WORKING FOR A HEALTHY FUTURE

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CEFIC Long-Range Research Initiative HETRA Project A1.3, "Establish the framework and operating system for a CEFIC exposure database"

Phase 2: Extension project to further develop the CEMAS prototype and undertake user trials in the UK and Netherlands

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World Health Organisation
Collaborating Centre
For Occupational Health

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CEMAS – the Chemical Exposure Management and Assessment System - is a prototype exposure database system developed as part of the CEFIC Long-Range Research Initiative (LRI). The aim of the database is to enable organisations, particularly SMEs, to collect information relevant to the control of workplace risks in a manner that is both user-friendly and consistent with prevailing regulatory expectations. CEMAS can be used to capture and manage chemical exposure and risk assessment data together with associated contextual information. A standardized exposure data collection format will promote the sharing of information between interested parties.

A PC based prototype of the database system was developed in Microsoft Access™ with web-based HTML help and guidance information. User trials of the database were conducted in the UK and Netherlands from mid to late 2005. Other interested parties provided very useful additional comments. The results of the trials were predominantly positive and strongly supported the aims and intentions of the CEMAS project. Many suggestions for improvements and future additions to the data model, the functionality and interface of the database were raised and will be implemented in the next version of the software.

The work that has been undertaken to develop and test CEMAS has been relevant in preparing for REACH and in paving the way for a reliable advanced exposure assessment tool for higher tier risk assessments. It is proposed that following further development, CEMAS should be made freely available, via a managed hub website.

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CONTENTS

EXECUTIVE SUMMARY

CEMAS - the Chemical Exposure Management System - is a chemical exposure database system that is being developed with support from the European chemical industry through the CEFIC Long-Range Research Initiative (LRI).

This final project report presents the outcomes of an extension to the collaborative research project (HETRA Project A1.3) conducted jointly by the Institute of Occupational Medicine (IOM) Edinburgh, UK and the Institute for Risk Assessment Sciences (IRAS) at Utrecht University, Netherlands.

The major deliverables of the extension project are the prototype CEMAS database and the results of the user trials as reported here.

The aim of the database is to enable organisations (and particularly SMEs) to collect information that is relevant for the control of workplace risks in a manner that is both user-friendly and is consistent with prevailing regulatory expectations.

It is intended that CEMAS is used for the capture and management of chemical exposure and risk assessment data along with associated contextual information. A standardized format will promote the sharing of (appropriately anonymised) data and associated information between interested parties. As a repository for such information it will have a role in meeting many of the regulatory requirements of chemical producers and users, including responsible care, product stewardship and REACH obligations in relation to the management of exposure scenarios.

A PC based prototype of the database system has been developed in the Microsoft Access™ DBMS, Also HTML based help and guidance information has been made available with the database and from a project website.

The system is used to collect data about an organisation and workplace exposure assessments in three broad areas: (1) the organisation level, with data about premises, workplaces, processes, products, employees, jobs, and tasks; (2) through workplace risk assessments, using a control-banding approach, closely aligned to the UK COSHH Essentials approach; and (3), through the capture of detailed workplace exposure monitoring survey data and results.

This standardised core of exposure data is augmented with further contextual information, in order to further describe and explain the exposure data. The structure of the database is designed to facilitate the linkage of related exposure data between the three different levels throughout an organisation. As the bank of data is built up over time, it provide for more detailed analysis of exposure data throughout the organisation. Currently CEMAS stores inhalation and dermal exposure data for chemicals, but could be further adapted to include biological monitoring data.

The database was updated structurally and functionally, using recommendations from the former project. Structural aspects included the accommodation of several additional exposure data elements, recording multiple substances products in exposure risk (E-Risk) assessments, and changes for reporting and user help facilities. Functional changes to the routines and interface were made to incorporate these data items, and in adding further navigational and menu facilities, and the production of the Help and guidance system.

Suitably packaged with an installation routine the application was delivered on CD to trialists; and by e-mail to other interested parties, potential stakeholders in the chemical industry and other representatives from the wider occupational hygiene community.

User trials of the database were conducted in the UK and Netherlands from mid to late 2005. Initial structured interviews and training sessions in the use of CEMAS were conducted at trialists' premises. Standard recording forms were used to record interviews, user feedback and any problems encountered by users during the course of the trials. Follow-up interviews were done up to 12 weeks after initial use of CEMAS.

Other interested parties (several members of other research, chemical industry and Occupation Hygiene interest groups) provided less formal but very useful comments and suggestions.

The results of the user trials were predominantly positive and it was found that the results strongly underlined the aims and intentions of CEMAS and its implementation. The overall objectives and concept of CEMAS were very well received, positively supported, and encouraged by the majority of users.

The structure of CEMAS and the comprehensive data input possibilities were experienced as very substantial, covering a very wide spectrum of exposure related data collection, assessment and analysis, However, the corollary to this, that data capture was then potentially onerous and time consuming, was considered to be far less positive. At the same time most users understood that well described exposure data required this level of detail. The fact that CEMAS manages to link together the many aspects of chemical exposure assessment, management and analysis, into one single piece of software, was much appreciated by most users.

Considerable feedback was concerned with the layout and appearance of the software and some lack of elegance in the structuring and navigation of the user interface. Concerns and criticisms were raised in connection with the definitions of some data elements in the exposure survey data and the structuring of exposure sampling data.

Although some minor bugs were reported there were no significant software errors or failures that prevented or discouraged use of the system itself. A great deal of very useful constructive criticism of the current implementation was provided. Many suggestions for improvements and future additions to the data model, the functionality and interface of the database were raised and will be implemented in the next version.

The assessment of the user trials demonstrates that whilst there is scope for improvement in the presentation and ease of use of the database, the prototype as implemented provided very good coverage of exposure data and its related contextual information. Users were impressed with the comprehensiveness of the product. Although the broad scope of the application could be somewhat overwhelming for new users it is suggested that that this may be overcome by appropriate user training and improvements to the structure and layering of the user interface and help system.

A website www.cemas.info has been set up for the purposes of this project and subsequent developments.. Currently the site contains information about the project, and a version of the help and guidance material that was issued with CEMAS on CD. It is an aim to further develop the site to include: information on latest and further developments; discussions and downloadable copies of the latest version of CEMAS; related information on (and links to) exposure/risk management, good practice, occupational exposure databases more generally, data standards, etc. This would be pending discussions and agreements on the provision of a fully developed "Hub" website for CEMAS which may be determined by CEFIC LRI.

To date (May 2006) the database and results have been presented in sessions at two major OH forums in early 2006: the Dutch Occupational Hygiene Society (NVvA) and at the British Occupational Hygiene Society. In addition CD copies of the system were distributed freely to interested parties at both of these events. Copies of the system were also circulated to a wide range of potential users from the chemical industry, the occupational hygiene profession and several EU regulatory authorities through an e-mail "campaign". At a BOHS meeting to discuss the implications of REACH in Brussels (December 2005) the CEMAS software was demonstrated and CD copies made freely available to participants.

Whilst CEMAS developments have been taking place, researchers at the IOM and collaborators at other institutes in the EU have been developing other closely related chemical exposure concepts and tools. Amongst others, this has recently come together in the formulation of a draft proposal for an advanced exposure modeling tool that seeks to meet the needs of the higher-level tier of risk assessments appropriate to the needs of REACH. This proposes a generic exposure assessment tool that would provide scientifically justified and realistic exposure data. The model for the tool incorporates both a mechanistic model (including a Monte Carlo module) and an empirical part with information from an exposure database. The foundations of the exposure database would be provided by CEMAS. The two parts are to be combined using a Bayesian process in order to produce exposure estimates.

The work that has been undertaken to develop and test the prototype CEMAS has been crucial in preparing for REACH and in paving the way for a reliable Advanced Exposure Assessment Tool for higher tier risk assessments. Further work is necessary to consolidate these developments, but the way forward is now clear.

Beyond CEFIC and the chemical industry, CEMAS may be adapted for use by other industrial groups, by occupational/industrial hygienists and by researchers in the fields of exposure assessments and epidemiology. When made more widely available, users will be able employ the full application, or to make use of the standardised specifications, data definitions and conceptual framework of the database as a template for their own systems.
It is suggested that further development of the database should be supported to provide the following:

1. A freely available, common platform for the collection and management of exposure information by stakeholders in the industry, and other interested users.
2. A version of CEMAS that has a simple E-Risk interface which would be more appropriate for naïve SME users. (And in which it would be possible for their consultants who measure exposures in their plants to import the data into CEMAS for them.)
3. A data model and interface updated to incorporate functionality for REACH requirements, using the information and requirements now arising from the REACH Implementation Projects (RIP). This will accommodate key elements of Chemical Safety Assessments, Reports and Exposure Scenarios.
4. An acceptable solution to the sharing of confidential information, for which the most attractive approach is to use a trusted third party.
5. A development of formal exposure data interchange facilities, standards and procedures This would include the development and agreement within the Occupational Hygiene community, such as the OEDB groups, of XML based schema for a standard recognised core of exposure data, and suitable associated contextual information. These would be made freely available via the Internet.

It is proposed that CEMAS should ultimately be made freely available, via a managed hub website, to chemical companies, or other users of chemicals, who often lack suitable tools for the management of such exposure information.

1 INTRODUCTION

1.1 BACKGROUND TO THE CEMAS DEVELOPMENT

CEMAS - the Chemical Exposure Management System - is a chemical exposure database system that is being developed with support from the European chemical industry through the CEFIC Long-Range Research Initiative (LRI). The project is a joint venture between the Institute of Occupational Medicine (IOM) in Edinburgh and the Institute of Risk Assessment Sciences (IRAS) at the University of Utrecht.

This report presents a summary of the work carried out in an extension to CEFIC LRI project A1.3, to further develop and pilot the CEMAS database. The work of this extension project was accomplished in two main parts: the further development of the database application, based upon the findings and recommendations from the first phase; and the conduct of user trials to test and validate the database and provide feedback, suggestions and recommendations for its improvement.

Measurements of human exposure at work have long formed the cornerstone of risk management strategies. With the advent of powerful computer databases such measurements have been collected in disparate ways by industry, government agencies, researchers and consulting organisations. Despite discussions on the need for standardization in this area, there have been only limited attempts to co-ordinate these efforts, so that there is limited opportunity to share data between organisations. Also firm agreement is needed on which data and other contextual information should be collected and stored when measurements are made. For example, should records be made of the detail of the work activities being undertaken, the size of the workroom and the presence of localised ventilation, each being factors that may affect the measured exposure, and how should they be recorded?. Such information is often not systematically recorded when exposure measurements are made.

More recently the introduction of new EU legislation known as REACH (Registration, Evaluation and Authorisation of Chemicals) has led to even greater recognition of the need to collect chemical exposure data in a standardised format. This is one of the main purposes of CEMAS, which will ultimately be made freely available to chemical companies, particularly small and medium sized enterprises (SMEs).

These needs were recognised in the original commissioning of the CEMAS development project. The first phase of this project carried out fundamental database specification, modeling and implementation work. Throughout this work we have had a dialogue with potential users of the database and have used stakeholder consultations within CEFIC and research communities to establish the scope of the database. It used recommendations and data specifications for occupational exposure databases (OEDBs) provided by expert working parties in the USA and EU. Some limited trials on a CEMAS prototype were carried out with several CEFIC stakeholders in the earlier phase.

That earlier work was presented to the CEFIC LRI in a project report with accompanying detailed appendices describing the database specification, data model and initial interface implementation. We also made recommendations for the further development and enhancement of CEMAS. For completeness we have included several aspects of those earlier findings in the current report and appendices.

CEMAS records and relates (links together) chemical exposure data and information for three related areas of interest:

- firstly at organisation level including data about premises, workplaces, processes, products, employees, jobs, tasks;
- secondly in a step-by-step exposure risk assessment, using a control banding approach analogous to the UK COSHH Essentials approach (http://www.coshh-essentials.org.uk/);
- and thirdly for the capture and reporting of detailed workplace exposure surveys and related analytical results, recording inhalation and dermal exposure survey and sample data.

A crucial characteristic of the data model is that common attributes, shared between the three areas, are linked in the database. Also, in each of these areas several contextual items are included that help to describe or explain the exposure data, thereby lending more "intelligence" to the information. For example, information describing the circumstances of workers at the time of exposure sampling is linked to information about the workplaces and processes sampled, and products used.

The data items in the database include those recognised and documented as standard requirements for Workplace Exposure Data Recording and Industrial Hygiene Databases in the EU and USA. These specifications are supplemented by further items determined by the research team through research and stakeholder consultation. There was some recognition of data items that would be mandatory or optional.

For ease of development and implementation the tool is currently implemented in the Microsoft Access database format, providing a familiar Windows-based environment for the majority of users. It is supported with a series of Help files,
Further information on the project and copies of the web based guidance for the database can be accessed at the project website http://www.cemas.info.

