATION_KEY	LEGISLATION_KEY
AUTHORITY	LEGISLATION_KEY	LEGISLATION_KEY
JURISDICTION	LEGISLATION_KEY	LEGISLATION_KEY

Name : Legislation_Version

Code : LEGISLATION_VERSION

Label : Versions and amendments to legislation

Number : 1000

Description:
Most acts and conventions are reviewed or amended from time to time. Lists of species, biotopes or sites may vary between versions.

Column Name	Code	Type	P	M
Legislation_Version_Key	LEGISLATION_VERSION_KEY	integer	Y	Y
Legislation_Key	LEGISLATION_KEY	integer		Y
Legislation_Version_Date	LEGISLATION_VERSION_DATE	char		Y
Legislation_Version_Name	LEGISLATION_VERSION_NAME	char		

Reference To	Primary Key	Foreign Key
LEGISLATION	LEGISLATION_KEY	LEGISLATION_KEY

Referenced By	Foreign Key	Primary Key
DESIGNATION_TYPE	LEGISLATION_VERSION_KEY	LEGISLATION_VERSION_KEY

Name : Loc_Admn

Code : LOC_ADMN

Label : Link between site locations and administrative areas

Number : 100000

Description:
This table links sites to standard administrative areas. although admin. areas may themselves be considered sites and therefore logically should be part of the location table in practice the dictionary of administrative areas will be managed and disseminated separately.

Column Name	Code	Type	P	M
Loc_Admn_Key	LOC_ADMN_KEY	integer	Y	Y
Location_key	LOCATION_KEY	integer		
Admin_Key	ADMIN_KEY	integer		
Date_Added	DATE_ADDED	date		

Reference To	Primary Key	Foreign Key
ADMIN	ADMIN_KEY	ADMIN_KEY

Name : Location

Code : LOCATION

Label : Geographical location

Number : 30000

Description:
A location is defined as any geographical location including administrative areas and wildlife sites or their subsites.

Column Name	Code	Type	P	M
Location_key	LOCATION_KEY	integer	Y	Y
Location_Type	LOCATION_TYPE	char		Y
Location_Name	LOCATION_NAME	char		
Location_Description	LOCATION_DESCRIPTION	char		
Location_Area	LOCATION_AREA	numeric		
Location_Area_Units	LOCATION_AREA_UNITS	char		
Location_Spatial_Ref	LOCATION_SPATIAL_REF	char		
Loc_Spatial_Ref_Accuracy	LOC_SPATIAL_REF_ACCURACY	char		
Spatial_Ref_Type	SPATIAL_REF_TYPE	char		
Location_Planning_Auth	LOCATION_PLANNING_AUTH	integer		

Reference To	Primary Key	Foreign Key
LOCATION_TYPE	LOCATION_TYPE	LOCATION_TYPE

Referenced By	Foreign Key	Primary Key
LOCATION_RELATION	LOCATION_KEY_1	LOCATION_KEY
LOCATION_RELATION	LOCATION_KEY_2	LOCATION_KEY
LOCATION_BOUNDARY	LOCATION_KEY	LOCATION_KEY
LAND_PARCEL	LOCATION_KEY	LOCATION_KEY
LOCATION_DESIGNATION	LOCATION_KEY	LOCATION_KEY
TENURE	LOCATION_KEY	LOCATION_KEY
LOCATION_CODE	LOCATION_KEY	LOCATION_KEY
GRID_SQUARES	LOCATION_KEY	LOCATION_KEY
LOCATION_FEATURES	LOCATION_KEY	LOCATION_KEY
LOCATION_USE	LOCATION_KEY	LOCATION_KEY

Name : Location_Boundary

Code : LOCATION_BOUNDARY

Label : Boundaries related to a location

Number :

Description:
Table for details of location boundaries. This could actually be boundaries within a GIS or pointers to files holding the boundary information.

Column Name	Code	Type	P	M
Location_Boundary_Key	LOCATION_BOUNDARY_KEY	integer	Y	Y
Location_key	LOCATION_KEY	integer		Y
Location_Boundary_From	LOCATION_BOUNDARY_FROM	char		
Location_Boundary_To	LOCATION_BOUNDARY_TO	char		
Location_Boundary_Data	LOCATION_BOUNDARY_DATA	binary		
Location_Area	LOCATION_AREA	decimal		
Measurement_Units	MEASUREMENT_UNITS	char		
Entry_Date	ENTRY_DATE	char		Y

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY

Name : Location_Code

Code : LOCATION_CODE

Label : Codes applied to a location for reference puposes

Number : 100000

Description:
Locations, especially recording sites may have many codes associated with the e.g. filing code for data folder, site and sub-site codes, Administrative areas may have codes from other databases.

It would also be possible to use this table to hold grading codes used in various site selection schemes e.g. RIGS although this would not allow recording of reasons for the grading.

Column Name	Code	Type	P	M
Location_Code_Key	LOCATION_CODE_KEY	integer	Y	Y
Location_Code_System	LOCATION_CODE_SYSTEM	integer		Y
Location_Code	LOCATION_CODE	char		Y
Location_key	LOCATION_KEY	integer		Y

Reference To	Primary Key	Foreign Key
LOCATION_CODE_SYSTEM	LOCATION_CODE_SYSTEM	LOCATION_CODE_SYSTEM
LOCATION	LOCATION_KEY	LOCATION_KEY

Name : Location_Code_System

Code : LOCATION_CODE_SYSTEM

Label : Sources of site and geographic codes

Number : 10000

Description:
All site and geographic codes must be identifiable to a coding system

Column Name	Code	Type	P	M
Location_Code_System	LOCATION_CODE_SYSTEM	char	Y	Y
Loc_Code_System_Definition	LOC_CODE_SYSTEM_DEFINITION	char		
Name_key	NAME_KEY	integer		
Source_Key	SOURCE_KEY	integer		

Referenced By	Foreign Key	Primary Key
LOCATION_CODE	LOCATION_CODE_SYSTEM	LOCATION_CODE_SYSTEM

Name : Location_Designation

Code : LOCATION_DESIGNATION

Label : Details pertaining to locations with statutory protection

Number : 50000

Description:
Links locations with various styles of protected status by legislation or convention. e.g. SSSIs, SACs, RAMSAR

Could also be used for non statutory designations e.g. RIGS, GCR and SINC

Note that designations can be withdrawn and so coverage has a start and end date.

Column Name	Code	Type	P	M
Location_key	LOCATION_KEY	integer	Y	Y
Designation_Key	DESIGNATION_KEY	char	Y	Y
Location_Designation_From	LOCATION_DESIGNATION_FROM	char		Y
Location_Designation_To	LOCATION_DESIGNATION_TO	char		
Location_Designation_Comment	LOCATION_DESIGNATION_COMMENT	char		

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY

Name : Location_Features

Code : LOCATION_FEATURES

Label : Summarised - selected features of a location

Number : 10000

Description:
This entity holds a summarised list of features deemed to be of interest for management, monitoring or other information aspects of the location - usually a site or subsite. It is necessary because many applications require a 'specific view' of the overall data which allows for planning and conservation action e.g. you would might wish to record both that the population of a certain taxon needs monitoring whils also wishing to note that the aim is to keep an exposure of Jurassic Limestone clear of scrub.

This table could be maintained in different ways. It could be populated automatically with all unique taxon, biotope, earth science occurrences or it could be done manually (with suitable checks that the feature being added has been recorded from the site). In some applications it may well be that only this summary table is required (e.g. in planning departments) and the actual records kept elsewhere (at the lrc).

Column Name	Code	Type	P	M
Location_Feature_Key	LOCATION_FEATURE_KEY	integer	Y	Y
Location_key	LOCATION_KEY	integer		Y
Location_Feature_Type	LOCATION_FEATURE_TYPE	char		Y
Loc_Feature_Foreign_Key	LOC_FEATURE_FOREIGN_KEY	integer		Y
Comment	COMMENT	char		
Loc_Feature_Grading	LOC_FEATURE_GRADING	char		

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY

Referenced By	Foreign Key	Primary Key
MANAGEMENT_AIMS	LOCATION_FEATURE_KEY	LOCATION_FEATURE_KEY
DAMAGE_OCCURRENCE	LOCATION_FEATURE_KEY	LOCATION_FEATURE_KEY

Name : Location_Relation

Code : LOCATION_RELATION

Label : Relationships between geographical locations

Number : 50000

Description:
Describes the relationships between geographical locations. Each relationship can belong to a relationship type.

e.g. Woodspring was a District of Avon from 1974 till 1996
Clevedon, Pier Beach SSSI is within the Severn Estuary SSSI
The Roman Camp is within Leigh Woods

Column Name	Code	Type	P	M
Location_Relation_Key	LOCATION_RELATION_KEY	integer	Y	Y
Location_key_1	LOCATION_KEY_1	integer		Y
Location_key_2	LOCATION_KEY_2	integer		Y
Location_Relation_1_to_2	LOCATION_RELATION_1_TO_2	char		Y

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY_1
LOCATION	LOCATION_KEY	LOCATION_KEY_2

Name : Location_Type

Code : LOCATION_TYPE

Label : Administrative and placename types

Number : 1000

Description:
Controlled terminology entity describing a locality either as a type of administrative boundary or as a placename

Column Name	Code	Type	P	M
Location_Type	LOCATION_TYPE	char	Y	Y
Location_Type_Definition	LOCATION_TYPE_DEFINITION	char		
Location_Type_Authority	LOCATION_TYPE_AUTHORITY	char		
Date_From	DATE_FROM	char		
Date_To	DATE_TO	char		

Referenced By	Foreign Key	Primary Key
LOCATION	LOCATION_TYPE	LOCATION_TYPE

Name : Location_Use

Code : LOCATION_USE

Label : Use of the whole location for different purposes

Number : 100000

Description:
It is often useful to record the use or potential use of a whole location or sub-site as opposed to specific use, management of biotopes etc.

Column Name	Code	Type	P	M
Loc_Use_Key	LOC_USE_KEY	integer	Y	Y
Location_key	LOCATION_KEY	integer		Y
Present_Potential	PRESENT_POTENTIAL	char		Y
Loc_Use	LOC_USE	char		Y
Comment	COMMENT	char		
Entry_Date	ENTRY_DATE	char		Y

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY

Name : Management_Aims

Code : MANAGEMENT_AIMS

Label : Management aims related to features of a location

Number : 100000

Description:
Management aims for a location should be linked to the features which the management refers to. This will also enable future surveillance to monitor whether mangement actions have had the desired effect.