1.2 ACCOUNTING FOR ONGOING CHANGES IN THE REGULATORY FRAMEWORK AND REACH

From the outset CEMAS was intended to be a tool to support the chemical industry's aim of being able to show demonstrable progress in the area of chemical safety assessment including: Product Stewardship, Responsible Care and Good Practice with regard to chemical exposure and its management. In the meantime the European Union (EU) white paper on Chemicals Policy has developed into REACH - Registration, Evaluation and Authorisation of Chemicals. This was approved by the European Parliament in December 2005. REACH has been described as the most important EU legislation for 20 years. It is expected that the legislation will come into force around April 2007, with a new European Chemicals Agency being fully operational 12 months later.

The proposed REACH legislation, and its practical requirements for companies, have been evolving whilst CEMAS was being developed and piloted in this project. At the time of writing work continues on the practical implications of the requirements, particularly in relation to exposure scenarios and their use. The regulations continue to be the subject of much debate with respect to both their utility (i.e. what can they or will they achieve?), and their expected impact on companies (eg added costs, administration, duties, better public relations, etc).

Given the timing it was unfortunately not feasible to prepare a system that would definitively meet the needs of REACH. However, considerable appreciation of the thrust of the nascent REACH implementation, and expectations for what constitutes exposure scenarios was held by

the researchers, the LRI project officer, and other industry contacts connected with the CEMAS project.

Within the project team it has been proposed that a generalised three-tiered approach to exposure assessment will be applicable for different companies and sectors that are to engage with the requirements of REACH. This moves from the simple screening approach, through the collection and analysis of more detailed exposure data (as in CEMAS), to advanced exposure modelling.

Whilst REACH does not yet explicitly identify the exposure information necessary to undertake a Chemical Safety Assessment (CSA), the recently completed Reach Implementation Project (RIP) 3.2-1 identified 18 approaches having the potential to evaluate workplace exposures under REACH. This RIP project concluded that a tiered (and iterative) approach to exposure assessment is required which should be centred upon industry and/or task specific exposure scenarios, and which should align with current practice for evaluating and managing workplace risks.

As far as can be anticipated at this stage CEMAS will be able to fulfill, and can be adapted to more closely align with, a significant role in assisting companies to meet current and future regulatory requirements. The inclusion of a control banding approach via E-Risk assessments (using the COSHH Essentials algorithm), the inclusion of relevant contextual information accompanying actual exposure data, and the ability to link key elements of these data together in the CEMAS data bank, further strengthen and enhance the potential for CEMAS to be developed and used in such a role.

1.3 THE GENERAL PROGRAM OF WORK FOR THE EXTENSION PROJECT

This report presents the results of an extension to the original CEFIC LRI HETRA Project A1.3. The extension project as proposed consisted of the following two main stages:

1. Finalise a “beta-plus” version of the database tool by incorporating features that have been identified in the Summer 02 pilot as being desirable and are not currently included in the database e.g. the addition of necessary help text.

2. Contact 10 companies from two CEFIC sector groups and undertake some fairly intensive usability trials. This would include visiting each company and spending time with the users discussing how they use the database and investigating features that are important to them. This work will help define which elements of the database should be considered as core (i.e. mandatory) and which would be outside the core. The output from this work would be a database that could be distributed to CEFIC members, although it would not be a fully “commercial” product.

2 CEMAS DATABASE DESIGN AND IMPLEMENTATION

2.1 FURTHER DEVELOPMENT AND IMPLEMENTATION OF THE PROTOTYPE DATABASE

This section of the report describes and documents the practical database implementation work of the project. Much of the practical foundation for this was laid in the earlier phase of the project. In the interests of completeness, and to allow the database documentation to "stand alone", updated versions of the relevant documentation have been produced in appendices to this report.

A key deliverable from the present phase of work was a more advanced prototype version of CEMAS to be used in the user trials, and which could subsequently be distributed to CEFIC members for evaluation purposes. Given resources available to the project, there were strict limits to the amount of software development and implementation fine tuning that could be carried out. The current exercise was intended to provide proof of concept (or otherwise) of the database– i.e. its contents and its functionality – but it was acknowledged that it would not yet be a fully "commercial" product. At a later date the database could be further developed and possibly implemented in other software or as a web based application.

The starting point for the current project was the version of CEMAS as delivered at the conclusion of the first phase, together with the recommendations for further work in the proposal to CEFIC. In summary, the proposed aims of the extension project were:

- Further identification of mandatory and optional exposure data items;
- Refinement of E-Risk assessment interfaces and further validation ;
- Improved data checking and validation;
- Development of customized menus/toolbars;
- Development of a help facility;
- Provision of summary reports;
- Appropriate layering of exposure data;
- Links to health and safety resources on the web;
- Consideration of coding schemes;
- Summary statistical analysis;

It was not feasible to pursue all of these items to completion and we prioritised actions to ensure that we met the primary objective of producing a sufficiently complete operating database for use in the formal user trials, whilst at the same time ensuring sufficient resources were available to the user trials. It was not possible to complete the last three items in the above list, although each was addressed to some extent.

2.2 DATABASE MODEL, SCHEMA AND DATA DICTIONARY – ADDITIONS, UPDATES AND DOCUMENTATION

In this phase the same operating principles that were used in Phase One were extended and applied. Those were expounded in detail in the final report to CEFIC.

A schematic of a generalized model of the use of CEMAS, as a flow chart, is shown in Figure 1. This shows that the system can be used to manage data in three key areas for a company, these being:

- To record basic information describing the Company and Premises and other fact about the workplace context;

- To undertake risk assessments (e-Risk Assessments) of a control banding type;
- To plan and undertake the collection of workplace exposure data to formally assess exposure.

A generalized overview of the different data components for these three key areas, and how they are related to one another, is shown in Figure 2. Although for simplicity shown separately here, much of the data in CEMAS is shared between the three key areas via related data items, and their operations. For example, although the addition of a workplace and its attributes are principally manifest at the Premises level, this can also be used by both the E-Risk or Exposure Survey modules for the addition or updating of workplace records, as required.

Figure 3 lists the main data subcomponents in the database. Again many of these are shared between the three main areas of interest. These links, or relations, between data items, and their expression in the CEMAS relational database model are described in more detail in the following sections and in the material presented in Appendix 1.

It is the ability to relate data between different items and different areas that gives the CEMAS database great potential for very powerful reporting and analysis, as the shared attributes can be retrieved and presented together. This means, for example, that ERA results for the substance toluene could be related and extracted together with more detailed exposure survey data for any workplaces and/or workers who have analytical results for toluene in their history. This becomes more significant as data is built up over time. A complex relational model has been rigorously designed and implemented to underpin the database, to allow for such linkage between these objects and the functionality layered on top of them.

The scope of the CEMAS database is very large, both in terms of data coverage, (via the resulting data model) and operating functionality. The application aims to meet the needs of two major groups of potential users: more generalist users from industry; who may go on to do exposure data capture; and the generally more detailed, in-depth needs of researchers or consultants in occupational hygiene or epidemiology recording detailed exposure data.

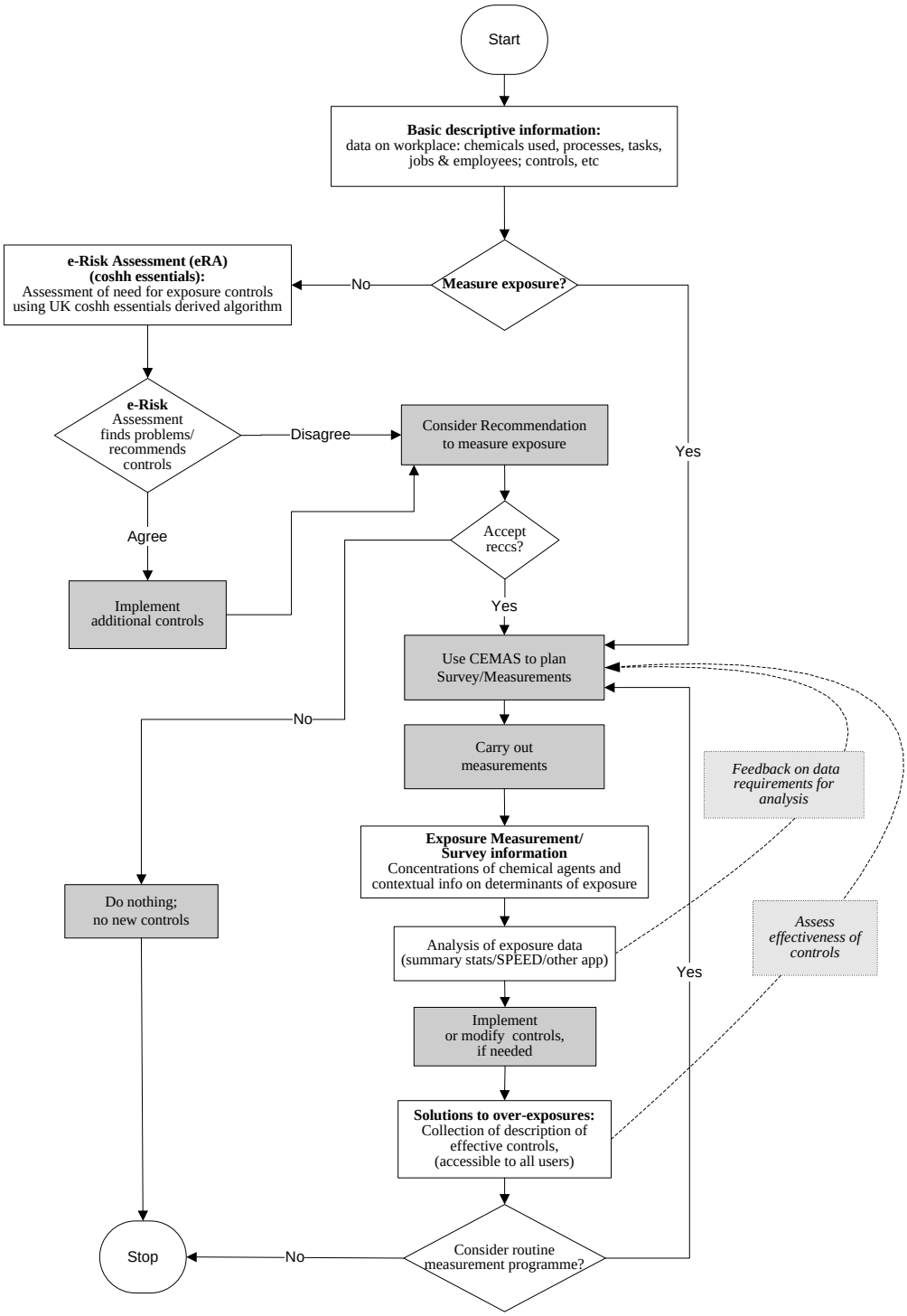

Figure 1: Schematic of main structures and process flows in proposed industry-wide occupational exposure database. (Arrows indicate the flow of data and information from the user via the main modules of the database. Text boxes represent collections of data (tables & queries); grey boxes represent user actions.

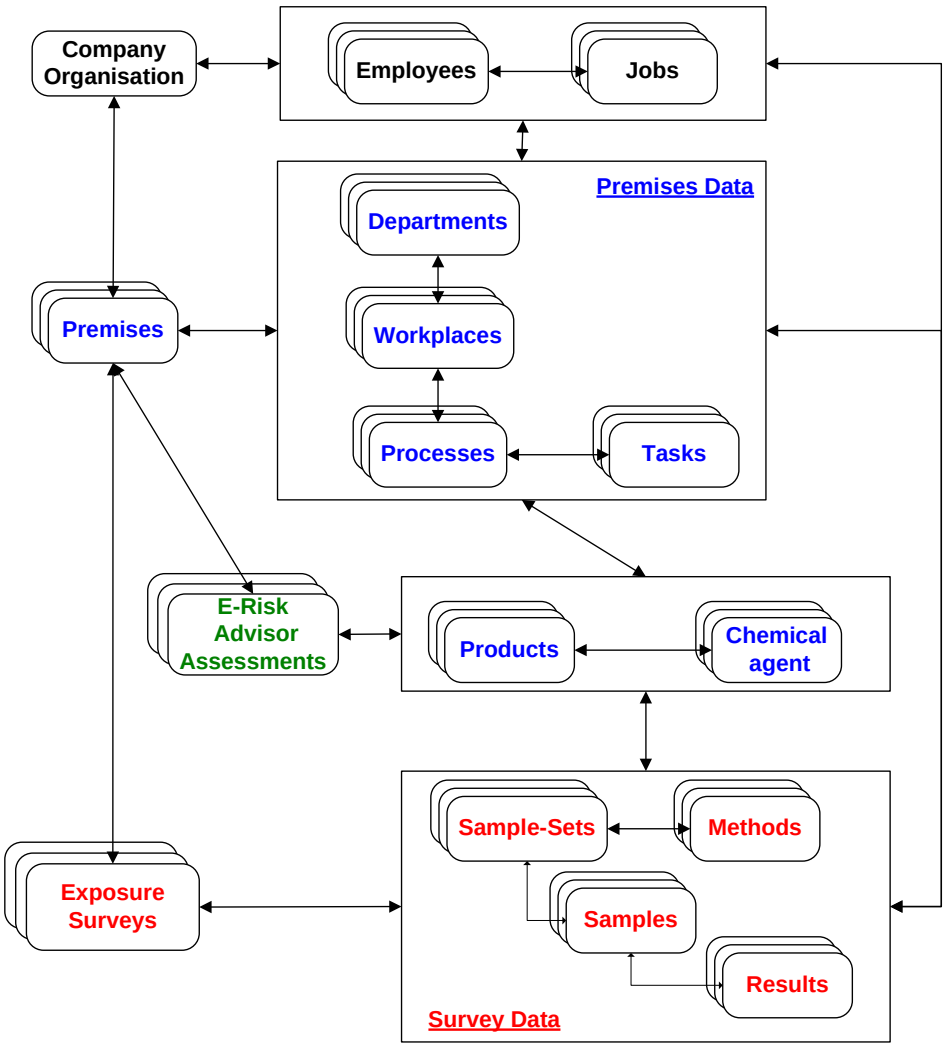

Figure 2: Key data areas and linked elements

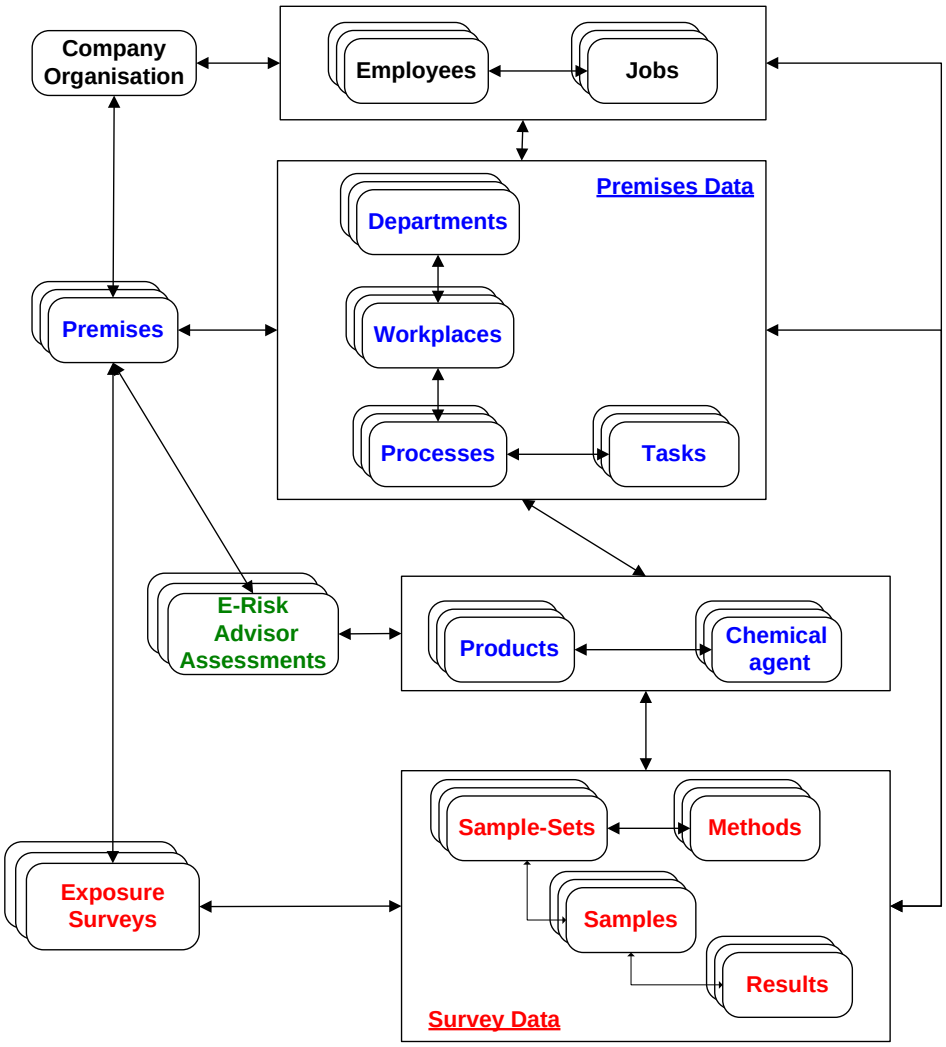

Figure 3: Summary of key data elements in CEMAS prototype database.

It is important that there is agreement and clarity on the terms and definitions used for the key entities in any exposure database including CEMAS. Where appropriate the terms and definitions used in CEMAS share the standards recommended by, firstly, the EU The European Foundation For The Improvement Of living and Working Conditions, Working Group on Exposure Registers In Europe (Rajan et al 1996), or secondly, those recommended by The joint ACGIH - AIHA Task Group on Occupational Exposure Databases (Lippmann et al 1996). The definitions of key items in the CEMAS database are given in Appendix 1, Table 1. A complete list of all data item in the database can be seen in the data dictionary in Appendix 1 Table 4. As is commonly found in the implementation of relational database schema, several key items or entities are broken down (decomposed) into more specific subcomponent entities for actual physical implementation in CEMAS.

Figure 4 shows a generalized view of the key elements as database entities and their relationships, at a conceptual level, prior to any necessary decomposition into sub-entities and attributes, as required by the full database model. The latter more detailed level is documented in Figures 1 to 4 in Appendix 1.

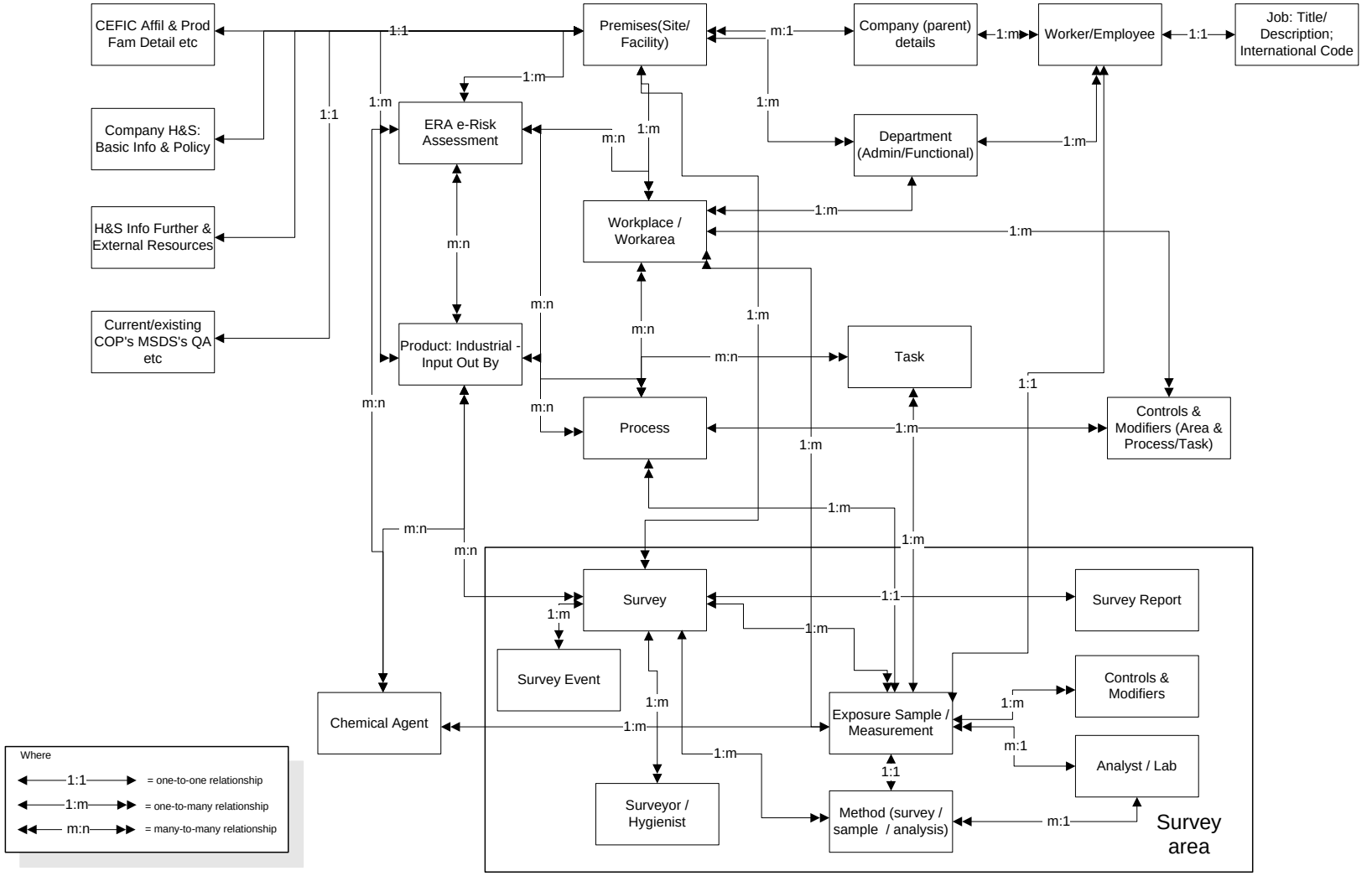

Figure 4: Overall CEMAS Relational Data Model - generalised view of key elements as database entities and relations between them

2.3 COMPANY/PREMISES DATA AND INTERFACE DEVELOPMENT

The data model for Company and Premises level data was modified to accommodate changes proposed and suggested from the first phase of our work, and other incremental adjustments that were identified as work progressed. Changes included the creation of additional objects and attributes for Products, Product risk phrases and Products Chemical ingredients. Several other pre-existing items were modified to improve their implementation and their relationships to other items.

The resulting generalised relational data model for the Company/Premises level data area is shown in Appendix 1, Figure 1.

Considerable functional adjustments and improvements were made to the programming of the interface to improve the functionality, linkage and communication between this and other areas of the database. For example, the ability to access and update Company and Premises items whilst operating in the ERA, or in the Exposure Survey modules was considerably enhanced.

The Help and Guidance materials for CEMAS demonstrate and document the interface and functionality in this module. These can be seen via the CEMAS help and Guidance files on the CEMAS site as follows:

Company	http://www.cemas.info/v2_1_help/company.htm
Premises	http://www.cemas.info/v2_1_help/premises.htm
Department	http://www.cemas.info/v2_1_help/html/department.htm
Process	http://www.cemas.info/v2_1_help/html/process.htm
Workplace	http://www.cemas.info/v2_1_help/html/workplace.htm
Jobs	http://www.cemas.info/v2_1_help/html/jobs.htm
Employees	http://www.cemas.info/v2_1_help/html/employees.htm

2.4 E-RISK ASSESSMENT (ERA) DATA AND INTERFACE DEVELOPMENT

In the first phase of the CEMAS project it was agreed that a version of a "control banding" approach to risk assessment would be incorporated into the database. The aim of this was to provide a "lighter" entry point for users, those less experienced with exposure data, particularly users in small and medium sided companies, so as to encourage uptake. The expectation was that this would then lead on to the capture of more detailed exposure data as experience and the requirements for more quantitative data grew. This approach is implemented in CEMAS as the E-Risk Assessment (ERA) module. It is based upon the principles of the UK COSHH Essentials approach (http://www.coshh-essentials.org.uk/) and uses the algorithm from that work.

The ERA approach was judged and assessed to be both appropriate and very useful in our earlier work. However that implementation version allowed only a single product to be recorded for each assessment. A primary task was to augment this to allow the addition of multiple products for each assessment. In order to accomplish this the ERA module received considerable attention in terms of alterations to the underlying data model, the interface and for reporting purposes. In general terms, for each product in turn, one or more risk phrases can be recorded (using data from the product safety data sheet), and one or more chemical ingredient can be recorded. The underlying screening routine was adjusted to assess and present each of these and the worst case amongst them to provide the appropriate control measures to be used as a result. Links were provided to direct the user to further information for the particular control approach advised.

The generalised relational data model for the ERA area of CEMAS is shown in Appendix 1 Figure 2.

A module was added to produce formatted reports for any given ERA. It also allows the selection of multiple ERA reports by selecting combinations of one or more criteria for ERAs, i.e. by Workplace, Process, Task, Product, Product-Ingredient (chemical agent), or any combination of these.

A brief overview of the ERA can be seen via the help and guidance materials for this component of the database at:

E-Risk Assessment	http://www.cemas.info/v2_1_help/E-Risk_advisor.htm
Data reports, output and export	http://www.cemas.info/v2_1_help/reports.htm

2.5 EXPOSURE SURVEY, SAMPLING LEVEL DATA AND INTERFACE DEVELOPMENT

In this phase of work the data model for exposure survey and sampling underwent considerable alteration at a detailed level to add additional data items, their attributes, and to account for the several different exposure sample types. The ability to track activity in more detail during sampling sessions was also added. Like ERA, better account was given to recording Products in Workplaces. Additional items were also added to record the extra parameters needed for dermal sampling and results. A generalised relational data model for this area is shown in Appendix 1 Figure 3.