Column Name	Code	Type	P	M
Management_Aim_Key	MANAGEMENT_AIM_KEY	integer	Y	Y
Location_Feature_Key	LOCATION_FEATURE_KEY	integer		Y
Management_Aims	MANAGEMENT_AIMS	char		Y
Entry_Date	ENTRY_DATE	char		
Next_Appraisal_Date	NEXT_APPRAISAL_DATE	char		

Reference To	Primary Key	Foreign Key
LOCATION_FEATURES	LOCATION_FEATURE_KEY	LOCATION_FEATURE_KEY

Name : Mineral_Determination

Code : MINERAL_DETERMINATION

Label : Identifications of minerals related to sample

Number : 100000

Description:
Any mineral collected may be reidentified several times

Column Name	Code	Type	P	M
Mineral_Determination_Key	MINERAL_DETERMINATION_KEY	integer	Y	Y
Mineral_Occurrence_Key	MINERAL_OCCURRENCE_KEY	integer		Y
Mineral_Checklist_Item_Key	MINERAL_CHECKLIST_ITEM_KEY	integer		Y
Name_key	NAME_KEY	integer		Y
Determination_Date	DETERMINATION_DATE	char		Y
Determination_Type	DETERMINATION_TYPE	char		Y

Reference To	Primary Key	Foreign Key
MINERAL_OCCURRENCE	MINERAL_OCCURRENCE_KEY	MINERAL_OCCURRENCE_KEY

Name : Mineral_Occurrence

Code : MINERAL_OCCURRENCE

Label : Minerals collected in the sample

Number : 100000

Description:
List of minerals related to the specific sample

Column Name	Code	Type	P	M
Mineral_Occurrence_Key	MINERAL_OCCURRENCE_KEY	integer	Y	Y
Sample_Key	SAMPLE_KEY	integer		Y
Check_Status	CHECK_STATUS	integer		Y
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY

Referenced By	Foreign Key	Primary Key
MINERAL_DETERMINATION	MINERAL_OCCURRENCE_KEY	MINERAL_OCCURRENCE_KEY

Name : Moving_Image

Code : MOVING_IMAGE

Label : All forms of recorded moving images (video, film)

Number : 10000

Description:
Subtype of image covering moving images including film and video but also electronic movies e.g. AVI and MPGs

Column Name	Code	Type	P	M
Image_Key	IMAGE_KEY	integer	Y	Y
Moving_Image_Format	MOVING_IMAGE_FORMAT	char		
Moving_Image_Duration	MOVING_IMAGE_DURATION	char		
Moving_Image_Colour	MOVING_IMAGE_COLOUR	char		
Moving_Image_Soundtrack	MOVING_IMAGE_SOUNDTRACK	char		
Number_of_Media	NUMBER_OF_MEDIA	integer		

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Name

Code : NAME

Label : Personal and organisation names

Number : 5000

Description:
Entity for linking individuals and organisations to addresses and communications numbers. This entity is subtyped.

Column Name	Code	Type	P	M
Name_key	NAME_KEY	integer	Y	Y
Name_Type	NAME_TYPE	char		Y
Comment	COMMENT	char		

Referenced By	Foreign Key	Primary Key
ORGANISATION	NAME_KEY	NAME_KEY
PERSON	NAME_KEY	NAME_KEY
NAME_AT_ADDRESS	NAME_KEY	NAME_KEY
COMMS_NUMBER	NAME_KEY	NAME_KEY
NAME_RELATION	NAME_KEY_1	NAME_KEY
NAME_RELATION	NAME_KEY_2	NAME_KEY
NAME_ROLE	NAME_KEY	NAME_KEY
COMMUNICATION	NAME_KEY_2	NAME_KEY
COMMUNICATION	NAME_KEY_1	NAME_KEY
TAXON_SKILL	NAME_KEY	NAME_KEY
NAME_CODE	NAME_KEY	NAME_KEY

Name : Name at Address

Code : NAME_AT_ADDRESS

Label : Link between names and addresses

Number : 5000

Description:
An individual or an organisation may be recorded at one or more addresses. Associations can be simultaneous (home address, work address) or over time (e.g. change of work)

Column Name	Code	Type	P	M
Name_key	NAME_KEY	integer	Y	Y
Address_key	ADDRESS_KEY	integer	Y	Y
Name_Address_Type	NAME_ADDRESS_TYPE	char		
Name_at_Address_Date_from	NAME_AT_ADDRESS_DATE_FROM	char		
Name_at_Address_Date_to	NAME_AT_ADDRESS_DATE_TO	char		
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
ADDRESS	ADDRESS_KEY	ADDRESS_KEY
NAME	NAME_KEY	NAME_KEY

Name : Name Relation

Code : NAME_RELATION

Label : Links between Names

Number : 10000

Description:
Links between individuals and organisations, individuals and individuals and organisations to organisations.
e.g. John Smith belonged to NFBR from 1991 to 1995
John Smith is married to Jane Smith
BRC is part of ITE

Column Name	Code	Type	P	M
Name_relations_key	NAME_RELATIONS_KEY	integer	Y	Y
Name_Key_1	NAME_KEY_1	integer		Y
Name_key_2	NAME_KEY_2	integer		Y
Name_relations_1_to_2	NAME_RELATIONS_1_TO_2	char		
Name_relations_date_from	NAME_RELATIONS_DATE_FROM	char		
Name_relations_date_to	NAME_RELATIONS_DATE_TO	char		

Reference To	Primary Key	Foreign Key
NAME	NAME_KEY	NAME_KEY_1
NAME	NAME_KEY	NAME_KEY_2

Name : Name_Code

Code : NAME_CODE

Label : Codes used for people or organisations

Number : 100000

Description:
People and organisations may have many code numbers or references attached to them e.g. individuals have national insurance numbers and driving licence numbers. They may have BRC allocated national recorder codes. Organisations such as museums have MDA Codes etc.

Column Name	Code	Type	P	M
Name_Code_Key	NAME_CODE_KEY	integer	Y	Y
Name_key	NAME_KEY	integer		Y
Name_Code	NAME_CODE	char		Y
Name_Code_System	NAME_CODE_SYSTEM	char		Y

Reference To	Primary Key	Foreign Key
NAME_CODE_SYSTEM	NAME_CODE_SYSTEM	NAME_CODE_SYSTEM
NAME	NAME_KEY	NAME_KEY

Name : Name_Code_System

Code : NAME_CODE_SYSTEM

Label : Controlled terminology list of Name Code Systems

Number : 10000

Description:
Controlled terminology entity - list of different coding systems for individuals and organisations and their definitions.

Column Name	Code	Type	P	M
Name_Code_System	NAME_CODE_SYSTEM	char	Y	Y
Name_Code_Definition	NAME_CODE_DEFINITION	char		
Authority	AUTHORITY	char		
Date_From	DATE_FROM	char		
Date_To	DATE_TO	char		

Referenced By	Foreign Key	Primary Key
NAME_CODE	NAME_CODE_SYSTEM	NAME_CODE_SYSTEM

Name : Name_Role

Code : NAME_ROLE

Label : Role played by an individual or type of organisation

Number : 10000

Description:
Links named individuals or organisations to a controlled terminology entity listing roles and organisation types e.g. Wildlife Trust or County Recorder

Column Name	Code	Type	P	M
Name_Role_Key	NAME_ROLE_KEY	integer	Y	Y
Name_key	NAME_KEY	integer		
Role_Term	ROLE_TERM	char		
Role_Date_From	ROLE_DATE_FROM	char		
Role_Date_To	ROLE_DATE_TO	char		
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
ROLE	ROLE_TERM	ROLE_TERM
NAME	NAME_KEY	NAME_KEY

Name : Numbers_Applied_To_Specimen

Code : NUMBERS_APPLIED_TO_SPECIMEN

Label : Reference numbers applied to specimens

Number : 100000

Description:
Specimens ususally have a variety of numbers associated with them e.g. field collection numbers, cabinet numbers, accession numbers etc.

Column Name	Code	Type	P	M
Spec_No_Key	SPEC_NO_KEY	integer	Y	Y
Specimen_Number	SPECIMEN_NUMBER	integer		Y
Spec_Ref_Number	SPEC_REF_NUMBER	char		Y
Name_key	NAME_KEY	integer		
Spec_Number_Date	SPEC_NUMBER_DATE	char		

Reference To	Primary Key	Foreign Key
SPECIMEN	SPECIMEN_NUMBER	SPECIMEN_NUMBER

Name : Organisation

Code : ORGANISATION

Label : Details of organisations

Number : 2000

Description:
Basic details of organisations or groups

Column Name	Code	Type	P	M
Name_key	NAME_KEY	integer	Y	Y
Organisation_full_name	ORGANISATION_FULL_NAME	char		Y
Organisation_acronym	ORGANISATION_ACRONYM	char		
Organisation_date_founded	ORGANISATION_DATE_FOUNDED	char		
Organisation_date_ended	ORGANISATION_DATE_ENDED	char		

Reference To	Primary Key	Foreign Key
NAME	NAME_KEY	NAME_KEY

Name : Person

Code : PERSON

Label : Details of individuals

Number : 3000

Description:
Basic details of individuals

Column Name	Code	Type	P	M
Name_key	NAME_KEY	integer	Y	Y
Person_title	PERSON_TITLE	char		
Person_forename	PERSON_FORENAME	char		
Person_Initials	PERSON_INITIALS	char		
Person_honorifics	PERSON_HONORIFICS	char		
Person_surname	PERSON_SURNAME	char		
Person_date_born	PERSON_DATE_BORN	char		
Person_date_died	PERSON_DATE_DIED	char		
Person_floreat	PERSON_FLOREAT	char		

Reference To	Primary Key	Foreign Key
NAME	NAME_KEY	NAME_KEY

Name : Photographic_Image

Code : PHOTOGRAPHIC_IMAGE

Label : Photographs and slides

Number : 10000

Description:
Subtype of image. Details of photographs and slides.

Column Name	Code	Type	P	M
Image_Key	IMAGE_KEY	integer	Y	Y
Photo_Type	PHOTO_TYPE	char		Y
Photo_Appearance	PHOTO_APPEARANCE	char		
Photo_Process	PHOTO_PROCESS	char		

Reference To	Primary Key	Foreign Key
IMAGE	IMAGE_KEY	IMAGE_KEY

Name : Physical_Data_Type

Code : PHYSICAL_DATA_TYPE

Label : What physical parameters can be measured

Number : 1000

Description:
Controlled terminology entity listing what physical parameters may be measured and what units they refer to. Typical examples would include water or soil pH, max and min altitudes, BoD levels etc.

Column Name	Code	Type	P	M
Physical_Data_Type	PHYSICAL_DATA_TYPE	char	Y	Y
Physical_Data_Type_Definition	PHYSICAL_DATA_TYPE_DEFINITION	char		
Measurement_Units	MEASUREMENT_UNITS	char		Y

Referenced By	Foreign Key	Primary Key
SAMPLE_LOCATION_DATA	PHYSICAL_DATA_TYPE	PHYSICAL_DATA_TYPE

Name : Potential_Threats

Code : POTENTIAL_THREATS

Label : Potential threats to features at a location

Number : 100000

Description:
A list of the percieved potential threats which may affect a feature of the location. This could be a list of PDOs for an SSSI or a more generalised observation for other sites. Use controlled terminology.

Column Name	Code	Type	P	M
Pot_Threat_Key	POT_THREAT_KEY	integer	Y	Y
Threat_Key	THREAT_KEY	integer		Y
Comment	COMMENT	char		
Sample_Key	SAMPLE_KEY	integer		Y
Location_Feature_Key	LOCATION_FEATURE_KEY	integer		

Reference To	Primary Key	Foreign Key
THREATS	THREAT_KEY	THREAT_KEY

Name : Publication

Code : PUBLICATION

Label : Details of published references

Number : 20000

Description:
Table holding details of published or manuscript references which may be linked to any other relevant entity e.g. location, taxon, designation etc.