Implementation at the Exposure Survey level was a large and complex process requiring the adaptation of existing data items, and the incorporation of many new ones, together with their modifying attributes and parameters. Considerable functional additions and adjustments were made at the Survey and Sample level in order to improve the linkage between the different areas, and to enable the addition of multiple samples whilst attempting to reduce data entry via the “sample-set” method of grouping data.

Basic data reporting facilities were also added. This allows the production of summaries of exposure surveys, samples and results. It is also possible to export data from exposure surveys in a number of formats to other packages for further analysis. Other survey results or reports pertaining to a survey, available in files external to the CEMAS database (eg Word or PDF reports delivered by an outsourced surveyor or analyst) may also be linked to the database records for that survey.

In introduction to this area can be seen via the CEMAS Help and Guidance files for Exposure Survey and Sampling as follows:

Exposure surveys	http://www.cemas.info/v2_1_help/html/exposure_surveys.htm
Sample sets	http://www.cemas.info/v2_1_help/html/sample-sets.htm
Samples and results	http://www.cemas.info/v2_1_help/html/sampresults.htm
Data reports, output and export	http://www.cemas.info/v2_1_help/reports.htm

2.6 GENERAL IMPLEMENTATION, NAVIGATION AND USER INTERFACE ASPECTS

The CEMAS database is implemented in the Access, using the Microsoft XP (2002) Office Developer Edition (ODE). This includes the ability to deliver the Access Runtime facility, so that the database can be installed and run by users, even where the Access XP application is not installed on the users computer.

On commencement of the latest phase of work the database was upgraded from Access 97 to the XP (2002) version to take advantage of new formats and features available in the later version. The relational data model was updated and implemented, via an iterative process, in Access data tables and lookup tables. These are listed in Appendix 1, tables 2 and 3.

There are currently 38 main data tables and 50 lookup tables. In CEMAS lookup tables are used to provide coding lists and descriptive labels for categorical variables via drop down boxes – they help to control and limit user input to appropriate and acceptable values.

For reference purposes the full data dictionary for all of the tables implemented in CEMAS is provided in Appendix 1 Table 4. This does not include system tables used for management of the user interface, reporting and other functions.

Overall, the majority of implementation work was expended on changes to the CEMAS user interface and on the production of the Help and Guidance information and its integration. The interface has been implemented using Access forms and reports, with custom written Visual Basic for Applications (VBA) routines used behind these for programming logic and to tie together and customise the user interface. This enabled user control, object interaction, calculations and many other management tasks for the database. Data checking and validation routines are controlled via VBA routines.

A main menu (shown in Figure 5 below) is provided, giving access to each of the main areas of CEMAS. Other menus and toolbars are provided throughout the application for screen and record navigation. All screens make use of “tooltips”, a facility where further information about a data field is displayed as the users mouse is hovered over the field. Customised CEMAS Help was available from each screen, by clicking Help on the toolbar, or via the F1 key.

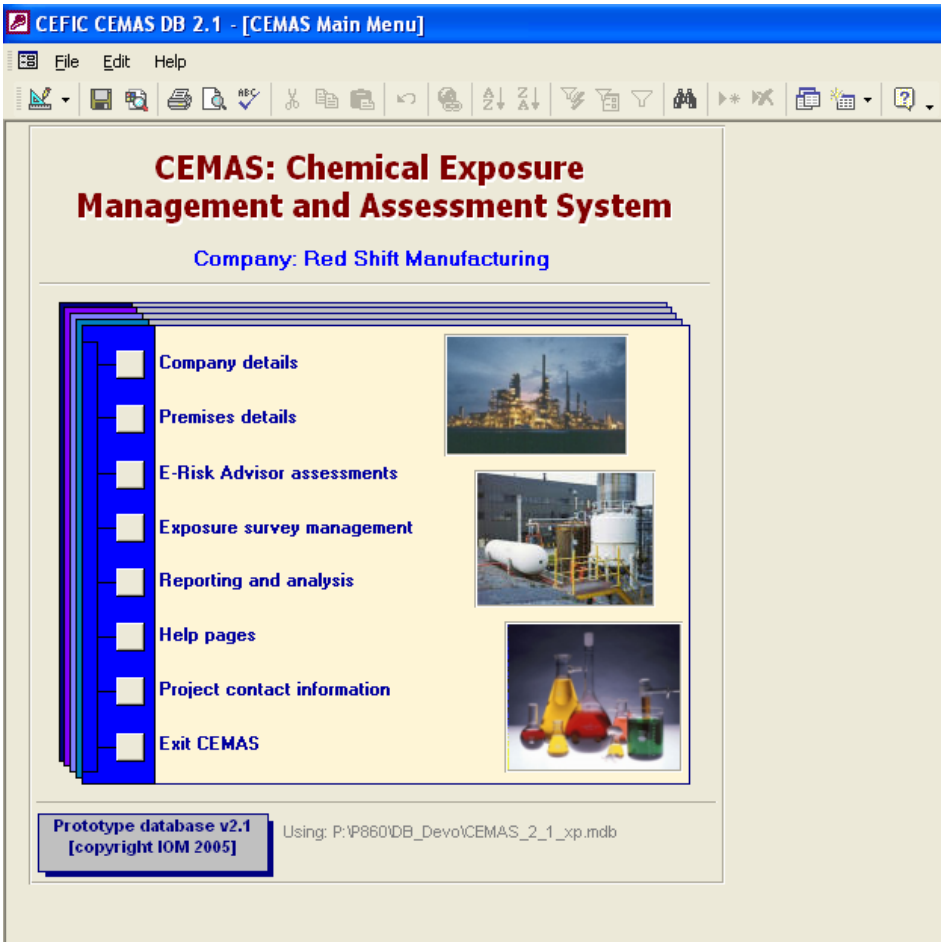

Figure 5: The main menu screen of the CEMAS application

In the interests of good standards and quality and to enhance the portability and future development of the database, all objects in the CEMAS database, and variables used in VBA have been named in a consistent manner using the standard Leszynski/Reddick Guidelines for Microsoft Access.

2.7 CEMAS HELP AND GUIDANCE INFORMATION

The production of Help and guidance information for CEMAS was a major part of the implementation work in the current project. Help files were produced for each screen, with text and screen shots. Other files with background information about the project and CEMAS more generally were also provided.
It was decided that, rather than using the Microsoft Windows Help-File format, supporting information would be produced in the ubiquitous HTML format, with some scripting incorporated to control navigation and menus. Using this format allows these files to be readily portable and accessed via any chosen Internet browser. They could thus be read independently of the database application if required, and also used for further website development.

Specific context sensitive help was available for each screen in the database via the toolbar, or the F1 key, Help could also be accessed as a whole unit from the main menu.
The Help files were bundled directly with the database on CD in the distribution package, and were therefore available on a standalone basis on the users computer - i.e. accessible without necessarily having a live internet connection.

The same help information was also made available on a project website (http://www.cemas.info). This source of information was especially useful for potential users who wanted to find further information on the project and an overview of how CEMAS operates.

The specific version of help, as implemented in the project can be accessed at http://www.cemas.info/v2_1_help. The CEMAS site can be updated and supplemented with aditional information about CEMAS and other related information on an ongoing basis, as required.

2.8 PACKAGING OF THE APPLICATION FOR DISTRIBUTION

On completion of the programming and implementation work the Microsoft ODE was used to combine all of the components of CEMAS and the help files into an installation package for distribution on CD to trialists and other users. The Access Runtime Files were included so that users who did not have or Access installed on their computer would be still able to install and run the CEMAS database.

3 CEMAS USER TRIALS

3.1 METHODS AND RECRUITMENT FOR THE TRIALS

We aimed to recruit ten companies, five each in the UK and the Netherlands, with the work split equally between the IOM (UK), and IRAS (NL). In the event it was possible to recruit two additional companies in the Netherlands (with one representative actually based in Norway) so that the trials are based upon the experiences of 12 health, safety and environment specialists, or other occupational and industrial hygiene professionals.

Recruitment aimed to concentrate on small and medium sized enterprises (SMEs, where small has up to 50 employees, and medium has 51 to 250 employees), since it was originally proposed that CEMAS would be of particular benefit to companies in these size sectors. However we also considered recruitment of larger organisations. After initial contact by phone, an information sheet was sent to potential recruits to provide more background to CEMAS. Pro-formas were developed to record in a standardised manner the information and feedback coming from the trials. These comprised:

- an initial interview and set-up recording form (available as Appendix 2)
- a trial log form, copies of which were left with users, to record faults/bugs, problems, suggestions etc, during the course of the trial (available as Appendix 3)
- a return interview and feedback recording sheet for completion at the end of the trial period. (available as Appendix 4)

Recruitment began in early February 2005. The actual user trials were carried out in the UK and the Netherlands from May until November 2005. Table 1 below lists the characteristics of the trialists.

Trialists were advised that as a prototype product CEMAS data should not be regarded as not be treated as “mission critical” or “production quality” at this stage. Users were reminded of this at the time of the first visit and interview.

Table 1: Location and general characteristics of volunteer trialists

Location	Type Of Company	Trialist's role	Number of employees
UK; North of England	UK, Specialist Chemical intermediates manufacturer. (chemical .user and intermediary producer)	R&D Chemist with HS&E responsibility	120 this site; 180 in UK
UK; Central Scotland	Multinational specialist metal components manufacturer for utilities and aerospace industries (chemical. user)	H&S advisor for plant	260 this site; 1000+ worldwide
UK; Central Scotland	International specialist food products and packaging (chemical. user)	H&S manager specialist	560 this site; 8500 worldwide
UK; E Scotland	Pipe and metal assemblers for utilities and energy (chemical. user)	H&S manager	400 this site; c2000 worldwide
UK; E Scotland	Large educational inst. (specialist small production processes involving hazardous chemical) (Chemical user)	H&S manager	380 this site only
NL: East	OH-service support: printing brochures (Chemical user)	Support H&S manager	50 at site
NL; West	Multinational, manufacturer. of basic chemical primary products (chemical. user and producer)	European H&S manager	10.000+ worldwide
NL: South	OH-service support: styrene polymerisation (chemical. user)	Support H&S manager	SME < 50
NL: South	OH-service support: internal use for trial purposes	Occupational Hygienist	
NL; West	OH-service support: internal use for trial purposes	Occupational Hygienist	
Norway	Hospital & petrochemical company (Chemical producer and user)	Occupational Hygienist	National 4000, worldwide 10.000+
NL: South	OH-service support: manufacture. of glass paints (Chemical user)	Support Health &Safety manager	190, 1 site

It proved difficult to recruit suitable SMEs for the trial and out of the twelve organisations only two had less than 100 employees. This was partly due to the inherent difficulty in getting SMEs to participate in this type of trial and partly because many of the SMEs approached to help with the project did not see the relevance to their operations.

Following recruitment the researcher visited the user site for an agreed appointment. Users were interviewed about their role(s) and experience with exposure data. A copy of the CEMAS software was installed on their personal computer and they were then introduced to the system through a tutorial and walkthrough of the software given by the visiting researcher. The volunteers were free to use CEMAS as frequently as they wanted for a period ranging between 6 to 12 weeks. The exact period varied between users, depending on their availability and other commitments within their companies. Users were issued with several Trial Log Forms, and contact details of the researcher from whom they could seek assistance if required.

Following the trial period a return visit was arranged. The trialists experience and feedback was gathered by means of a review interview that was recorded on the standard form.. Any completed trial log sheets were collected also. At all stages users were encouraged to comment on the software and to suggest where improvements and extensions could be made.

3.2 OTHER CONTACTS RECEIVING CEMAS

Several other interested users were provided with copies of the database to evaluate. Over the same period as the formal trials were conducted another 11 copies of the CEMAS software were distributed by post or e-mail for more general and informal appraisal by occupational hygienists in several countries (Canada, Australia, USA, Ireland, Denmark). They were previously aware of the CEMAS project and had expressed an interest in testing and evaluating the product in more general terms than the formal user trials. These users were provided with a short, summary feedback form to complete and return to the project team at their convenience. They provided comments on the database through e-mail responses to the project team.

In November 2005, through contact with the CEFIC LRI Project officer, another 19 CD copies were requested for appraisal by various representatives of the EU chemical industry, the occupational hygiene profession or regulatory bodies in EU states. Each had expressed a desire to evaluate the software. Feedback was requested after a month of use, and a reminder dispatched after 8 weeks. A written response to this request was forthcoming from just two users.

In December 2005 during a workshop on REACH in Brussels attention was also given to CEMAS by means of a presentation, where attendees could get further information and a demonstration of the software. On this occasion 36 CDs were distributed together with background information about the project. Users were reminded to provide feedback after ten weeks: verbal feedback was later received from three of these attendees.

3.3 OTHER PRESENTATIONS OF CEMAS

CEMAS was presented at the annual conference of the Dutch Occupational Hygiene Association (NVvA), March 2006. A 90 minute session containing 4 related presentations was given. This gave the opportunity to describe and showcase the CEMAS project, from the first steps through to this latter phase. This covered: the background to and reasons for the CEMAS development; the design and implementation of the database, with live software demonstration; the results of the user trials; and the potential for future developments and use of CEMAS, particularly its role in relation to REACH. In addition 40 copies of CEMAS on CD were distributed at this conference.

CEMAS was also presented in a 20 minute paper to the British Occupational Hygiene Society (BOHS) annual conference in April 2006, with approximately 80-100 attendees. The database was also demonstrated outside of this session and CD copies were distributed to 15 people.

4 USER TRIAL RESULTS: FEEDBACK, QUALITATIVE ASSESSMENT AND COMMENTARY

This section summarizes the outcomes of the user trials that were conducted to test and evaluate the CEMAS prototype software and its acceptance or otherwise by users "in the field". The key findings are summarized below. They have been aggregated from the structured qualitative feedback collected by the site visit interviews. This section also incorporates information from the other recording forms collected. It includes suggestions for amendments, additions, items for removal, and other improvements to the software. Other pertinent comments and observations gathered by phone or e-mail conversations are also recorded in the relevant section. Specific results are accompanied by some commentary from the authors where appropriate. Commentary is highlighted in italics.

Appendix 5 contains a fuller listing of the comments and feedback from the user trial recording sheets.

4.1 INSTALLATION OF THE SOFTWARE

All participants in the trial had a version of Microsoft Windows™ installed on their office computer. This was either Windows 2000 or XP. Most systems were configured as desktop computer using a personal version of the MS Office™ software. Access was not always included in the Office software. In some cases the Office software was run from an external server. Unlike the Windows versions, in several cases MS Office was an older version (from Office '97 onwards). In the UK the Office was generally a more recent version (one user of Office 2000 and four users Office XP).

For users with older versions of Office, i.e. prior to XP, the Access runtime module on the CEMAS CD needed to be installed. In most cases the installation of CEMAS was carried out easily and without problems. In three out of 12 cases some installation problems were encountered:

- Due to security restrictions by the system administrator the runtime module was not permitted and therefore not installed. No errors were shown during the installation of CEMAS but the startup of the program stagnated due to Windows security settings.
    - *This is dependant on local security policies and may be faced by any application installation. Approval and permissions of system administrators is necessary for the Access runtime to be installed.*

- Access Runtime and CEMAS were installed without problems but since Access was run from an external server the runtime module (that was locally installed) wasn't detected and CEMAS couldn't be opened by the older version of Access.
    - *Better path and shortcut control could be built in with an improved 3rd party (ie non Microsoft) installer being used for subsequent versions.*

- A system administrator who tried to install CEMAS as a network version (restrictions to local installation and the need for multiple employees to try CEMAS) faced the problem that the runtime module overruled the previous Access version resulting in older Access files that couldn't be opened with the newer version of Access.
    - *The Office Developer Edition packager/installer is relatively unsophisticated and poor at version control. If Access continues to be used for CEMAS development then a better (say the Wyse or Installshield) installer and*

accessory scripts for Access Runtime that have more "intelligence" and control should be used.

Finally all participants had a working version of CEMAS on their office or notebook computer. In all cases CEMAS functioned well once it was installed. Help pages connected to the software and through the users' standard web browser ran fluently.

Once in operation the software continued to run well over the course of the trial with no reports of errors or bugs that caused the system to stop, fail or hang. Just two trapped (ie handled without aborting the system) errors, (caused by a data type mismatch in the menus and opening of forms) were reported by one user.

For future development purposes the use of a web-based system hosted on a controlled server would alleviate many of these problems as well as allowing central version updates, security and control. Depending on the implementation strategy chosen, the down side of this may be a less functionally rich user interface environment.

4.2 GENERAL CONCEPT AND STRUCTURE OF CEMAS

The concept of the database, its aims and intentions, and its overall structure was introduced to the users following installation in the introductory training session using the demonstration data and the help files. The aims, intentions and main components of the database and how they were related were demonstrated and discussed with the user.

In general the concept of CEMAS being a database system in which premises data, exposure data and risk assessment data are comprehended in one single piece of software is much appreciated.

In the UK interviews, after being first introduced to the software, all users were very enthusiastic about the ability to build up a bank of related exposure and contextual data that would, particularly over time, give the ability to report or analyse data by many different factors or criteria. For example, two of the trialists with analogous roles and workplace situations could see that such a tool could replace their tedious current requirement to manually link existing portions of exposure data that existed in three locations: a paper report; another part in a Word document; and the detailed results in an Excel spreadsheet. The ability to have good links to other existing, though functionally distinct, health and safety systems were raised as very important functions to consider at this point.

In the Dutch situation trialists were also very optimistic about CEMAS as a single all-purpose tool. Some hygienists working for OH-services appeared to be struggling with the integration of relevant exposure data in one system. They immediately used CEMAS to test it for this purpose.

4.3 USE OF STANDARD DEFINITIONS

Despite definitions being available in the help files some terms are not sufficiently explicit or unambiguous enough for some users. The prime example was users who experienced difficulties with the term "Department". Although defined as a functional or managerial element, this term was still sometimes also interpreted as physical (as a workplace or geographical location), and hence became confused with "workplace" for these users.

- *The use of some terms (particularly department and workplace) needs to be clarified and/or reinforced through enhanced help or training. Key terms are defined in the Help function. However "Department" appears to be*

particularly prone to misinterpretation in UK and NL. A separate help page of definitions of terms for CEMAS would be useful.

In contrast a UK user described the use of Department as defined by the database as "very good, easy to understand"; and Process details as "good, easy to understand and to add details for". Some of this confusion or ambiguity may be explained by the fact that Dutch users reported some difficulties with English, and this is likely to be compounded when there are very specific meanings attributed to data items in CEMAS (or similar niche applications). In any case, multinational users and languages will need to be accommodated in order to help make CEMAS more widely adopted.

4.4 GENERAL STRUCTURE OF THE DATABASE AND USER NAVIGATION

Mixed reactions were experienced here: in very general terms UK users found the structure of the application fairly complex initially. However given the nature of the database and its intentions, they came to understand the complexity and the reasons for it, as they practiced with it.

The layout of individual screens was found to be acceptable, but there were too many similar screens that could be confused with each other, and that could be open concurrently, increasing the tendency for users to lose track of their location. Some Dutch users found maneuvering through different screens a bit disorderly, and the use of pop-up windows overlying the previous screen was sometimes experienced as disconcerting.

- *The use of color coding could distinguish different portions or layers of the application. The interface should be more "task focused" with more effective closing or hiding of inactive components. A more effective indication or "signposting" of the current position within the overall structure of the model was suggested, akin to "breadcrumb trails" found in many web sites these days.*
- *As opposed to the open, tabbed interface, better menus should be used to navigate to separate screens for these items.*

4.5 EXISTING EXAMPLE DATA

The **'**preset' example data, for a company with two Premises, which was provided with CEMAS, was useful as a demonstration to most users. However it was not always appreciated that new premises should be added for users' new data: some users didn't distinguish the example from their own data and entered their own data as part of the example. This did not invalidate the data *per se* but it did demonstrate that the partitioning of Company and Premises data needs to be clarified and protected from incorrect attribution and accidental updating. It was suggested that from a confidentiality point of view, for consultants with data collection for multiple organisations, compartmentalise discrete units of data for secure access and read/write status.

- *Even though it is distinguished in the help and training there needs to be clearer sign posting on the overall structure of the database and some improved partitioning of existing/demonstration data*
- *Improved introductory training and diagrams of the overall aims and structure should be provided.*
- *Implement better read and write control over existing and new data in any case – this would help general awareness as well as help prevent accidental data overwrites or unintended attribution of data to the incorrect premises*

- *If CEMAS was to be used by consultants, partition the database to compartmentalise data from multiple companies. This would also better accommodate security schemes required for future versions*
- *Better more realistic set of example data would improve testing*

4.6 CONFIDENTIALITY

Since one of the aims of CEMAS is to eventually exchange information between different companies and upstream or downstream users, data sharing is foreseen. Some users were very cautious on this, raising potentially sensitive confidentiality issues. As demonstrated there is no real application security in the current prototype, and only operating systems permissions could be used to restrict access.

- *Some basic security should be included in any case for each particular company.*
- *In case of transferring datasets they will definitely have to be anonymised. Transfers of such datasets may need to be mediated through a trusted third party, eg a trade association of other independent broker.*

4.7 SEARCH FUNCTION AND CRITERIA SELECTION

The search function for several standardized lists provided were found to be useful, particularly appreciated was that for industrial codes and chemical substances, and the ability to select criteria for reports.

4.8 HELP SYSTEM

Some users did not appreciate that help on specific screens was available from the help menu item for a particular screen, although this feature was demonstrated in the initial introductory session.

Help was produced in simple web browser files within the scope of the system, depending on the platform used. For the next version help may be provided in different ways, but should be more generally searchable. The content of the help files was found to be useful however. No specific problems were reported in the actual use of help.

4.9 DATA INPUT: ADDING USER DATA

The possibilities to add user data to CEMAS were described as “nearly infinite” in some parts of the model by some volunteers. Whilst some more experienced users could see a use for this, for others it was experienced as somewhat overwhelming and off-putting to some. It was stressed by the demonstrators that a substantial portion of data fields were optional: it was suggested that further coding of items (for drop-downs etc) should be made more flexible, and these lists made updateable by the user.

Through introductory training users appreciated that over time an appreciable bank of data could be built up and used for reporting and analysis. All of the UK testers appreciated that an initial investment in time to enter the initial baseline data, and some detailed exposure data, would provide a very useful resource, which could then be updated periodically. But they were concerned about their ability to find that initial resource. On the other hand three UK users stated that in adopting other Health and Safety computer systems in their companies in the past the same problem occurred: any candidate systems would need to be evaluated and justified for purchase or adoption in any case. This would be the case with CEMAS or other tools to be adopted for responsible management, say for new REACH obligations. Besides purchase costs

they would need to consider other start up costs and the return on investment over time. Besides just monetary aspects, return on investment must be appreciated also in terms of greater and more demonstrable responsible care and product stewardship, and more valuable in terms of safety and good practice for the workforce and the company as a whole.

4.10 COMPANY AND PREMISES LEVEL DATA

It was suggested that the most important mandatory fields be marked or highlighted so that users with limited time could skip fields of a lower importance. Furthermore it was suggested that further/better validation be carried out so that the users could continue only after required mandatory fields were completed.

Adding premises details concerning CEFIC affiliation in some cases led to confusion. A Dutch occupational hygienist working for a large chemical company experienced some difficulties about CEFIC coding.

- *Coding is intended for the proposed later aggregation of data across the sectors and groups as provided by CEFIC. They serve as an example of industry particular groups. Other groups or sectors could also apply: it is expected that these examples would be adapted or replaced with other sub-groups as relevant, as recognised by the chemical or other industry company or sector using CEMAS.*

4.11 EXPOSURE SURVEY MANAGEMENT

Despite instruction and explanations several users were not comfortable with the interplay between sample sets and the different exposure types. The different layers of data were only appreciated through instruction and considerable use. Several users appreciated that the method could cut down on repeated data entry, but despite this thought that a simpler tabular format ("a bit more spreadsheet like"), even though it involved more repetition of entry would be more comfortable and re-assuring. The screens could also be made more recognizable so that users are aware of what part of the model they are in.

The link between different departments or workplaces and the collected exposure data from those places is not always clear enough. As in the company and Premises level data "department" as a functional or administrative term and a geographical "workplace" location as used in CEMAS are not sufficiently familiar or distinguishable for some users.

Although some linkage and definitions raised difficulties, data coverage overall was reported to be good. The concept or ability to link data across time was appreciated but is not really demonstrable with the demonstration data in the prototype: it needs more enhancement and instruction to be used correctly in practice in future.

Linkage to other reports on exposure surveys was much appreciated. The concept of worker tracking (which was presented firmly as a prototype feature in the software) was judged to be useful or potentially very useful, but also to be very labour intensive to record in its current manifestation.

For exposure survey data the modifications suggested above can be feasibly accommodated by modifications and adaptations to the data model and interface to the system. As before, the tabbed interface may be substituted with better menus and separate screens, helping to shield the user from some complexity.

4.12 ERA - E-RISK ASSESSMENTS

E-Risk was generally accepted and highly appreciated by the UK users – they were familiar with the concept and liked the ability to store such assessments in one place, and linked to other background data. They agreed it was a useful entry point to risk and exposure assessment, especially for less experienced, more naïve users.

Some doubt was still expressed over whether a control banding / COSHH Essentials type approach was appropriate be used in practice in any case, as a mater of principle. As expected this was more prevalent in the Dutch situation where COSHH Essentials is not generally known. The E-Risk assessment was therefore a relatively new approach for
Dutch users.

E-Risk reporting was found to be useful in selecting ERA reports by one or more criteria so as to pick out certain types – for instance by Workplace, by substance etc, and then to be able to see the reports side-by-side.

For one particular UK trialist (in chemical manufacturing), whilst the basic E-Risk model was appreciated, strong suggestions were made that E-Risk should be augmented to make it more appropriate for manufacturing processes: additional to the basic COSHH Essentials approach it should have the capacity to record more detailed factors. For example special containment and personal protective equipment (PPE) use on the Job or Process– where PPE should be allocated to each raw material handled/used, and each of the manufacturing "steps" need to accommodate facts on special handling or containment measures.