Column Name	Code	Type	P	M
Publication_Key	PUBLICATION_KEY	integer	Y	Y
Publication_Authors	PUBLICATION_AUTHORS	char		
Publication_Date	PUBLICATION_DATE	char		
Publication_Title	PUBLICATION_TITLE	char		
Publication_Type	PUBLICATION_TYPE	char		Y
Publication_Serial_Key	PUBLICATION_SERIAL_KEY	integer		
Publication_Serial_Volume	PUBLICATION_SERIAL_VOLUME	char		
Publication_Numb_of_Vols	PUBLICATION_NUMB_OF_VOLS	integer		
Publication_Serial_Part	PUBLICATION_SERIAL_PART	char		
Publication_Serial_Number	PUBLICATION_SERIAL_NUMBER	char		
Publication_Serial_Supplement	PUBLICATION_SERIAL_SUPPLEMENT	char		
Publication_edition	PUBLICATION_EDITION	char		
Publication_Symposium_Title	PUBLICATION_SYMPOSIUM_TITLE	char		
Publication_Symposium_Editors	PUBLICATION_SYMPOSIUM_EDITORS	char		
Publication_Pages	PUBLICATION_PAGES	char		
Publication_Plates	PUBLICATION_PLATES	char		
Publication_Figures	PUBLICATION_FIGURES	char		
Publication_Tables	PUBLICATION_TABLES	char		
Publication_Maps	PUBLICATION_MAPS	char		
Publication_Publisher	PUBLICATION_PUBLISHER	char		
Publication_Location	PUBLICATION_LOCATION	char		

Reference To	Primary Key	Foreign Key
SERIAL	SERIAL_KEY	PUBLICATION_SERIAL_KEY
PUBLICATION_TYPE	PUBLICATION_TYPE	PUBLICATION_TYPE

Referenced By	Foreign Key	Primary Key
PUBLICATION_EXTERNAL_NUMBER	PUBLICATION_KEY	PUBLICATION_KEY
REFERENCE_LINK	PUBLICATION_KEY	PUBLICATION_KEY
PUBLICATION_KEYWORDS	PUBLICATION_KEY	PUBLICATION_KEY

Name : Publication_External_Number

Code : PUBLICATION_EXTERNAL_NUMBER

Label : Reference numbers in cataloguing systems

Number : 100000

Description:
External reference numbers for the publication e.g. ISBN and ISSN numbers or even user filing codes. (Box 69!)

Column Name	Code	Type	P	M
External_Ref_Number	EXTERNAL_REF_NUMBER	char	Y	Y
External_Ref_Key	EXTERNAL_REF_KEY	integer		Y
Publication_Key	PUBLICATION_KEY	integer		Y

Reference To	Primary Key	Foreign Key
PUBLICATION	PUBLICATION_KEY	PUBLICATION_KEY
PUBLICATION_REFERENCE_SYSTEM	EXTERNAL_REF_KEY	EXTERNAL_REF_KEY

Name : Publication_Keywords

Code : PUBLICATION_KEYWORDS

Label : Keywords for tracking publications

Number : 200000

Description:
Many users wish to track identification publications through the use of keywords or taxon references

Column Name	Code	Type	P	M
keyword_ID	KEYWORD_ID	integer	Y	Y
Publication_Key	PUBLICATION_KEY	integer		Y
Keyword	KEYWORD	char		Y
Key_Taxon	KEY_TAXON	integer		
Key_Biotope	KEY_BIOTOPE	integer		

Reference To	Primary Key	Foreign Key
PUBLICATION	PUBLICATION_KEY	PUBLICATION_KEY

Name : Publication_Reference_System

Code : PUBLICATION_REFERENCE_SYSTEM

Label : Cataloguing systems for publication (e.g. ISBN)

Number : 300

Description:
Any referencing system that provides numbers for filing or referencing publicatiions e.g. ISBN, ISSN etc. Even home-made systems. This information could be kept in a general code table

Column Name	Code	Type	P	M
External_Ref_Key	EXTERNAL_REF_KEY	integer	Y	Y
External_Ref_Name	EXTERNAL_REF_NAME	char		Y
External_Ref_Acronym	EXTERNAL_REF_ACRONYM	char		

Referenced By	Foreign Key	Primary Key
PUBLICATION_EXTERNAL_NUMBER	EXTERNAL_REF_KEY	EXTERNAL_REF_KEY

Name : Publication_Type

Code : PUBLICATION_TYPE

Label : List of publication types

Number : 10000

Description:
Lookup table listing different types of reference e.g. Journal, symposium, book, manuscript. This information could be kept in a general code table.

Column Name	Code	Type	P	M
Publication_Type	PUBLICATION_TYPE	char	Y	Y

Referenced By	Foreign Key	Primary Key
PUBLICATION	PUBLICATION_TYPE	PUBLICATION_TYPE

Name : Record_Type

Code : RECORD_TYPE

Label : List of types of records

Number : 1000

Description:
A controlled terminology entity which lists the possible types of record e.g. olfactory record, footprint, binocular observation, dead on road, light trap sample. This information could be kept in a general code table.

Column Name	Code	Type	P	M
Record_Type	RECORD_TYPE	char	Y	Y
Record_Type_Definition	RECORD_TYPE_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
TAXON_OCCURRENCE	RECORD_TYPE	RECORD_TYPE

Name : Reference_Link

Code : REFERENCE_LINK

Label : General link between any table and publication reference

Number : 50000

Description:
A generalised link between any table and a published reference. This effectively allows references to be attached to any item of information in the database.

Column Name	Code	Type	P	M
Reference_Link_Key	REFERENCE_LINK_KEY	integer	Y	Y
Linked_Table_Name	LINKED_TABLE_NAME	char		Y
Linked_Table_Key	LINKED_TABLE_KEY	integer		Y
Publication_Key	PUBLICATION_KEY	integer		Y
Reference_Link_Type	REFERENCE_LINK_TYPE	char		

Reference To	Primary Key	Foreign Key
PUBLICATION	PUBLICATION_KEY	PUBLICATION_KEY

Name : Rock_Type_Occurrence

Code : ROCK_TYPE_OCCURRENCE

Label : Outcrop of a rock type in the area of the sample

Number : 100000

Description:
A sample may be associated with one or more rock types e.g. granite, sandstone, chalk

Column Name	Code	Type	P	M
Rock_Occurrence_Key	ROCK_OCCURRENCE_KEY	integer	Y	Y
Rock	ROCK	char		Y
Sample_Key	SAMPLE_KEY	integer		Y
Check_Status	CHECK_STATUS	integer		Y
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY

Name : Role

Code : ROLE

Label : List of organisation types or individual roles

Number : 500

Description:
Controlled terminology entity listing types of organisation or personal roles e.g. Wildlife Trust, Local Record Centre, County Recorder etc.

Column Name	Code	Type	P	M
Role_Term	ROLE_TERM	char	Y	Y
Role_Term_Acronym	ROLE_TERM_ACRONYM	char		
Role_Definition	ROLE_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
NAME_ROLE	ROLE_TERM	ROLE_TERM

Name : Sample_Location_Data

Code : SAMPLE_LOCATION_DATA

Label : Physical data readings

Number : 100000

Description:
Physical data are actual measurements or readings associated with a sample during a recording event. Such measurements could include pH, Nitrogen levels, soil depth, soil temperature etc.

Column Name	Code	Type	P	M
Physical_Data_Key	PHYSICAL_DATA_KEY	integer	Y	Y
Physical_Data_Type	PHYSICAL_DATA_TYPE	char		Y
Physical_Data	PHYSICAL_DATA	char		Y
Sample_Key	SAMPLE_KEY	integer		Y

Reference To	Primary Key	Foreign Key
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY
PHYSICAL_DATA_TYPE	PHYSICAL_DATA_TYPE	PHYSICAL_DATA_TYPE

Name : Sample_Relation

Code : SAMPLE_RELATION

Label : Relationship between samples

Number : 100000

Description:
Describes the relationship between samples e.g. quadtrats with a grassland community or hierarchical relations e.g. which stand sample a quadrat sample falls within.

Column Name	Code	Type	P	M
Sample_Key_1	SAMPLE_KEY_1	integer	Y	Y
Sample_Key_2	SAMPLE_KEY_2	integer	Y	Y
Sample_Relation	SAMPLE_RELATION	char		Y
Position_Number	POSITION_NUMBER	integer		

Reference To	Primary Key	Foreign Key
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY_1
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY_2

Name : Serial

Code : SERIAL

Label : List of journals and standard abbreviations

Number : 2000

Description:
Look-up table of Serial names for use with references. Mainly a list of journal names and publication dates. This also includes other serial publications such as volume sets of reference works e.g. Conchologica Iconica or Birds of the Western Palaearctic.

Column Name	Code	Type	P	M
Serial_Key	SERIAL_KEY	integer	Y	Y
Serial_Abbreviation	SERIAL_ABBREVIATION	char		
Serial_Title	SERIAL_TITLE	char		Y
Serial_start_date	SERIAL_START_DATE	char		
Serial_end_date	SERIAL_END_DATE	char		
Serial_publisher	SERIAL_PUBLISHER	char		
Serial_country	SERIAL_COUNTRY	char		
Serial_Associated_Person	SERIAL_ASSOCIATED_PERSON	char		

Referenced By	Foreign Key	Primary Key
PUBLICATION	PUBLICATION_SERIAL_KEY	SERIAL_KEY

Name : Source

Code : SOURCE

Label : Source of information in database

Number : 50000

Description:
A general source table linking to dataset metadata and to references which can be used as a source of information in the database.

Column Name	Code	Type	P	M
Source_Key	SOURCE_KEY	integer	Y	Y
Source_Type	SOURCE_TYPE	char		Y
Publication_Key	PUBLICATION_KEY	integer		
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
DATASET_SOURCE	SOURCE_KEY	SOURCE_KEY
COLLECTION	SOURCE_KEY	SOURCE_KEY

Referenced By	Foreign Key	Primary Key
SOURCE_LINK	SOURCE_KEY	SOURCE_KEY

Name : Source_Link

Code : SOURCE_LINK

Label : Links any data item to a source

Number : 100000

Description:
Any table and data item can be linked to a source.

Column Name	Code	Type	P	M
Source_Link_Key	SOURCE_LINK_KEY	integer	Y	Y
Source_Key	SOURCE_KEY	integer		Y
Linked_Table_Name	LINKED_TABLE_NAME	char		Y
Linked_Table_Key	LINKED_TABLE_KEY	integer		Y
Reference_Link_Type	REFERENCE_LINK_TYPE	char		Y
Source_Link_Description	SOURCE_LINK_DESCRIPTION	char		

Reference To	Primary Key	Foreign Key
SOURCE	SOURCE_KEY	SOURCE_KEY

Name : Specimen

Code : SPECIMEN

Label : Any collected natural object

Number : 100000

Description:
An actual collected specimen relating to a taxon occurrence or earth science object. It may be part of a museum collection or part of a recorder's reference material. The full details of this entity and its relations have not yet been fully worked/ There are obvious links here with museum cataloguing systems.

Column Name	Code	Type	P	M
Specimen_Number	SPECIMEN_NUMBER	integer	Y	Y
Specimen_Type	SPECIMEN_TYPE	char		Y

Referenced By	Foreign Key	Primary Key
NUMBERS_APPLIED_TO_SPECIMEN	SPECIMEN_NUMBER	SPECIMEN_NUMBER
TAXON_SPECIMEN	SPECIMEN_NUMBER	SPECIMEN_NUMBER

Name : Strat_checklist_Item

Code : STRAT_CHECKLIST_ITEM

Label : Occurrence of a stratigraphic term in a list

Number : 100000

Description:
Stratigraphic terms are combined to make checklists. Each term is an item in a version of the checklist.

Column Name	Code	Type	P	M
Strat_Chklist_Item_Key	STRAT_CHKLIST_ITEM_KEY	integer	Y	Y
Checklist_Version_Key	CHECKLIST_VERSION_KEY	integer		Y
Stratigraphic_Rank	STRATIGRAPHIC_RANK	char		Y
Checklist_Item_Sort_Code	CHECKLIST_ITEM_SORT_CODE	numeric		Y
Strat_Term_Version_Key	STRAT_TERM_VERSION_KEY	integer		Y

Reference To	Primary Key	Foreign Key
STRAT_RANK	STRATIGRAPHIC_RANK	STRATIGRAPHIC_RANK
STRAT_CHECKLIST_VERSION	CHECKLIST_VERSION_KEY	CHECKLIST_VERSION_KEY
STRAT_TERM_VERSION	STRAT_TERM_VERSION_KEY	STRAT_TERM_VERSION_KEY

Name : Strat_Checklist_Version

Code : STRAT_CHECKLIST_VERSION

Label : Dated versions of a standard stratigraphic list

Number : 20000

Description:
Checklists may be changed in different editions - every checklist must have at least one version

Column Name	Code	Type	P	M
Checklist_Version_Key	CHECKLIST_VERSION_KEY	integer	Y	Y
Checklist	CHECKLIST	char		Y
Checklist_Ver_Date_Start	CHECKLIST_VER_DATE_START	char		
Checklist_Ver_Date_Ended	CHECKLIST_VER_DATE_ENDED	char		
Checklist_Version_Detail	CHECKLIST_VERSION_DETAIL	char		
Source_Key	SOURCE_KEY	integer		

Reference To	Primary Key	Foreign Key
STRATIGRAPHIC_CHECKLIST	CHECKLIST	CHECKLIST

Referenced By	Foreign Key	Primary Key
STRAT_CHECKLIST_ITEM	CHECKLIST_VERSION_KEY	CHECKLIST_VERSION_KEY

Name : Strat_Codes

Code : STRAT_CODES

Label : Codes applied to stratigraphic names

Number : 100000

Description:
Stratigraphic codes used to refer to stratigraphic terms e.g. BGS mapping codes or GD2 codes

Column Name	Code	Type	P	M
Strat_Code	STRAT_CODE	char	Y	Y
Strat_Code_Scheme	STRAT_CODE_SCHEME	char	Y	Y
Strat_Term_Version_Key	STRAT_TERM_VERSION_KEY	integer		Y

Reference To	Primary Key	Foreign Key
STRAT_CODING_SCHEME	STRAT_CODE_SCHEME	STRAT_CODE_SCHEME
STRAT_TERM_VERSION	STRAT_TERM_VERSION_KEY	STRAT_TERM_VERSION_KEY

Name : Strat_Coding_Scheme

Code : STRAT_CODING_SCHEME

Label : Stratigraphic coding scheme

Number : 200

Description:
Details of stratigraphic code schemes e.g. BGS Map Codes - could be kept in a general codes table.

Column Name	Code	Type	P	M
Strat_Code_Scheme	STRAT_CODE_SCHEME	char	Y	Y
Date_Introduced	DATE_INTRODUCED	char		
Name_key	NAME_KEY	integer		
Source_Key	SOURCE_KEY	integer		Y
Comment	COMMENT	char		

Referenced By	Foreign Key	Primary Key
STRAT_CODES	STRAT_CODE_SCHEME	STRAT_CODE_SCHEME

Name : Strat_Occurrence_Data

Code : STRAT_OCCURRENCE_DATA

Label : Measurements and observations linked to strat

Number : 100000

Description:
Any number of measurements and observations may be linked to a stratigraphic observation. e.g. bed thickness, angle of dip, strike, internal bed structures. May need sub-typing.

Column Name	Code	Type	P	M
Strat_Occ_Data_Key	STRAT_OCC_DATA_KEY	integer	Y	Y
Strat_Occurrence_Key	STRAT_OCCURRENCE_KEY	integer		Y
Strat_Data_Type	STRAT_DATA_TYPE	char		Y
Strat_Data_Units	STRAT_DATA_UNITS	char		Y
Strat_Data	STRAT_DATA	char		Y
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
STRATIGRAPHIC_OCCURRENCE	STRAT_OCCURRENCE_KEY	STRAT_OCCURRENCE_KEY

Name : Strat_Rank

Code : STRAT_RANK

Label : Ranking within a statigraphic hierarchy

Number : 1000

Description:
Controlled terminology entity - Stratigraphic terms may have various ranks e.g. Group, formation, Period, Stage etc.

Column Name	Code	Type	P	M
Stratigraphic_Rank	STRATIGRAPHIC_RANK	char	Y	Y
Stratigraphic_Rank_Type	STRATIGRAPHIC_RANK_TYPE	char		Y
20	LIST_FONT	char		
List_font_size	LIST_FONT_SIZE	integer		
List_font_style	LIST_FONT_STYLE	char		
List_Indent	LIST_INDENT	decimal		

Referenced By	Foreign Key	Primary Key
STRAT_CHECKLIST_ITEM	STRATIGRAPHIC_RANK	STRATIGRAPHIC_RANK

Name : Strat_Rel_Geog

Code : STRAT_REL_GEOG

Label : Geographic areas or locations for relationships

Number : 100000

Column Name	Code	Type	P	M
Strat_Rel_Key	STRAT_REL_KEY	integer		
Place	PLACE	char		
Strat_equiv_geog_key	STRAT_EQUIV_GEOG_KEY	integer		

Reference To	Primary Key	Foreign Key
STRAT_RELATIONS	STRAT_REL_KEY	STRAT_REL_KEY

Name : Strat_Rel_List

Code : STRAT_REL_LIST

Label : List of equivalent stratigraphic horizons

Number : 100000

Description:
This table stores a list of stratigraphic checklist item terms which can be made the equivalents of a single item in a stratigraphic checklist. For instance what is a single stratigraphic term in one classification may be represented by several in another.

Column Name	Code	Type	P	M
Strat_Equiv_key	STRAT_EQUIV_KEY	integer	Y	Y
Strat_Chklist_Item_Key	STRAT_CHKLIST_ITEM_KEY	integer		
Strat_Rel_Key	STRAT_REL_KEY	integer		
Strat_Relation	STRAT_RELATION	char		
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
STRAT_RELATIONS	STRAT_REL_KEY	STRAT_REL_KEY

Name : Strat_Relations

Code : STRAT_RELATIONS

Label : Relationship between stratigraphic terms

Number : 100000

Description:
Stratigraphic terms relate to each other both hierarchically and by overlap between checklists.

Column Name	Code	Type	P	M
Strat_Rel_Key	STRAT_REL_KEY	integer	Y	Y
Strat_Chklist_Item_Key1	STRAT_CHKLIST_ITEM_KEY1	integer		Y
Comment	COMMENT	char		
Date_From	DATE_FROM	char		
Date_To	DATE_TO	char		
Publication_Key	PUBLICATION_KEY	integer		

Referenced By	Foreign Key	Primary Key
STRAT_REL_LIST	STRAT_REL_KEY	STRAT_REL_KEY
STRAT_REL_GEOG	STRAT_REL_KEY	STRAT_REL_KEY

Name : Strat_Term

Code : STRAT_TERM

Label : Stratigraphic term

Number : 20000

Description:
This is the overall list of all stratigraphic terms

Column Name	Code	Type	P	M
Strat_Key	STRAT_KEY	integer	Y	Y
Start_Term	START_TERM	char		Y
Term_Authority	TERM_AUTHORITY	char		
Date_From	DATE_FROM	char		
Comment	COMMENT	char		
Strat_Term_Type	STRAT_TERM_TYPE	char		Y
Publication_Key	PUBLICATION_KEY	integer		

Reference To	Primary Key	Foreign Key
STRAT_TERM_TYPE	STRAT_TERM_TYPE	STRAT_TERM_TYPE

Referenced By	Foreign Key	Primary Key
STRAT_TERM_VERSION	STRAT_KEY	STRAT_KEY

Name : Strat_Term_Type

Code : STRAT_TERM_TYPE

Label : Type of stratigraphic term

Number : 100

Description:
Controlled terminology entity - Stratigraphic terms fall into different classification types e.g. lithostratigraphic or chronostratigraphic. could be managed in a general term table.

Column Name	Code	Type	P	M
Strat_Term_Type	STRAT_TERM_TYPE	char	Y	Y
Comment	COMMENT	char		

Referenced By	Foreign Key	Primary Key
STRAT_TERM	STRAT_TERM_TYPE	STRAT_TERM_TYPE

Name : Strat_Term_Version

Code : STRAT_TERM_VERSION

Label : Revisions of a standard strat term

Number : 100000

Description:
All stratigraphic terms are likely to be revised, usually with reference to their top and bottoms and dates

Column Name	Code	Type	P	M
Strat_Term_Version_Key	STRAT_TERM_VERSION_KEY	integer	Y	Y
Strat_Key	STRAT_KEY	integer		Y
Radiometric_Base_Date	RADIOMETRIC_BASE_DATE	decimal		
Comment	COMMENT	char		
Version_Authority	VERSION_AUTHORITY	char		
Publication_Key	PUBLICATION_KEY	integer		

Reference To	Primary Key	Foreign Key
STRAT_TERM	STRAT_KEY	STRAT_KEY

Referenced By	Foreign Key	Primary Key
STRAT_CODES	STRAT_TERM_VERSION_KEY	STRAT_TERM_VERSION_KEY
STRAT_CHECKLIST_ITEM	STRAT_TERM_VERSION_KEY	STRAT_TERM_VERSION_KEY

Name : Stratigraphic Checklist

Code : STRATIGRAPHIC_CHECKLIST

Label : An ordered list of stratigraphic terms

Number : 10000

Description:
Different authorities and organisations produce checklists of stratigraphic terms e.g. BGS or Geol. Soc. Geologic Time Scale

Column Name	Code	Type	P	M
Checklist	CHECKLIST	char	Y	Y
Checklist_Detail	CHECKLIST_DETAIL	char		
Checklist_Authority	CHECKLIST_AUTHORITY	char		

Referenced By	Foreign Key	Primary Key
STRAT_CHECKLIST_VERSION	CHECKLIST	CHECKLIST

Name : Stratigraphic_Occurrence

Code : STRATIGRAPHIC_OCCURRENCE

Label : The record of the stratigraphy made during recording

Number : 100000

Description:
Recorders may wish to record the stratigraphy related to the survey sample that they are making e.g. a biotope may be based on the Chalk or a more detailed record e.g. Butcombe Sandstone may be needed

Column Name	Code	Type	P	M
Strat_Occurrence_Key	STRAT_OCCURRENCE_KEY	integer	Y	Y
Sample_Key	SAMPLE_KEY	integer		Y
Strat_Chklist_Item_Key	STRAT_CHKLIST_ITEM_KEY	integer		Y
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY

Referenced By	Foreign Key	Primary Key
STRAT_OCCURRENCE_DATA	STRAT_OCCURRENCE_KEY	STRAT_OCCURRENCE_KEY

Name : Survey

Code : SURVEY

Label : Details of organised Surveys

Number : 10000

Description:
This table holds the details of organised surveys including organisers, dates and validation methods. This could form part of the basic metarecord needed for data transfer.