In the UK and Netherlands several users questioned the "authority", jurisdiction and validity of the E-Risk assessment, in relation to the existing COSHH Essentials and also in relation to its recognition by any regulatory authority: would it be approved or endorsed by the HSE or another EU regulatory body as a valid assessment that could be used to assess risk for their workforce?

Output of ERA (and all other) reports in other formats, such as RTF or PDF files, would be desirable in an updated version of CEMAS

4.13 OUTPUT: REPORTING AND ANALYSIS

Only limited feedback on these aspects of CEMAS was received. In general the limited reporting that was included was favourably received but was commented on as being somewhat inflexible. The output module was the last added and had relatively small resources devoted to it. Further development in the next version of CEMAS is therefore needed.

Several users reported that they would like the system to be able to import/export or otherwise link to other exposure data related systems. Exporting to practical tools that are in use by many (Dutch) occupational hygienists, for instance IH-stat or HYGIENIST, would be useful. The same is true for import options from Excel or other spreadsheet based programs or interchange functions.

- *It was discussed with several UK users that recent xml based file formats and related technology could be developed and used to exploit this in next stages of development.*

4.14 FEEDBACK FROM OTHER CONTACTS

Following reminders, 8 out of the 11 users supplied with a copy of CEMAS produced at least some feedback. These were from a different perspective to the formal trials as in general they had not tested the database through extensive use, and their observations, predominantly provided by e-mail, were of a more general nature. These comments were overwhelmingly positive in favor of the aims and intentions of the database, the general concepts and model used, and the implementation of the database, where the latter was sufficiently well inspected.

Most issues for these contributors were to do with the principle of use of the E-Risk Assessment model as a control banding approach, and its appropriateness and usefulness, reflecting a more general debate that is taking place in the exposure risk assessment field. On the other hand, several users commended this approach, agreeing with the principle of allowing access to less experienced exposure data users. Very largely these comments echoed the views of the trialists and they have been incorporated into the results in the appendices and the more general discussion.

5 DISCUSSION

5.1 INTRODUCTION

The collection of occupational exposure data is becoming increasingly important. It is relevant for companies wishing to demonstrate to the outside world that they comply with the best standards - both within their own processes and, if they manufacture chemicals, amongst the ultimate users of these products. The introduction of the REACH regulatory regime will require companies to have access to appropriate human exposure data. The only viable way of making this data accessible and available is through some form of computerized database.

For maximum effectiveness it is not sufficient that users just collect and store data in a database, they must collect the same range of data items and the definition of these data items should be uniform and unambiguous. This common format is essential if data are to be shared between organizations (for example, up and down the supply chain), or pooled together for aggregate reporting (for example, by a trade association representing a range of manufacturers and users). This can be facilitated by a single database or by a common standard for data exchange. We envisage that making CEMAS freely available will promote the sharing of data and it could be promoted as a common data exchange standard.

The value of occupational exposure data is greatly enhanced when it is combined with appropriate contextual information; for example in relation to the work activities undertaken, the environment where the process is carried out, and other factors that will determine the exposure. CEMAS has been designed to incorporate a broad range of contextual data that is known to explain the exposures that people experience. We are confident that the value of the complete data set that would be stored in CEMAS is an excellent basis for understanding the exposure measurements and for generalization of trends or patterns in exposure between sites or chemicals.

We believe that the inclusion of the E-Risk module, based on the UK COSHH Essentials control banding system, was conceived as an important way of making the database attractive to users, particularly SMEs. However, this module also allows users to collect relevant descriptive data related to exposure even if there are no intentions to collect actual exposure measurements. This data can then be shared, perhaps again with a trade association who are concerned to identify the extent (prevalence) of exposure to a specific chemical.

5.2 USER TRIALS

The present version of CEMAS has been improved since the original prototype and the limited user trials have provided helpful feedback from a range of work environments. Overall, the user experience with CEMAS was largely positive. Some minor bugs arose during use but these did not stop operation of the trials in any way - no actual software errors were reported that prevented CEMAS from being operated thoroughly. In some cases minor difficulties occurred during the installation of the software, mostly originating from local security settings or restrictions on the company system. These problems are to be expected at this stage of the database development.

The concept of CEMAS providing a single package for accessing a complete spectrum of exposure data collection and management was much appreciated. Suggestions for improvements mainly focused on the handling of exposure data, import and export functions and more generally on navigation and layout of the software. Most of these comments however were

foreseen since most development effort for this prototype had been put in the conceptual and technical features of CEMAS.

In the UK, the E-Risk module, its relationship to COSHH Essentials, and its linkage with other related contextual and/or exposure data was seen as a very powerful concept. The Dutch trialists were more hesitant, having less familiarity and, for some, some reservations about the value of COSHH Essentials. However, there was an appreciation that where "control banding" assessments were undertaken the ability to link to other related data was helpful. It is clear that for some users the E-Risk module will be more important than the fact that the database is a repository for exposure measurements. This is still useful and for the further development of CEMAS there should be some consideration given to providing a simpler user interface based on the E-Risk algorithm.

In parallel with the user trials, several of the practicalities of REACH were still being discussed, in particular the procedures and data requirements of "exposure scenarios". Even while this was still a "live" issue, for several of the trial users, and for many of the other industrial and regulatory representatives contacted, it was perceived that CEMAS could be a significant component in a range of information management tools. These tools would be needed by chemical user companies to help with health and safety governance and to meet their REACH obligations. It is strongly suggested that as these REACH requirements are finalized, the CEMAS database should where necessary be adapted and augmented to incorporate any additional requisite data items or functions for this role. CEMAS is in a fairly unique position to fulfill the likely occupational exposure data management role needed for REACH.

An important aspect of data sharing will be confidentiality of information, and this was a concern raised by some during our user trial. We can see a number of possible solutions to this problem, but the most attractive approach is to use a trusted third party to mediate the sharing. This approach has advantages in that they can ensure that any information that might identify the donor is removed before it is shared, but they can also serve as a arbitrator of the data quality.

Work should be undertaken to develop the existing Occupational Exposure Data standards into freely available XML based formats for the definition and interchange of data. This would greatly enhance the ability of disparate systems to collect and exchange exposure information.

5.3 AN ADVANCED TOOL FOR REACH

In parallel with the development of CEMAS we have been in dialogue with other human exposure scientists in Europe to discuss the best strategy for higher tier exposure assessments under REACH. The concept for an Advanced Exposure Assessment Tool was discussed at a two-day workshop in Zeist, the Netherlands during May 2006. Participants from IOM, IRAS, the UK Health and Safety Laboratory, BAUA in Germany, AMI in Denmark, ArboUnie in the Netherlands and TNO reached a clear consensus with respect to the usefulness and feasibility of such a tool, and it was believed that it would provide an important improvement in accuracy and precision for regulatory exposure assessments. A key element of this advanced tool was the development of CEMAS to hold exposure data that could be incorporated into risk assessments.

The proposed new framework incorporates both a mechanistic model with a Monte Carlo module to produce probabilistic exposure estimates and an empirical part with information from an exposure database (CEMAS). Data from both parts are to be combined using a Bayesian process in order to produce exposure estimates for specific scenarios relevant to the REACH process. It is recognised that it is important for the reliability and credibility of the tool that it

incorporates exposure data and that CEMAS is the best candidate database for this purpose. We plan to take forward these proposals for further discussion with stakeholders.

5.4 THE WAY FORWARD

Further formal software implementation work should follow this to provide the freely available database application as advocated in the original proposal for this work. This may be continuation of the current model in Access, as a client-server system, or as a web based system. Although the latter seems the obvious direction to take, the pros and cons of these approaches should be considered before commencing the next stage and these should be discussed with key stakeholders to ensure that the ultimate software implementation meets their needs.
In broad terms it was generally agreed that the current prototype would be unsuitable for use by the naive SME user who had limited background and experience in handling or analyzing exposure data. The main users for CEMAS are likely to be those who collect moderate amounts of exposure data, i.e. health and safety professionals. We believe that a version of the CEMAS that had a simple E-Risk interface would be more appropriate for SME users and it would be possible for their consultants who measure exposures in their plants could import the data into CEMAS for them.

The data model and user interface should be updated to take account of and incorporate functionality for REACH requirements, using the information and requirements arising from the current REACH Implementation Projects (RIP). This will accommodate key elements of each of REACH Chemical Safety Assessments (CSA) Chemical Safety Reports (CSR) and Exposure Scenarios (ES). These requirements are pending finalisation, with the prospect of a large central IUCLID database being fed electronic dossiers of the appropriate data and information, supported by web based systems and associated procedures. Therefore the time is now ripe for the development and inclusion of appropriate subsets of data into the next version of CEMAS.

Regardless of the database used for risk assessment:

1. An important aspect of data sharing will be confidentiality of information, for which the most attractive approach is to use a trusted third party to mediate the sharing. This approach has advantages in that the third party can ensure that any information that might identify the donor is removed before it is shared, but they can also serve as a arbitrator of the data quality.

2. Work should be undertaken to develop the existing Occupational Exposure Data standards into freely available XML based formats for the definition and interchange of data. This would greatly enhance the ability of disparate systems to collect and exchange exposure information.

5.5 FINAL CONCLUSIONS

The work that has been undertaken to develop and test the prototype CEMAS has been crucial in preparing for REACH and in paving the way for a reliable Advanced Exposure Assessment Tool for higher tier risk assessments. Further work is necessary to consolidate these developments, but the way forward is now clear.

6 ACKNOWLEDGEMENTS

We are indebted to the trialists who agreed to participate in our research and devoted a great deal of valuable time and effort to the piloting of CEMAS, and in providing so much constructive criticism and feedback. Thanks also to many other participants and recipients who took the time to consider and comment on CEMAS in many ways. The authors would like to gratefully acknowledge the sponsorship and support of this project by the CEFIC LRI, and in particular the LRI Project Officer, Dr Chris Money.

APPENDIX 1: DEVELOPMENT AND DEFINITION OF DATA DICTIONARY, DATA MODEL, AND DATABASE SCHEMA FOR THE CEMAS DATABASE

Table A1.1: definitions of key terms and entities in the CEMAS database

Term / Name	Definition or description
CAS number	Chemical Abstracts Service number, which uniquely defines the hazardous substance. Used in CEMAS for listings of substances referred to in e-RA or exposure samples and as components of products
CEFIC Affiliation	Information about the company's CEFIC Product family and CEFIC Sector affiliation details, where appropriate
Chemical	A chemical product or agent that may either be a single substance/compound or a mixture.
Company	Name of the company or organisation that operates or is directly responsible for the facility
Company general H&S info and background	General background information about the company's health and safety policy. Detailed contents to be defined.
Controls and/or exposure modifiers	Factors that may affect exposure related to the workplace; Process, Task or Personal behaviours.
COSHH Essentials assessment	Details of COSHH Essentials assessment carried out with linkage to appropriate areas above: material; agent; task; controls; processes. As COSHH Essentials has connotations of ownership as UK scheme, it is proposed this be referred to as e-Risk Assessment?
Department	Administrative or functional departments within the Premises; as opposed to a fixed physical location or geographic area; although in some organisations could also be a fixed physical location or geographic area. Would cover for example "maintenance" as an operating department that may range across the organisation.
e-Risk E-risk Assessment; e-RA	The implementation of a control banding approach to risk assessment and control using the COSHH Essentials approach and algorithm in CEMAS- referred to as an e-Risk assessment, or e-RA.
Exposure Sample or measurement	Details of the sample collected in a survey. Types and characteristics; How why and where it was collected; the context; the results
Hazard Groups	These are used in the COSHH Essentials approach. They are: "A" the lowest degree of harm to health, for example, mild reversible irritation "B" low to moderate harm "C" medium harm "D" high harm "E" very nasty substances
Job	Job title; code; description. Local and with linkage to standard national/international codes
Material	Common or trade name of the material or product used as an input to process.
Methods	Used for Survey; Sampling; Analysis.;
Premises	Official industrial production establishment or site name. Potential for company to have more than one premises, though

Term / Name	Definition or description
	in prototype we expect to concentrate on site. Depending on how we configure these details some general information will be shared.
Process	A distinct set of operations/tasks carried out in the production of goods, products or services. Link to local codes; possibly, through amalgamation of data, to lead to development of pan-industry coding scheme.
Process: Batch	Batch Process: Has repeated or occasional cycles or activity events involving – start-up, running/implementation, and shutdown/stop, phases. May last minutes to several hours. Would cover also manual operations such as painting, cleaning, etc. Batch has frequency within a timescale (eg 5 times per hour; 8 times/day) and a duration (average) for each event.
Process: Continuous	Continuous Process: Runs for at least a work shift and may run on for several days, or longer, continuously. Would include automated industrial operations etc. Doesn't generally have a frequency recorded but would have a duration eg 10 days.
Product	Trade name and description of the chemical product; may be an input, output or by product; for e-RA will also have detail of component risk phrases (from SDS), and hazardous ingredients/chemical agents via CAS lists
Safety Data Sheet (SDS or MSDS)	Safety data Sheet (SDS) or sometimes the Material Safety Data Sheets (MSDS) is a summary of the hazards associated with a chemical and how it should be used to minimise the risks.
Sample	See exposure sample
Sample-set	Term used to refer to a group of samples of the same type collected in the same sampling session under the same circumstances – used to collected together related samples for convenience and to reduce repetitive entry of shared data. If personal type, they will be attributable to one person, who may have one, or more, sample(s) collected in the same session
Survey	Overall details of exposure assessment survey. Can be Qualitative as well as quantitative.
Survey report	Details of survey in a formal report.
Surveyor	The person who carried out the survey.
Task	Specific activity or operation carried out, that, alone or in combination with others, will constitute a process. Link to local codes; [ambitions that possibly, through amalgamation of data, to lead to development of pan-industry coding scheme for tasks].
Worker/Employee	Information about worker/employee. Can be used to link to sample information for personal samples. This separate information may not be used by all users and there will be a requirement to allow the entry of personal details at the sample entry level. May need to be anonymised. Data needs to remain contemporary to any exposure data collected
Workplace	Distinct geographic/physical locations within the premises where work, processes and tasks take place in the production of goods or services.