Column Name	Code	Type	P	M
Survey_Key	SURVEY_KEY	integer	Y	Y
Survey_Name	SURVEY_NAME	char		Y
Survey_Type	SURVEY_TYPE	char		Y
Survey_Date_From	SURVEY_DATE_FROM	char		Y
Survey_Date_To	SURVEY_DATE_TO	char		Y
Survey_Status	SURVEY_STATUS	char		
Survey_Responsible	SURVEY_RESPONSIBLE	integer		
Survey_Description	SURVEY_DESCRIPTION	char		
Survey_Media	SURVEY_MEDIA	char		
Geographic_Coverage	GEOGRAPHIC_COVERAGE	char		

Reference To	Primary Key	Foreign Key
SURVEY_TYPE	SURVEY_TYPE	SURVEY_TYPE

Referenced By	Foreign Key	Primary Key
SURVEY_EVENT	SURVEY_KEY	SURVEY_KEY

Name : Survey_Event

Code : SURVEY_EVENT

Label : Survey, expedition or single observation event

Number : 100000

Description:
The recording event entity refers to the organisational information relating to a survey, expedition or even a single observation event. It also covers information general to the recording event such as the weather, duration of the survey.

Details of the location are not linked to recording event because observations may be may at different locations within one event.

Column Name	Code	Type	P	M
Survey_Event_Key	SURVEY_EVENT_KEY	integer	Y	Y
Survey_Event_Date	SURVEY_EVENT_DATE	char		Y
Survey_Event_Weather	SURVEY_EVENT_WEATHER	char		
Survey_Type	SURVEY_TYPE	char		Y
Survey_Key	SURVEY_KEY	integer		Y
Location_key	LOCATION_KEY	integer		

Reference To	Primary Key	Foreign Key
SURVEY	SURVEY_KEY	SURVEY_KEY

Referenced By	Foreign Key	Primary Key
SURVEY_SAMPLE	SURVEY_EVENT_KEY	SURVEY_EVENT_KEY
SURVEY_RECORDER	SURVEY_EVENT_KEY	SURVEY_EVENT_KEY

Name : Survey_Method

Code : SURVEY_METHOD

Label : Means whereby sample was obtained

Number : 1000

Description:
Controlled terminology entity.

The survey method refers to the techniques actually applied within the survey type to obtain data related to the current record sample. e.g. in a Phase I survey (Survey type) a biotope sample (e.g. relating unimproved meadow to a land parcel) may have been observed through binoculars (survey method). Another example in a detailed invertebrate survey a sample may have been obtained from a specific pitfall trap (survey method) whilst another may have been pooted from leaf litter. May refer to a standard method e.g. Pollard Walk.

Column Name	Code	Type	P	M
Survey_Method	SURVEY_METHOD	char	Y	Y
Survey_Method_Definition	SURVEY_METHOD_DEFINITION	char		

Referenced By	Foreign Key	Primary Key
SURVEY_SAMPLE	SURVEY_METHOD	SURVEY_METHOD

Name : Survey_Recorder

Code : SURVEY_RECORDER

Label : People linked to recording events

Number : 10000

Description:
A recording event must be linked to at least one recorder but may include many. A recorder may be linked to many recording events.

Column Name	Code	Type	P	M
Name_key	NAME_KEY	integer	Y	Y
Survey_Event_Key	SURVEY_EVENT_KEY	integer	Y	Y
Role_Term	ROLE_TERM	char		Y

Reference To	Primary Key	Foreign Key
SURVEY_EVENT	SURVEY_EVENT_KEY	SURVEY_EVENT_KEY

Name : Survey_Sample

Code : SURVEY_SAMPLE

Label : A group of observations made during a recording event

Number : 100000

Description:
The sample is an actual group of observations made during a recording event. A recording event may consist of only one sample e.g. a species list related to a I kilometre square but many samples may be taken at different times and precise locations in relation to the same event e.g. butterfly sightings along a transect or in different habitat compartments in a single wood or quadrats within a single biotope stand.

Column Name	Code	Type	P	M
Sample_Key	SAMPLE_KEY	integer	Y	Y
Survey_Event_Key	SURVEY_EVENT_KEY	integer		Y
Survey_Method	SURVEY_METHOD	char		Y
Location_key	LOCATION_KEY	integer		
Sample_Grid_Ref	SAMPLE_GRID_REF	char		Y
Sample_Grid_System	SAMPLE_GRID_SYSTEM	char		Y
Sample_Grid_Ref_Source	SAMPLE_GRID_REF_SOURCE	char		Y
Sample_Grid_Checked	SAMPLE_GRID_CHECKED	integer		Y
Sample_Date	SAMPLE_DATE	char		Y
Sample_Type	SAMPLE_TYPE	char		Y
Sample_Time	SAMPLE_TIME	char		
Sample_Scale	SAMPLE_SCALE	char		
Sample_Area	SAMPLE_AREA	char		
Sample_Area_Unit	SAMPLE_AREA_UNIT	char		
Observation_Period	OBSERVATION_PERIOD	char		
Sample_Ref_Code	SAMPLE_REF_CODE	char		

Reference To	Primary Key	Foreign Key
SURVEY_EVENT	SURVEY_EVENT_KEY	SURVEY_EVENT_KEY
SURVEY_METHOD	SURVEY_METHOD	SURVEY_METHOD

Referenced By	Foreign Key	Primary Key
TAXON_OCCURRENCE	SAMPLE_KEY	SAMPLE_KEY
SAMPLE_LOCATION_DATA	SAMPLE_KEY	SAMPLE_KEY
BIOTOPE_OCCURRENCE	SAMPLE_KEY	SAMPLE_KEY
SAMPLE_RELATION	SAMPLE_KEY_1	SAMPLE_KEY
SAMPLE_RELATION	SAMPLE_KEY_2	SAMPLE_KEY

Referenced By	Foreign Key	Primary Key
STRATIGRAPHIC_OCCURRENCE	SAMPLE_KEY	SAMPLE_KEY
MINERAL_OCCURRENCE	SAMPLE_KEY	SAMPLE_KEY
ROCK_TYPE_OCCURRENCE	SAMPLE_KEY	SAMPLE_KEY
EARTH_SCI_FTR_OCCURRENCE	SAMPLE_KEY	SAMPLE_KEY

Name : Survey_Type

Code : SURVEY_TYPE

Label : Controlled list of survey types

Number : 1000

Description:
Controlled terminology entity listing types of Survey e.g. Phase I Field Survey. Could be in a general terms table

Column Name	Code	Type	P	M
Survey_Type	SURVEY_TYPE	char	Y	Y
Survey_Type_Definition	SURVEY_TYPE_DEFINITION	char		Y
Publication_Key	PUBLICATION_KEY	integer		

Referenced By	Foreign Key	Primary Key
SURVEY	SURVEY_TYPE	SURVEY_TYPE

Name : Taxon

Code : TAXON

Label : Taxonomic names

Number : 100000

Description:
This is the basic reference table for the whole taxon dictionary. It lists every name given to the taxa of interest to the system. Interpretations of these names and their incorporation into various checklists are handled by other tables.

A taxon is any formal, common or informal name referring to an organism. Normally the taxon derives from a published reference but for practical purposes may also be a manuscript term especially where information is being derived from collection labels or notebooks.

A taxon relating to the zoological, botanical and other scientific codes of nomenclature must have an original author and date. A common name must give its language.

Column Name	Code	Type	P	M
Taxon_Key	TAXON_KEY	integer	Y	Y
Taxon	TAXON	char		Y
Taxon_Authority	TAXON_AUTHORITY	char		
Taxon_Introduced_Date	TAXON_INTRODUCED_DATE	char		
Taxon_Language	TAXON_LANGUAGE	char		Y
Taxon_Name_Type_Key	TAXON_NAME_TYPE_KEY	integer		Y

Index Code	P	F	U	C	Column Code	Sort
TAXON			Y		TAXON	ASC

Reference To	Primary Key	Foreign Key
TAXON_NAME_TYPE	TAXON_NAME_TYPE_KEY	TAXON_NAME_TYPE_KEY

Referenced By	Foreign Key	Primary Key
TAXON_VERSION	TAXON_KEY	TAXON_KEY

Name : Taxon_Biotope_Association

Code : TAXON_BIOTOPE_ASSOCIATION

Label : Links between taxa and biotopes

Number : 100000

Description:
This table allows taxa to be linked with a range of biotopes and their association strength with that biotope to be recorded. This table could then be used for biotope occupancy searches and predictive modelling.

Column Name	Code	Type	P	M
TX_BT_Ass_Key	TX_BT_ASS_KEY	integer	Y	Y
Taxon_Version_Key	TAXON_VERSION_KEY	integer		Y
Biotope_key	BIOTOPE_KEY	integer		Y
TX_BT_Association	TX_BT_ASSOCIATION	char		Y
TX_BT_Ass_Strength	TX_BT_ASS_STRENGTH	char		
Location_key	LOCATION_KEY	integer		Y
Name_key	NAME_KEY	integer		Y
TX_BT_Ass_Date	TX_BT_ASS_DATE	char		
Publication_Key	PUBLICATION_KEY	integer		

Reference To	Primary Key	Foreign Key
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY

Name : Taxon_Codes

Code : TAXON_CODES

Label : Actual Codes used in Checklist

Number : 100000

Description:
Table holding the actual taxon codes used in the various taxon coding schemes.

Column Name	Code	Type	P	M
Taxon_Code_Key	TAXON_CODE_KEY	integer	Y	Y
Taxon_Code	TAXON_CODE	char		Y
Coding_Scheme	CODING_SCHEME	char		Y
Taxon_Version_Key	TAXON_VERSION_KEY	integer		Y
Checklist_Version_Key	CHECKLIST_VERSION_KEY	integer		

Reference To	Primary Key	Foreign Key
CODING_SCHEME	CODING_SCHEME	CODING_SCHEME
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY

Name : Taxon_Designation

Code : TAXON_DESIGNATION

Label : Various categories of conservation status for species

Number : 100000

Description:
A particular species - identified by its name version may have one or more levels of protection or conservation status applied to it. It may also have a number of other rarity and conservation staus ranks given to it e.g. RDB1 or local RDB. This table may record national or local designations.

Column Name	Code	Type	P	M
Taxon_Designation_Key	TAXON_DESIGNATION_KEY	integer	Y	Y
Taxon_Version_Key	TAXON_VERSION_KEY	integer		Y
Designation_Key	DESIGNATION_KEY	char		Y
Tx_Designation_Date _From	TX_DESIGNATION_DATE__FROM	char		
Tx_Designation_Date_To	TX_DESIGNATION_DATE_TO	char		
Tx_Designation_Comment	TX_DESIGNATION_COMMENT	char		
Name_key	NAME_KEY	integer		Y
Entry_Date	ENTRY_DATE	char		Y

Reference To	Primary Key	Foreign Key
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY
DESIGNATION_TYPE	DESIGNATION_KEY	DESIGNATION_KEY

Name : Taxon_Determination

Code : TAXON_DETERMINATION

Label : record of identification and checking of taxon record

Number : 100000

Description:
For most taxon records it is important to know who made the identification and therefore if their skills match those required for that particular taxon. The determiner may not be the original recorder. This is the case when voucher specimens are sent off to taxon referees.

Identifications may also be checked at a later date by other individuals

Every taxon record must be linked with at least one identifier/checker record

Column Name	Code	Type	P	M
Determination_Key	DETERMINATION_KEY	integer	Y	Y
Taxon_Occurrence_Key	TAXON_OCCURRENCE_KEY	integer		Y
Specimen_Number	SPECIMEN_NUMBER	integer		
Name_key	NAME_KEY	integer		Y
Checklist_Item_Key	CHECKLIST_ITEM_KEY	integer		Y
Determination_Date	DETERMINATION_DATE	char		Y
Determination_Type	DETERMINATION_TYPE	char		Y
Determination_Comment	DETERMINATION_COMMENT	char		
Det_Work	DET_WORK	integer		

Reference To	Primary Key	Foreign Key
TAXON_OCCURRENCE	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY
TAXON_SPECIMEN	SPECIMEN_NUMBER	SPECIMEN_NUMBER

Name : Taxon_Facts

Code : TAXON_FACTS

Label : Extra Information about Taxa

Number : 100000

Description:
This table holds facts about a taxon which may actually be related to more than one version (but not necessarily). The table may need considerable extension probably using sub-types to cope with all the possible facts that might be recorded. Both nationally provided and locally developed facts can be stored in this table. These have not been fully worked out here.

Column Name	Code	Type	P	M
Taxon_Fact_Key	TAXON_FACT_KEY	integer	Y	Y
Taxon_Version_Key	TAXON_VERSION_KEY	integer		Y
Taxon_Account_Type	TAXON_ACCOUNT_TYPE	char		
Taxon_Account	TAXON_ACCOUNT	char		
Source_Key	SOURCE_KEY	integer		Y
Location_key	LOCATION_KEY	integer		Y
Name_key	NAME_KEY	integer		Y
Taxon_Fact_Date	TAXON_FACT_DATE	char		Y
Publication_Key	PUBLICATION_KEY	integer		

Reference To	Primary Key	Foreign Key
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY

Name : Taxon_Name_Type

Code : TAXON_NAME_TYPE

Label : Types of scientific, common and informal names

Number : 1000

Description:
Taxon names may fall into a number of types e.g. scientific binomial, common and informal names. Names can also be user-defined or belong to different classification schemes e.g. list of common bird names etc. This is a controlled entity which labels entries in the main taxon table with their name type. Could be in a general term table.

Column Name	Code	Type	P	M
Taxon_Name_Type_Key	TAXON_NAME_TYPE_KEY	integer	Y	Y
Taxon_Name_Type	TAXON_NAME_TYPE	char		Y
Taxon_Name_Type_Note	TAXON_TYPE_NOTE	char		
Source_Key	SOURCE_KEY	integer		Y
Authority	AUTHORITY	char		

Referenced By	Foreign Key	Primary Key
TAXON	TAXON_NAME_TYPE_KEY	TAXON_NAME_TYPE_KEY

Name : Taxon_Occ_Data_Type

Code : TAXON_OCC_DATA_TYPE

Label : List of parameter terms relating to populations

Number : 1000

Description:
A controlled terminology entity which lists the possible range of terms and measures which may be related to populations in taxon observations. These include terms for sex, stage, number, dominance, percentage cover etc.

A single observation can have many population data records.
Could be in a general term table.

Column Name	Code	Type	P	M
Population_Measure_Term	POPULATION_MEASURE_TERM	char	Y	Y
Population_Measure_Type	POPULATION_MEASURE_TYPE	char		Y

Referenced By	Foreign Key	Primary Key
TAXON_OCCURRENCE_DATA	POPULATION_MEASURE_TERM	POPULATION_MEASURE_TERM

Name : Taxon_Occurrence

Code : TAXON_OCCURRENCE

Label : List of taxa recorded at a given time and place

Number : 100000

Description:
This is the list of taxa associated with an individual sample e.g. at a given time and place.

Column Name	Code	Type	P	M
Taxon_Occurrence_Key	TAXON_OCCURRENCE_KEY	integer	Y	Y
Sample_Key	SAMPLE_KEY	integer		Y
Record_Type	RECORD_TYPE	char		Y
Substrate	SUBSTRATE	char		
Comment	COMMENT	char		
Check_Status	CHECK_STATUS	integer		Y
Confidential_Flag	CONFIDENTIAL_FLAG	char		Y
Surveyors_Ref	SURVEYORS_REF	char		

Reference To	Primary Key	Foreign Key
SURVEY_SAMPLE	SAMPLE_KEY	SAMPLE_KEY
RECORD_TYPE	RECORD_TYPE	RECORD_TYPE

Referenced By	Foreign Key	Primary Key
TAXON_OCCURRENCE_RELATION	TAXON_OCCURRENCE_KEY_1	TAXON_OCCURRENCE_KEY
TAXON_OCCURRENCE_RELATION	TAXON_OCCURRENCE_KEY_2	TAXON_OCCURRENCE_KEY
TAXON_DETERMINATION	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY
TAXON_OCCURRENCE_DATA	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY
TAXON_SPECIMEN	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY

Name : Taxon_Occurrence_Data

Code : TAXON_OCCURRENCE_DATA

Label : Facts relating to sex, stage and numbers in taxon records

Number : 100000

Description:
A wide range of observations relating to sex, stage and number make up of taxon based observations. Observations may include abundance, dominance and percentage cover codes. Each taxon record may be linked to many population measures within each sampling event.

Observations may be made in relation to a taxon occurrence record or the specimens collected. May need to be subtyped - not worked out here

Column Name	Code	Type	P	M
Population_Data_Key	POPULATION_DATA_KEY	integer	Y	Y
Taxon_Occurrence_Key	TAXON_OCCURRENCE_KEY	integer		Y
Specimen_Number	SPECIMEN_NUMBER	integer		
Population_Measure_Term	POPULATION_MEASURE_TERM	char		Y
Population_Measure	POPULATION_MEASURE	char		Y

Reference To	Primary Key	Foreign Key
TAXON_OCC_DATA_TYPE	POPULATION_MEASURE_TERM	POPULATION_MEASURE_TERM
TAXON_OCCURRENCE	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY
TAXON_SPECIMEN	SPECIMEN_NUMBER	SPECIMEN_NUMBER

Name : Taxon_Occurrence_Relation

Code : TAXON_OCCURRENCE_RELATION

Label : Observed relationships between taxa

Number :

Description:
Taxa may be observed in relation to one another e.g. a larva eating a plant, a parasite upon a host etc.

Column Name	Code	Type	P	M
Taxon_Occurrence_Rel_Key	TAXON_OCCURRENCE_REL_KEY	integer	Y	Y
Taxon_Occurrence_Key_1	TAXON_OCCURRENCE_KEY_1	integer		Y
Taxon_Occurrence_Key_2	TAXON_OCCURRENCE_KEY_2	integer		Y
Taxon_Occurrence_Relation	TAXON_OCCURRENCE_RELATION	char		Y

Reference To	Primary Key	Foreign Key
TAXON_OCCURRENCE	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY_1
TAXON_OCCURRENCE	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY_2

Name : Taxon_Rank

Code : TAXON_RANK

Label : Level in taxonomic hierarchy

Number : 300

Description:
List of all the various taxonomic Ranks. A controlled terminology entity. could be in general table

Column Name	Code	Type	P	M
Taxon_Rank	TAXON_RANK	char	Y	Y
Taxon_Rank_Type	TAXON_RANK_TYPE	char		Y
List_font	LIST_FONT	char		
List_font_size	LIST_FONT_SIZE	integer		
List_font_style	LIST_FONT_STYLE	char		
List_Indent	LIST_INDENT	decimal		

Referenced By	Foreign Key	Primary Key
CHECKLIST_ITEM	TAXON_RANK	TAXON_RANK

Name : Taxon_Skill

Code : TAXON_SKILL

Label : Record of Taxonomic skills of recorders

Number : 10000

Description:
It may be necessary to match determiner's and recorders skills against taxon validation levels. This is highly contentious and perhaps will be replaced by a system of recording formal and informal taxonomic qualifications.

Column Name	Code	Type	P	M
Skill_Record_Key	SKILL_RECORD_KEY	integer	Y	Y
Name_key	NAME_KEY	integer		Y
Taxon_Key	TAXON_KEY	integer		Y
Taxon_ID_Skill_level	TAXON_ID_SKILL_LEVEL	char		Y
Date_level_acquired	DATE_LEVEL_ACQUIRED	char		Y
Accredited_By	ACCREDITED_BY	integer		Y

Reference To	Primary Key	Foreign Key
NAME	NAME_KEY	NAME_KEY

Name : Taxon_Specimen

Code : TAXON_SPECIMEN

Label : Actual collection specimen referring to a taxon observation

Number : 100000

Description:
A link to physical collections management - Taxon specimens relate to Specimen which allows for multi-specimen identifications within a group e.g. several specimens in one tube or in the case of fossils, several taxa on one piece of rock.

Column Name	Code	Type	P	M
Taxon_Specimen_Number	TAXON_SPECIMEN_NUMBER	integer	Y	Y
Specimen_Number	SPECIMEN_NUMBER	integer		Y
Taxon_Occurrence_Key	TAXON_OCCURRENCE_KEY	integer		Y
Comment	COMMENT	char		

Reference To	Primary Key	Foreign Key
TAXON_OCCURRENCE	TAXON_OCCURRENCE_KEY	TAXON_OCCURRENCE_KEY
SPECIMEN	SPECIMEN_NUMBER	SPECIMEN_NUMBER

Referenced By	Foreign Key	Primary Key
TAXON_DETERMINATION	SPECIMEN_NUMBER	SPECIMEN_NUMBER
TAXON_OCCURRENCE_DATA	SPECIMEN_NUMBER	SPECIMEN_NUMBER

Name : Taxon_Taxon_Association

Code : TAXON_TAXON_ASSOCIATION

Label : Association between taxa

Number : 100000

Description:
This table allows the recording of known associations between taxa e.g. between a moth and its food plant or a parasite and its host.

Column Name	Code	Type	P	M
TX_TX_Ass_Key	TX_TX_ASS_KEY	integer	Y	Y
Taxon_Version_Key_1	TAXON_VERSION_KEY_1	integer		Y
Taxon_Version_Key_2	TAXON_VERSION_KEY_2	integer		Y
TX_TX_Association	TX_TX_ASSOCIATION	char		Y
Location_key	LOCATION_KEY	integer		Y
Publication_Key	PUBLICATION_KEY	integer		
Name_key	NAME_KEY	integer		Y
TX_TX_Ass_Date	TX_TX_ASS_DATE	char		
TX_TX_Ass_Comment	TX_TX_ASS_COMMENT	char		

Reference To	Primary Key	Foreign Key
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY_1
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY_2

Name : Taxon_Version

Code : TAXON_VERSION

Label : Different interpretations of the same name

Number : 100000

Description:
Each entry in the taxon table is a name which may be used in different ways by authors, especially when species are lumped or split. This entity tracks the various use of name as versions. Each taxon must have at least one version (its original use) but may have several where later authors have used the name differently - (e.g. changed its rank or scale by lumping or splitting) hence the need to record the version authority in addition to the taxon authority.

Column Name	Code	Type	P	M
Taxon_Version_Key	TAXON_VERSION_KEY	integer	Y	Y
Taxon_Key	TAXON_KEY	integer		Y
Taxon_Version_Attribute	TAXON_VERSION_ATTRIBUTE	char		
Taxon_Version_Authority	TAXON_VERSION_AUTHORITY	char		
Taxon_Version_From	TAXON_VERSION_FROM	char		Y
Taxon_Version_To	TAXON_VERSION_TO	char		
Taxon_Version_Comment	TAXON_VERSION_COMMENT	char		
Taxon_Validation_Level	TAXON_VALIDATION_LEVEL	integer		Y
Taxon_UK_Native	TAXON_UK_NATIVE	char		Y

Reference To	Primary Key	Foreign Key
TAXON	TAXON_KEY	TAXON_KEY

Referenced By	Foreign Key	Primary Key
CHECKLIST_ITEM	TAXON_VERSION_KEY	TAXON_VERSION_KEY
TAXON_DESIGNATION	TAXON_VERSION_KEY	TAXON_VERSION_KEY
TAXON_FACTS	TAXON_VERSION_KEY	TAXON_VERSION_KEY
TAXON_VERSION_RELATION	TAXON_VERSION_KEY_1	TAXON_VERSION_KEY
TAXON_VERSION_RELATION	TAXON_VERSION_KEY_2	TAXON_VERSION_KEY
TAXON_BIOTOPE_ASSOCIATION	TAXON_VERSION_KEY	TAXON_VERSION_KEY
TAXON_TAXON_ASSOCIATION	TAXON_VERSION_KEY_1	TAXON_VERSION_KEY
TAXON_TAXON_ASSOCIATION	TAXON_VERSION_KEY_2	TAXON_VERSION_KEY
TAXON_CODES	TAXON_VERSION_KEY	TAXON_VERSION_KEY

Name : Taxon_Version_Relation

Code : TAXON_VERSION_RELATION

Label : Relationships between versions of taxa

Number : 100000

Description:
This entity tracks the changes made to versions of taxa e.g. where a taxon is split or lumped it should be possible to trace its full history by following from taxon to taxon through the relations entity. It is not used for synonymy which is regarded as an attribute of the checklist.