Table A1.2: Listing of all data tables (38) used to implement entities in CEMAS prototype database

Main Entity Table	Description
tblCompanyOrg	Company/Parent Organisation details
tblDepartment	Functional/Administrative department details
tblEmployee	Company Employee details
tblERA	ERA E-Risk Assessment
tblERAProcTask	ERA process tasks
tblERSubstIngred	ERA substance ingredients
tblERSubstRPcodes	ERA substance risk codes
tblKeyElementDefinitions	Definitions for key elements in exposure database
tblLocalJobs	Local Jobs List
tblPremCEFICpf	Premises CEFIC product families
tblPremCEFICsg	Premises CEFIC sector groups
tblPremises	Industrial Premises/Site/Facility
tblProcess	Processes at Premises
tblProcessTask	Task components of process
tblProduct	Product details & physichem params
tblProductIngredient	Product chem. ingredients
tblProductRisk	Product risk phrases (from sds)
tblSample	Details of individual samples within sample set
tblSampleResult	Result for agent in sample
tblSampSetDept	Survey Sampleset Department
tblSampSetProcess	Survey Sampleset activity tracking - Process
tblSampSetProduct	Survey Sampleset Products in use
tblSampSetTask	Survey Sampleset activity tracking - Task
tblSampSetWorkplace	Survey Sampleset activity tracking - Workplace
tblSurvey	Exposure Survey details
tblSurveyAnalyMethod	Survey used analytical methods
tblSurveyCoAnalyst	Surveyor / Hygienist company details
tblSurveyReport	Details of survey report
tblSurveySampleEvent	Survey sampling event/session
tblSurveySampleSet	Basic info on sample set
tblSurveySampSetDerm	Dermal sampling information for derm samp set
tblSurveySampSetPPE	PPE used in Survey Sample set
tblSurveySampSetEmp	Employee associated with sample set
tblTask	Task list
tblWorkplace	Physical workplaces in premises
tblWorkPlaceHealthSurv	Health surveillance used in workplace
tblWorkPlacePPE	PPE used in workplace
tblWorkplaceProcess	Processes within workplaces

Table A1.3: Listing of accessory lookup tables (50) used in CEMAS prototype database

Lookup Table Name	Description
tlkpAnalyMethod	Analytical methods
tlkpAnalyTechnique	Analytical technique
tlkpCAS	CAS numbers and names
tlkpCEFIC_ProdFam	CEFIC product families
tlkpCEFIC_SG	CEFIC SG Code & managers (ca2001)
tlkpDermSamplingDevice	Dermal sampling device
tlkpDermSamplingMedia	Dermal sampling media
tlkpDurationUnit	Units of time duration lookup
tlkpERA_EASE_dustCat	ERA dustiness categories (EASE related)
tlkpERAContAppInPlace	ERA current used control approaches
tlkpERAControlAppName	ERA Control approach name & description
tlkpERAControlApproach	ERA Control Approach parameters matrix
tlkpERASubstDustiness	ERA Substance dustiness
tlkpExposureConditions	Lookup general exposure conditions
tlkpExposurePattern	Lookup general exposure pattern
tlkpExtractMedia	Extraction media for analysis method
tlkpGender	Gender
tlkpHandedness	Handedness - R L or Ambi
tlkpHandlingCat	ERA substance handling categories
tlkpHealthPolicy	Health policies @ premises lookup
tlkpHealthSurveillance	Health surveillance @ premises lookup
tlkpInhSamplingDevice	Lookup inhalation/atmospheric sampling device
tlkpInhSamplingMedia	Lookup inhalation/atmospheric sampling media
tlkpISIC3	ISIC 3 digit code
tlkpISIC4	ISIC 4 digit code
tlkpJobTime	Job duration FT or PT job
tlkpMeasurementUnit	Sample agent measurement units
tlkpNEDB_ProcessCodes	Process details (UK NEDB examples)
tlkpPersDermSampLocn	Lookup body location for pers derm samples
tlkpPersInhSampLocn	Lookup body location for pers inh samples
tlkpPPE	Lookup PPE types
tlkpPrecipitationLevel	Lookup precipitation levels
tlkpPremisesSize	Lookup Coy/Premises size (n emps)
tlkpProcessBatchFreq	lookup for proc batch freq
tlkpProcessType	Lookup for process type
tlkpRphrase	Standard risk phrases and numbers (from coshh essentials)
tlkpSampleType	Lookup Sample Type
tlkpSubstCat	General chemical category of substance
tlkpSubstQty	Quantity of substance used
tlkpSubstState	Substance physical state
tlkpSurveyReason	Lookup principal survey reason
tlkpSurveySampStrategy	Lookup survey sampling strategy
tlkpSurveyWorkerSelMode	Lookup survey sampling strategy
tlkpUK_SIC_92Code	Lookup Standard industrial codes (eg UKSIC92)

Lookup Table Name	Description
tlkpUK_SOC90_JobCode	Lookup standard occupational codes (eg UKSOC90)
tlkpVentControl	Ventilation control code
tlkpWorkplaceConfinement	Workplace confinement levels
tlkpWorkplaceType	Workplace type & scale
tlkpWorkplaceVolCat	Lookup workplace volume category
tlkpWorkRates	General personal work rates

Table A1.4: The CEMAS Data Dictionary. Comprehensive listing of tables, columns and descriptions.

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblCompanyOrg	Table	tblCompanyOrg			Company/Parent Organisation details
	Column	CoySID	Number (Long)	4	
	Column	CoRep	Text	50	
	Column	CompanyName	Text	100	
	Column	Address1	Text	60	
	Column	Address2	Text	60	
	Column	Address3	Text	60	
	Column	City	Text	50	
	Column	StateOrProvince	Text	20	
	Column	PostAreaCode	Text	20	
	Column	Country	Text	50	
	Column	PhoneNumber	Text	30	
	Column	FaxNumber	Text	30	
	Column	CoIndustryObj	Text	200	Note on Co indust objectives;product/services
	Column	CoYrsEst	Number (Integer)	2	Years established
	Column	CoWWW	Hyperlink	-	Company URL
	Column	CoNote	Memo	-	Notes/observations re coy
	Column	DateUpdated	Date/Time	8	
tblDepartment	Table	tblDepartment			Functional/Administrative department details
	Column	PremSID	Number (Long)	4	Premises System ID
	Column	DeptSID	Number (Long)	4	Dept system ID
	Column	DeptLocalID	Text	50	Dept designated ID
	Column	DeptName	Text	50	Dept name
	Column	DeptDescr	Text	100	Dept description
	Column	DeptPrimeFunctionResp	Text	100	Primary/main function/responsibility of dept
	Column	DeptEmps	Number (Integer)	2	No emps directed by dept
	Column	DeptNote	Memo	-	Notes/ comments on dept
tblEmployee	Table	tblEmployee			Company Employee details

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblEmployee	Column	EmpSID	Number (Long)	4	Employee SID
	Column	CoySID	Number (Long)	4	Company System ID
	Column	PremSID	Number (Long)	4	Company Premises principally based at SID
	Column	LocalEmpID	Text	50	Local given employee ID
	Column	ForeName	Text	50	Forename(s)
	Column	SurName	Text	50	Surname
	Column	Gender	Text	1	Gender
	Column	DOB	Date/Time	8	Birthdate
	Column	LocalJobSID	Number (Long)	4	Local job SID
	Column	EmpDeptSID	Number (Long)	4	Departmental affiliation
	Column	Contractor	Yes/No	1	Is a contractor
	Column	DateJoined	Date/Time	8	Date joined company
	Column	JobTime	Number (Long)	4	Full or part time
	Column	ShiftWorker	Yes/No	1	Shift worker
	Column	Handedness	Number (Long)	4	L/R or A ambidextrous
	Column	EmpNote	Text	250	Note on employee
	Column	EmpCurrent	Yes/No	1	Is currently employed
tblERA	Table	tblERA			ERA E-Risk Assessment
	Column	PremSID	Number (Long)	4	Premises SID
	Column	ERASID	Number (Long)	4	e-Risk Advisor SID
	Column	ERADate	Date/Time	8	Date recorded/created
	Column	ERAUpdate	Date/Time	8	Date last updated
	Column	ERAShortTitle	Text	100	Short user name or title for this assessment
	Column	ERABackGround	Text	255	Description of background/reason(s) for eRA assessment
	Column	ProcSID	Number (Long)	4	Process SID
	Column	ERProcType	Number (Byte)	1	Process type (batch or continuous)
	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	WkpType	Number (Byte)	1	Code for type of workplace
	Column	WkpSizeCat	Number (Byte)	1	Workplace size category - volume (cubic metres)

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblERA	Column	WkpVentilation	Number (Byte)	1	Ventiation type employed in workplace
	Column	ERASubstID	Text	30	Substance/chemical ID
	Column	ERASubstName	Text	80	Substance/chemical name
	Column	ERASubstDesc	Text	100	Substance/chemical description
	Column	ERASubstCaty	Number (Integer)	2	Substance category
	Column	ERASubstState	Number (Byte)	1	Physical state - solid or liquid
	Column	ERASubstRM	Yes/No	1	Raw material to process
	Column	ERASubstIntBy	Yes/No	1	Intermediate or by-product of process
	Column	ERASubstFinProd	Yes/No	1	Final product of process
	Column	ERASubstHazGroup	Number (Byte)	1	Product hazard group outcome
	Column	ERASubstQty	Number (Byte)	1	Quantity of product used (categ)
	Column	ERASubstDust	Number (Byte)	1	Dustiness score of substance
	Column	ERASubstLiqOpT	Number (Integer)	2	Operating temp for liquid substance
	Column	ERASubstLiqBP	Number (Integer)	2	BP for liquid substance
	Column	ERASubstVolatility	Number (Byte)	1	Volatility score of substance
	Column	ERASubstHandCat	Number (Byte)	1	Handling cetegory score
	Column	ERAContAppInPlace	Number (Byte)	1	Control approach in place for the workplace
	Column	ERACalcCA	Number (Byte)	1	Lat calculated control approach
	Column	ERAOutcomeNote	Memo	-	User notes or observations on this assessment
	Column	ERASeekSpecAdviceDate	Date/Time	8	
	Column	ERASeekSpecAdviceNote	Text	150	
	Column	ERAExpMonDate	Date/Time	8	
	Column	ERAExpMonNote	Text	50	
	Column	ERAPlanControlDate	Date/Time	8	
	Column	ERAPlanControlNote	Text	50	
	Column	ERAControlImpDate	Date/Time	8	
	Column	ERAControlImpNote	Text	50	
	Column	ERARevDate	Date/Time	8	
	Column	ERARevNote	Text	50	

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblERAProcTask	Table	tblERAProcTask			ERA process tasks
	Column	ERASID	Number (Long)	4	e-Risk Advisor SID
	Column	TaskSID	Number (Long)	4	Task SID
	Column	ERATaskNote	Text	100	ERA task note
tblERSubstIngred	Table	tblERSubstIngred			ERA substance ingredients
	Column	ERASID	Number (Long)	4	
	Column	IngredNameCASNo	Text	50	Name or Cas no of chemical
	Column	Composition	Text	50	Quantity of ingred in substance
tblERSubstRPcodes	Table	tblERSubstRPcodes			ERA substance risk codes
	Column	ERASID	Number (Long)	4	e-Risk Advisor SID
	Column	RphraseNum	Text	50	Risk phrase number
	Column	tempRphraseScore	Number (Byte)	1	
	Column	tempRphraseSkin	Number (Byte)	1	
tblKeyElementDefinitions	Table	tblKeyElementDefinitions			Definitions for key elements in exposure database
	Column	EntityName	Text	255	
	Column	Definition/description	Memo	-	
tblLocalJobs	Table	tblLocalJobs			Local Jobs List
	Column	CoySID	Number (Long)	4	
	Column	LocalJobSID	Number (Long)	4	Local job SID
	Column	LocalJobCode	Text	50	Local job code
	Column	JobTitle	Text	30	Local job title
	Column	JobDescription	Text	120	Job description
	Column	SOC	Number (Long)	4	Standard Occupational Code equivalent if applic
tblPremCEFICpf	Table	tblPremCEFICpf			Premises CEFIC product families
	Column	PremSID	Number (Long)	4	Premises SID
	Column	CPF_SID	Number (Long)	4	CEFIC product family SID
tblPremCEFICsg	Table	tblPremCEFICsg			Premises CEFIC sector groups
	Column	PremSID	Number (Long)	4	Premises SID
	Column	AbbrevSG	Text	16	Abbreviated sector group