Column Name	Code	Type	P	M
Taxon_Version_Key_1	TAXON_VERSION_KEY_1	integer	Y	Y
Taxon_Version_Key_2	TAXON_VERSION_KEY_2	integer	Y	Y
Taxon_Version_Relation_1_2	TAXON_VERSION_RELATION_1_2	char		Y

Reference To	Primary Key	Foreign Key
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY_1
TAXON_VERSION	TAXON_VERSION_KEY	TAXON_VERSION_KEY_2

Name : Tenure

Code : TENURE

Label : Ownership or tenancy of land

Number : 100000

Description:
Any defined piece of land may be owned or tenanted by one or more people or organisations at any time and changing with time.

Column Name	Code	Type	P	M
Tenure_Key	TENURE_KEY	integer	Y	Y
Location_key	LOCATION_KEY	integer		Y
Name_key	NAME_KEY	integer		Y
Tenure_Type	TENURE_TYPE	char		Y
Tenure_From	TENURE_FROM	char		Y
Tenure_To	TENURE_TO	char		

Reference To	Primary Key	Foreign Key
LOCATION	LOCATION_KEY	LOCATION_KEY

Name : Term_Type

Code : TERM_TYPE

Label : Controlled list of termlists used in application

Number : 500

Description:
An entity which lists the termlists used in the application

Column Name	Code	Type	P	M
Term_Type	TERM_TYPE	char	Y	Y
Subject_Area	SUBJECT_AREA	char		Y
Source_Key	SOURCE_KEY	integer		Y

Referenced By	Foreign Key	Primary Key
TERMLIST	TERM_TYPE	TERM_TYPE

Name : Termlist

Code : TERMLIST

Label : Entity to hold flat term lists for validation checking

Number : 100000

Description:
A general lookup table to hold lists of terms used for controlled terminology entry checking.

Column Name	Code	Type	P	M
Term_Key	TERM_KEY	integer	Y	Y
Term	TERM	char		Y
Term_Type	TERM_TYPE	char		Y
Term_Code	TERM_CODE	char		
Definition	DEFINITION	char		
Entry_Date	ENTRY_DATE	char		Y
Source_Key	SOURCE_KEY	integer		Y
Checklist_Item_Sort_Code	CHECKLIST_ITEM_SORT_CODE	numeric		

Reference To	Primary Key	Foreign Key
TERM_TYPE	TERM_TYPE	TERM_TYPE

Name : Threats

Code : THREATS

Label : Controlled terminology list of potential threats

Number : 500

Description:
A controlled terminology entity which lists potential threats e.g. PDOs

Column Name	Code	Type	P	M
Threat_Key	THREAT_KEY	integer	Y	Y
PDO_Number	PDO_NUMBER	integer		
Threat	THREAT	char		Y

Referenced By	Foreign Key	Primary Key
POTENTIAL_THREATS	THREAT_KEY	THREAT_KEY
DAMAGE_OCCURRENCE	THREAT_KEY	THREAT_KEY

Annex 4.

Forms for first-pass 'Slim' Recorder

The following is an assessment of the forms, attributes and associated functions which might appear in a 'slim' version of new Recorder. The LRC version would differ mainly by the inclusion of a wider range of data tracking functions and differing access levels. It is also likely that an LRC version would use direct access to GIS.

Main Application and Data Forms:

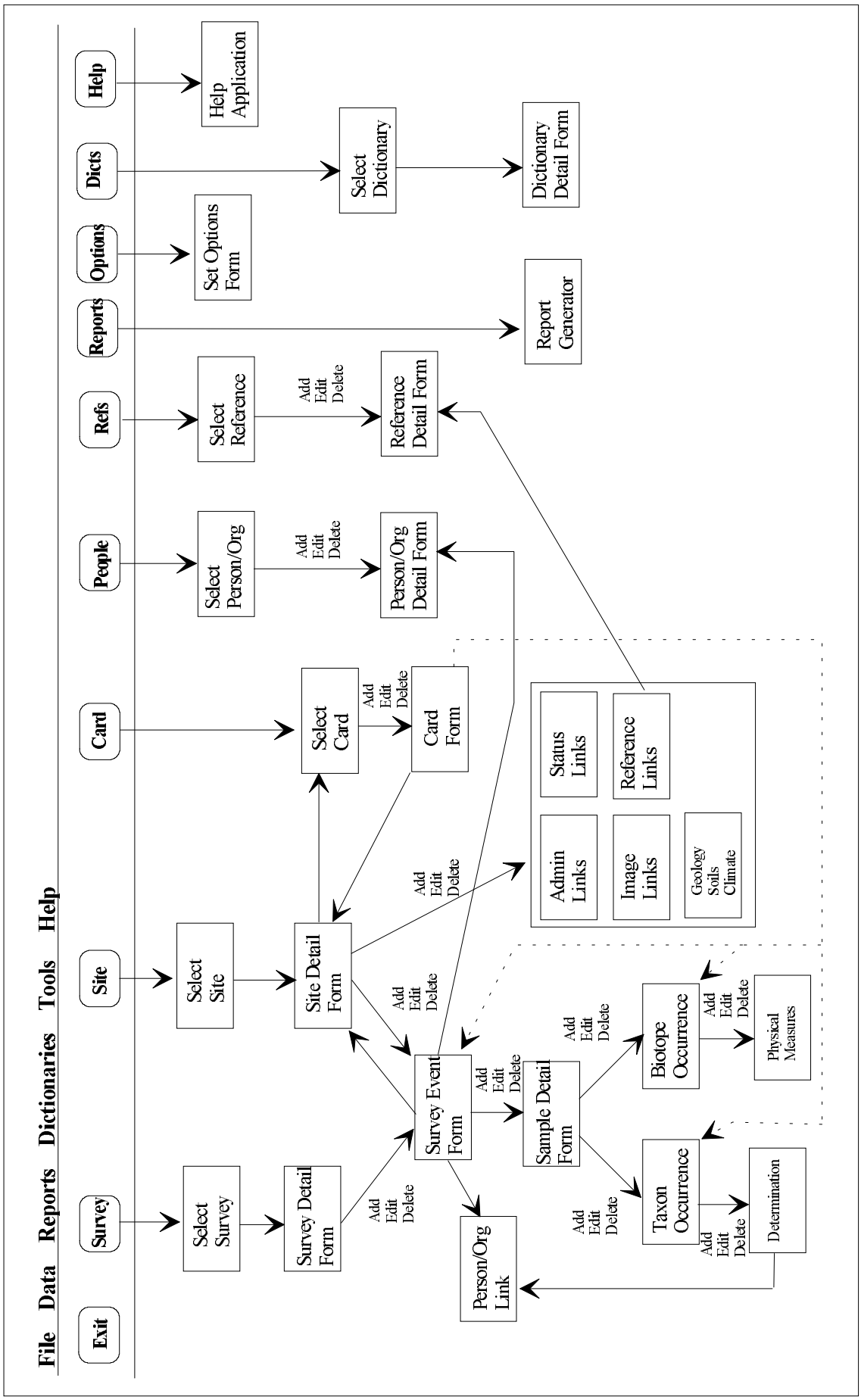
1. Survey Selection Form - Also functions as Add/Delete, Report and Map control for surveys.
   Fields: form with embedded table showing fields from Survey Table - no direct editing

2. Survey Detail Form - Acts also as a Survey Event Selection Form. Also functions as Add/Delete, Report and Map control for events.
   Fields:
   - Record Number: auto-increment. could be hidden
   - Survey Type: select from drop-down edit box
   - Survey Name: free text
   - Survey_Responsible: organiser - must be in people table
   - Survey Media: drop-down list (BRC cards, own design cards, free form etc.)
   - Geographic Range: probably free text but could be linked to Admin. Table
   - Date From and Date to: valid date format including vague date
   - Description: free text
   - Embedded table of Survey Events using fields from SV_Event table

3. Survey Event Form - Acts also as a Sample Selection Form. Links to other forms: People/Organisation Links. Also functions as Add/Delete, Report and Map control for samples.
   Fields:
   - Record Number: auto-increment
   - Survey Key: auto-filled when coming from survey or pick from select list
   - Survey Type: autofilled - non editable
   - Locality key: pick from selection form or other method
   - Start, end and other dates: valid date format including vague date
   - Weather: free text
   - Associated Recorders: embedded table for survey_recorder table

   Note some applications may want other fields added e.g. number of samples and number of photos (possibly as calculated fields)

4. Sample Form - Acts also as a Biotope Occurrence Selection Form and a Taxon Occurrence Selection Form. Also functions as Add/Delete, Report and Map control for biotope and taxon occurrences. There is scope here to have context sensitive sample forms depending on the sample type e.g. community (biotope) sample, quadrat record, trap sample. [See main text for examples].
   Fields:
   - Sample Key: auto-increment
   - Survey Event Key: auto-filled or pick
   - Location Key: auto-filled with survey event location but editable to a sub-location if needed
   - Survey method & Sample Type: pick from select lists. method should match event.
   - Sample Ref. Code: surveyors reference code for this sample e.g. quadrat number
   - Grid Ref. Type & checked: must be valid within type limitations. check autoset to No
   - Grid Ref. source: pick list (original/inferred/GIS etc.)Sample Date: Date validation
   - Sample Area & units: pick list of units
   - Also possibly Time and observation periods.
   - Links to physical data records: can either be embedded table or hard-coded fields e.g. Soil pH, Soil Depth, Slope and Aspect. [see examples in Paradox Model]
   - Link tables to Biotope and Taxon Occurrences.


File Data Reports Dictionaries Tools Help
Exit
Survey
Site
Card
People
Refs
Reports
Options
Dicts
Help
Help Application
Select Dictionary
Dictionary Detail Form
Set Options Form
Report Generator
Select Reference
Add Edit Delete
Reference Detail Form
Select Person/Org
Add Edit Delete
Person/Org Detail Form
Select Card
Add Edit Delete
Card Form
Status Links
Reference Links
Admin Links
Image Links
Geology Soils Climate
Select Site
Site Detail Form
Add Edit Delete
Select Survey
Survey Detail Form
Add Edit Delete
Survey Event Form
Add Edit Delete
Sample Detail Form
Add Edit Delete
Biotope Occurrence
Add Edit Delete
Physical Measures
Taxon Occurrence
Add Edit Delete
Determination
Person/Org Link

5. Site Selection Form. Also functions as Add/Delete, Report and Map control for sites.
Fields: form with embedded table showing fields from Sites Table - no direct editing

6. Site Detail Form - Also acts as a Biotope Occurrence Selection Form and a Taxon Occurrence Selection Form. Links to other forms: Images, Admin. Links, Site Status Links, Site Codes, Related Site Links, Climate, Soil and Geology Links, Reference Links, People/Organisation Links.
This form is likely to be the most different for 'fat' and 'thin' users as LRCs and planning users are likely to want to store details of site tenure and management whereas naturalist users are more likely to require basic geographic information. Typical fields are listed below:
Fields:

- Location Key - auto-increment
- Location Type - picked from drop-down list
- Location Name - current name (may need to create a separate name table if users want multiple names)
- Location Description - free text of unlimited length (e.g. memo field)
- Spatial Area & units - valid number and units from drop-down list
- Spatial Reference (Grid Ref.) & System & Accuracy & Checked - Valid reference within chosen system. Accuracy from drop-down list. Checked - Yes/No
- Altitude Min. & Max. & Units - valid numbers, drop-down list of unit types
- embedded table: Related Sites
- embedded table: Site Status
- embedded table: Admin. Areas
- embedded table: Land Parcels
- embedded table: Site codes
- embedded table: Soil - possibly under features
- embedded table: Geology - possibly under features
- embedded table: Climate - possibly under features
- embedded table: References
- embedded table: Images

Extra fields for 'Fat Recorder':

- embedded table - Tenure
- extension for Feature Management - embedded table for Features
- embedded table - Threats to features
- embedded table - Damage Occurrence to Features
- embedded table - Management Aims for Features
- link to Boundary Table for digitised boundary data

7. Select Person/Organisation Form. Also functions as Add/Delete, and Report control for people/orgs.
Fields: form with embedded table showing fields from Person/Org Table - no direct editing

8. Person/Organisation Detail Form
(N.B. This form has not been fully modelled in the accompanying application)
Fields:

- Name Key - auto-increment
- Name Type - drop-down list (Person/Organisation)
- Full Name - Name as required for printing out
- Org_Acronym - Short form of organisation name
- Org_Date_Founded - valid or vague date
- Org_Date_Ended - valid or vague date
- Pers_Title - could use a select list
- Pers_FName - First Name
- Pers_Inits - Initials
- Pers_SName - surname
- Pers_Hons - letters after name etc.
- Pers_Born - valid or vague date
- Pers_Died - valid or vague date
- Floreat - period during which person or organisation was most active - valid or vague range date
- Comment - free text e.g. memo

embedded table - Name at Address - link to Address Table
- embedded table - Comms Number (phone, fax, email etc.)

Extensions in 'Fat Recorder':
- embedded table - Name Relations (links people to people, people to orgs etc.)
- embedded table - Name Codes
- embedded table - Taxon Skills
- embedded table - Communications

9. Select Reference Form. Also functions as Add/Delete, and Report control for references
Fields: form with embedded table showing fields from Refs. Table - no direct editing

10. Reference Detail Form.
Fields:
- Publication Key - auto-increment
- Authors - text in format preferred for refs. (e.g. Copp C.J.T.)
- Date - valid date, year date or vague date
- Title - long text
- Publication_Type - drop-down list
- Serial Key - selection link to Serial table (implies an available dictionary listing journals etc.) otherwise this will be a text field for the Serial name.
- Volume
- Edition
- Serial_Part
- Serial_Number
- Serial_Supplement
- Symposium_Title
- Symposium_Editors
- Pages & Plates & Figures & Tables & Maps - numbers or text
- Publisher
- Place of Publication
- embedded table - Reference Numbers - link to Reference numbering systems (e.g. ISBN) needs a controlled terminology list.
- possibly also embedded table - publication keywords (not in the prototype)

11. Image Detail Form - includes stored image display
The prototype uses a very basic image 'module' which lacks most of the attributes and related tables defined in the Recorder Systems Analysis. This is, however, more akin to what amateur users would require. The design of the prototype has only allowed linking of images to sites but the application could be extended to link to other tables e.g. the taxon dictionary, survey events or taxon occurrence records.
- Image Key - auto-increment
- Title - free text
- Description - long text e.g. memo
- Image Type - drop-down list
- Date - valid or vague date
- Source - this might be a foreign key to a source table or a free text field.
- Image - either the actual image or the path to where the image is stored (depends on database implementation)

12. Add/Edit Taxon Occurrence
This would be the equivalent of a single species record entry in the current Recorder whereas most data entry is likely to be from card images or picklists. This form could also be used to add or inspect individual records in multi-record samples.

Fields:
- Taxon_Occurrence_Key - auto-increment

- Sample_key - foreign key to Samples Table and linked tables (Form would display Site Name, Grid Ref. for site and sample, Recorders - non editable)
- Record_Type - drop-down list either tree or context sensitive.
- Taxon_Key - foreign key to Taxon Dict (Form displays name and checklist used). The name chosen should be the original recorded name or first checked determination.
- Determined_By - original determiner - foreign key to Names or a free text field?
- substrate - drop-down list (only applicable to certain taxa - not used in prototype)
- Confidential - optional field for amateur naturalist use to flag records they do not wish to pass on. [In the national system confidentiality will be defined through the Dictionary]
- Check status - drop-down list [needs checking, correct, known incorrect]
- Comment - free text field for notes e.g. memo
- other fields: Each type of recording scheme will have its own attributes which are relevant to add to the taxon occurrence record. These may be held in a separate table as taxon-observations or included into the taxon occurrence table. For instance in the CCW Phase II Survey database fields for Domin and DAFOR values are included in the taxon occurrence table for convenience - see example in prototype application. Current Recorder has Sex, Stage, Number or population measure. [need to use lists derived from Recorder for terminology control]
- embedded table - taxon determinations. lists later redeterminations of this record but note that the original determination is always maintained in its own field above.
- optional part of the build could be to include a link to a taxon specimen table for naturalists wishing to work from collections (museum or trapped). embedded table - Taxon_Specimen. This has not been modelled in the prototype.

13. Add/Edit Biotope Occurrence

The biotope equivalent of the taxon record.

Fields:

- Biotope_Occurrence_Key - auto-increment
- Sample_key - foreign key to Samples Table and linked tables (Form would display Site Name, Grid Ref. for site and sample, Recorders - non editable)
- Biotope_Key - foreign key to Biotopes (Form would display biotope name and checklist)
- Determined-By - original determination - two fields in the biotope occurrence table - Name_Key and Det_Type.
- Biotope_Area & Units - valid number and choose units from list
- Comment - free text
- Checked status - drop-down list [needs checking, correct, known incorrect]
- Min. & Max. Veg. Ht & Units - valid numbers and pick units from list
- embedded table - biotope determinations. lists later redeterminations of this record but note that the original determination is always maintained in its own field above. Not in the prototype.
- other fields: May be in separate table Biotope_occurrence_Data or part of Biotope Occurrence table. In the prototype I have added Management and Grazers.

14. Add/Edit Admin. Area Link

Fields:

- Key - auto-increment
- Loc_Key - foreign key to site
- Admin_Key - foreign key to Admin Area

15. Add/Edit Site Status Link

Fields:

- Loc_Key - foreign key to site
- Desig_key - foreign key to status
- From & To - valid or vague dates
- Comment - free text

16. Add/Edit Site Code

Fields:

- Loc_Code_Key - auto-increment

- Loc_Key - foreign key to site
- Loc_Code - Code for the site
- Loc_Code_System - list or free text

17. Add/Edit People/Organisation Link

This could be used to link individuals to any table and attribute but in the prototype I have linked multiple-individuals only to the survey event and samples.

Fields:

- Key - auto-increment
- Survey_Event_Key - foreign key
- Sample_Key - foreign key if used
- Role - text or list
- From & To - valid or vague dates
- Comment - free text

18. Add/Edit Reference Link

This example shows how references (people or images) can be linked to any other table or attribute.

Fields:

- Reflink_Key - auto-increment
- Publication Key - foreign key to references (form can display ref. title, authors and date)
- Table_Name - table to link ref. to.
- FKey - Key to record in table selected (can display whatever fields are desired)

19. Add/Edit Image Link

Images can also be handled in the same way as references although in the paradox prototype they are only linked to sites.

Fields:

- Imagelink_Key - auto-increment
- Image Key - foreign key to Image (form can display titles and date)
- Table_Name - table to link ref. to.
- FKey - Key to record in table selected (can display whatever fields are desired)

20. Add/Edit Climate Link
21. Add/Edit Soil Link
22. Add/Edit Geology Link

The above link forms include only the following data fields:

- Loc_Key - foreign key to site
- Rock_Key, Soil_Key or Climate_Key - foreign key to relevant table
- Comment - free text

The actual link forms could display name and description from the chosen feature table or feature type.

23. Select Recording Card form

Fields: form with embedded table/list showing list of available recording cards - no direct editing

24. Recording Card Forms - as many as needed!

Not worked out in detail but see examples in accompanying application prototype.

25. Taxon occurrence determinations - further determinations form (not in accompanying prototype) Not in paradox prototype.

Fields:

- Determination_Key - auto-increment
- Taxon_Occurrence_Key - foreign key
- Specimen_Number - text
- Name_Key - foreign key to names or text entry (depends how implemented)
- Taxon_Key - foreign key to taxon dictionary
- Determination_Date - valid or vague date
- Determination_Type - pick from list (e.g. taxon revision, re-determination etc.)
- Comment - free text

- Reference - either text or key to reference link

26. Biotope occurrence determinations - further determinations form (not in accompanying prototype)
Fields:

- Biotope_Determination_Key - auto-increment
- Biotope_Occurrence_Key - foreign key
- Name_Key - foreign key to names or text entry (depends how implemented)
- Biotope_Key - foreign key to biotope dictionary
- Determination_Date - valid or vague date
- Determination_Type - pick from list (e.g. classification revision, re-determination, equivalent in another classification etc.)
- Comment - free text
- Reference - either text or key to reference link

Report Forms:

Details of these forms are not listed here as they are really part of the application programming but see the accompanying prototype for examples.

1. General Report Generator using check boxes, quick selection forms, quicken-style type boxes and drop-down lists for setting variables in selection procedure.
2. Special report Generator(s) e.g. statistical analysis and graphical output [Needs a bit of thought! - I have established a means of output to spreadsheets and Cornell condensed Format for vegetation analysis]
3. Query-by-Example - QBE functionality will be provided by supplied system tools but we may need a form based system for saving and retrieving saved queries.
4. Map-based Reports. - Retrieval of saved distribution maps?

Other Information Forms and selection forms (non-editable):

These forms are ideal for setting up using the tree window and associated data view window technique. The full attribute details for these forms have not yet been listed as their appearance will depend on the format of the dictionaries which we finally decide to supply but see the accompanying prototype for examples.

1. View Taxon Dictionary - Select and View taxon
2. View Biotope Dictionary - Select and View Biotopes
3. View Admin. Dictionary - Select and View Admin. Areas
4. View Geology
5. View Soils
6. View Climate

Application Management Forms:

Details of these forms are not listed here as they are really part of the application programming but see the accompanying prototype for examples.

1. Set Options Form - tabbed form for setting all application options from screen colour to taxon group for current session.
2. Import/Export Control Form(s)

Annex 5

References

Burnett J., Copp C. & Harding P 1995 *Biological Recording in the United Kingdom* 3 vols. prepared on behalf of the Coordinating Commission for Biological Recording. published by Department of the Environment. ISBN 1 85112 265 6

Copp C. 1996 *Local Record Centres,* A review commissioned by the Wildlife Trusts. unpublished report. Wildlife Trusts. Lincoln.