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblPremises	Table	tblPremises			Industrial Premises/Site/Facility
	Column	PremSID	Number (Long)	4	Premises SID
	Column	CoySID	Number (Long)	4	Company SID
	Column	PremID	Text	10	Designated Premises ID
	Column	PremisesName	Text	80	Specific premises/facility name
	Column	PremSize	Number (Integer)	2	Premises size (n emps)
	Column	PremISIC	Text	50	Internat standard industrial code
	Column	UKSIC92Code	Text	8	UK SIC 92
	Column	PremCEFICprodFam	Number (Integer)	2	CEFIC Product Family
	Column	PremCEFICSectAffil	Number (Integer)	2	CEFIC Sector or affiliation
	Column	PremOthIndAffil	Text	50	Other relevant industrial affiliations/memberships
	Column	PremChemIndClass	Number (Integer)	2	Chemical industry class (after cefic)
	Column	PremIndustObj	Text	255	General description of indust objectives;product output for premises
	Column	PremContactSalutation	Text	10	Mr ; Ms; Dr; Sir; etc
	Column	PremContactFore	Text	30	Forename of premises contact
	Column	PremContactSur	Text	30	Surname of premises contact
	Column	PremContactFunction	Text	20	Job title of premises contact
	Column	PremAddress1	Text	50	Premises address line1
	Column	PremAddress2	Text	50	Premises address line2
	Column	PremAddress3	Text	50	Premises address line3
	Column	PremAddress4	Text	50	Premises address line4
	Column	PremTownCity	Text	30	Premises Town City
	Column	PremAreaCode	Text	20	Premises Postcode
	Column	PremCountry	Text	30	Premises Country
	Column	PremContactTelNo	Text	20	Premises Contact phone
	Column	PremFaxNo	Text	20	Premises Fax
	Column	PremContactEmail	Text	50	Premises contact e-mail address
	Column	PremWWW	Hyperlink	-	Premises Specific URL
	Column	DateAdd	Date/Time	8	Date record was added

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblPremises	Column	DateUpdate	Date/Time	8	Date last updated
	Column	HSCoyPolicy	Number (Byte)	1	Do you have a written health and safety policy?
	Column	HSAssessRisks	Number (Byte)	1	Do you assess health and safety risks arising from work practices?
	Column	HSAdvisor	Number (Byte)	1	Do you have an appointed health and safety advisor?
	Column	HSTraining	Number (Byte)	1	Do you have a health and safety training programme for the workforce?
	Column	QA_Schemes	Memo	-	Describe QA & QC Schemes in operation
	Column	PremNote	Memo	-	Notes/observations on premises
tblProcess	Table	tblProcess			Processes at Premises
	Column	PremSID	Number (Long)	4	Premises SID
	Column	ProcSID	Number (Long)	4	Process system ID
	Column	ProcLocalID	Text	50	Process local code
	Column	ProcName	Text	50	Process name
	Column	ProcDesc	Text	200	Process description
	Column	ProcType	Number (Byte)	1	Process type (batch or continuous)
	Column	ProcNworkers	Number (Integer)	2	Ave N workers on process
	Column	ProcBatchFreq	Number (Single)	4	Frequency of batch operation
	Column	ProcBatchClass	Number (Integer)	2	Batch frequency class (times/d;t/w/;t/y;)
	Column	ProcDuration	Number (Long)	4	Ave Durationof process in wkplace
	Column	ProcDurationUnits	Text	1	Units of duration: mins; hours; days
	Column	ProcNote	Memo	-	Note on process
	Column	ProcCLC	Number (Long)	4	Process common list code
tblProcessTask	Table	tblProcessTask			Task components of process
	Column	ProcSID	Number (Long)	4	Process system ID
	Column	TaskSID	Number (Long)	4	Task SID
	Column	TaskDuration	Number (Integer)	2	Duration of task this process (Mins)
	Column	TaskDurationUnits	Text	1	Units of duration: mins; hours; days
	Column	TaskFreq	Number (Integer)	2	Frequency of task per process
	Column	ProcTaskNote	Text	50	Note on process task

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblProduct	Table				
t	Column	PremSID	Number (Long)	4	Premises SID
	Column	ProdSID	Number (Long)	4	SID for the product
	Column	ProdID	Text	50	Local product ID
	Column	ERASID	Long Integer	4	ERA id source
	Column	SampSetSID	Long Integer	4	Sample set source
	Column	ERAProdID	Text	30	Product name used in ERA
	Column	ProdName	Text	80	Product name
	Column	ProdDesc	Text	100	Product description
	Column	ProdCategory	Integer	2	Product category
	Column	ProdState	Byte	1	Product State
	Column	ProdPrimeRole	Long Integer	4	Productd primary role
	Column	ProdHazGroup	Byte	1	Product hazard group
	Column	ProdQty	Byte	1	Product quantity
	Column	ProdDust	Byte	1	Product dustiness
	Column	ProdLiqOpT	Integer	2	Operating temp (liq)
	Column	ProdLiqBP	Integer	2	BP liq
	Column	ProdVolatility	Byte	1	Volatility
	Column	ProdHandCatSol	Byte	1	Handling cateegory (solid)
	Column	ProdtHandCatLiq	Byte	1	handling category (liq)
	Column	ProductMSDS	Text	50	Product MSDS where appl
tblProductIngredient	Table				
	Column	ProductSID	Long Integer	4	Product id
	Column	AgentSIDCAS	Long Integer	4	Chem agent CAS no
	Column	CompositionNote	Text	50	Note on composition
tblProductRisk	Table				
	Column	ERAProductSID	Long Integer	4	Product id
	Column	RphraseNum	Long Integer	4	Risk phrase id number
	Column	tempRphraseScore	Byte	1	Risk phrase score
	Column	tempRphraseSkin	Byte	1	Skin risk
tblSample	Table	tblSample			Details of individual samples within sample set
	Column	SampSetSID	Number (Long)	4	Sample Set SID
	Column	SampleSID	Number (Long)	4	Sample SID (auto)
	Column	SampleLocalID	Text	50	In house sample ID
	Column	SampleLabel	Text	50	Label for sample

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
	Column	SampleType	Number (Integer)	2	Sample type (as in parent sample set)
	Column	DS_SampDevice	Number (Long)	4	Dermal sampler type
	Column	DS_SampMedia	Number (Long)	4	Dermal media type
	Column	DS_OutIn	Number (Long)	4	Dermal Outer or inner sample
	Column	DS_Locn	Number (Long)	4	Dermal body location
	Column	DS_AreaRep	Number (Long)	4	Dermal area represented
	Column	DS_SampArea	Number (Long)	4	Dermal sample area
	Column	SampleNote	Text	250	
tblSampleResult	Table	tblSampleResult			Result for agent in sample
	Column	SampleSID	Number (Long)	4	Sample SID
	Column	SampResultSID	Number (Long)	4	SampleResultSID
	Column	AgentSID	Number (Integer)	2	Agent SID
	Column	AgentCASNO	Text	14	CAS no
	Column	AM_SID	Number (Integer)	2	Analysis regime used SID
	Column	Result	Number (Double)	8	Result for this agent this sample
	Column	ResultUnits	Text	6	Units used to measure this agent
	Column	RBLOD	Yes/No	1	Results Below limits of detection? Y/N
tblSampleResult	Column	TWA	Yes/No	1	TWA result?
	Column	TWAtype	Text	2	The TWA type method represented
	Column	LinkToSamp	Number (Integer)	2	Other sample this is linked to
	Column	ResultNote	Text	50	Note on result
tblSampSetDept	Table	tblSampSetDept			SurvSampset scenario department
	Column	SampSetSID	Number (Long)	4	Sample Set SID
	Column	DeptSID	Number (Integer)	2	Dept system ID
	Column	SSDNote	Text	50	Notes on dep tsampled
tblSampSetProcess	Table	tblSampSetProcess			SurvSampset scenario process
	Column	SampSetSID	Number (Long)	4	Sample Set SID
	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	ProcSID	Number (Long)	4	Process system ID
	Column	SSPMins	Number (Integer)	2	Time spent on sampled process (mins)
	Column	SSPNote	Text	50	Note on sampled process
	Column	SSPPhoto	Text	10	Photograph of sampled process
	Column	SSPVideo	Text	10	Video clip of process during sampling

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblSampSetTask	Table	tblSampSetTask			SurvSampset scenario task
	Column	SampSetSID	Number (Long)	4	Sample Set SID
	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	ProcSID	Number (Long)	4	Process system ID
	Column	TaskSID	Number (Long)	4	Task SID
	Column	SSTMins	Number (Integer)	2	Time spent on sampled task (mins)
	Column	SSTPPEused	Yes/No	1	Was PPE available/used during this task
	Column	SSTPPEeffective	Yes/No	1	Was PPE effective
	Column	SSTNote	Text	50	Note on sampled process
	Column	SSTPhoto	Text	10	Photograph of sampled process
	Column	SSTVideo	Text	10	Video clip of process during sampling
tblSampSetWorkplace	Table	tblSampSetWorkplace			SurvSampset scenario workplace
	Column	SampSetSID	Number (Long)	4	Sample Set SID
tblSampSetWorkplace	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	SSWMinsSpent	Number (Integer)	2	Minutes spent in this workplace
	Column	SSWnWkPresent	Number (Integer)	2	N workers present in workplace during sampling
	Column	SSWVentTypeCode	Number (Integer)	2	Ventilation controls
	Column	SSWVentEffective	Yes/No	1	Ventilation effectiveness
	Column	SSWSampNote	Text	50	Note on sampled workplace
tblSurvey	Table	tblSurvey			Exposure Survey details
	Column	PremSID	Number (Long)	4	Premises SID
	Column	SurvSID	Number (Long)	4	Survey SID
	Column	SurvID	Text	50	Local survey ID
	Column	SurvTitle	Text	200	Full Title of The Survey
	Column	SurvStart	Date/Time	8	Date survey started (dd/mm/yyyy)
	Column	SurvEnd	Date/Time	8	Date survey ended (dd/mm/yyyy)
	Column	Completed	Yes/No	1	Is survey completed/closed
	Column	SurvAuthorisor	Text	50	Who authorised/commissioned the survey (Name)
	Column	Surveyor	Number (Integer)	2	Link to surveyor details
	Column	Analyst	Number (Long)	4	Link to analyst details
	Column	SurvReason	Number (Integer)	2	Surv reason: baseline;scheduled;complaint;compliance;emergency etc
	Column	SurvSampStrat	Number (Integer)	2	Surv sampling strategy Qualitative/Representative/worst case/other type

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
	Column	SurvAimObjDescNote	Memo	-	Survey Aims and objectives description
	Column	SurvWorkerSelMode	Number (Long)	4	Survey worker selection mode
	Column	SurvSampTypePers	Yes/No	1	Personal samples included
	Column	SurvSampTypeStat	Yes/No	1	Static samples included
	Column	SurvSampInhal	Yes/No	1	Inhalation samples included
	Column	SurvSampDerm	Yes/No	1	Dermal samples included
	Column	SurvSampDurWhole	Yes/No	1	Whole shift (>6hrs)
	Column	SurvSampDurLT6	Yes/No	1	Part shift (<6hrs)
	Column	SurvSampDurTS	Yes/No	1	Task specific
	Column	SurvSampDurST	Yes/No	1	Short term
tblSurvey	Column	SurvReportLink	Hyperlink	-	Link to report
	Column	DateAdd	Date/Time	8	Date record was added
	Column	DateUpdate	Date/Time	8	Date last updated
tblSurveyAnalyMethod	Table	tblSurveyAnalyMethod			Survey used analytical methods
	Column	SurvSID	Number (Long)	4	Survey SID
	Column	AM_SID	Number (Long)	4	Analytical Method SID
	Column	AM_SurveyLOD	Number (Integer)	2	Limits of detection this method this survey
	Column	AnalyMethod Note	Text	100	
tblSurveyCoAnalyst	Table	tblSurveyCoAnalyst			Surveyor / Hygienist company details
	Column	SA_SID	Number (Long)	4	Surveyor Analyst System ID
	Column	SA_CoID	Text	30	Surveyor Analyst local Designated ID
	Column	SA_CoName	Text	80	SA company Name
	Column	SACoRegNo	Text	50	SA company registration no
	Column	ContactSalutation	Text	10	Salutation Mr ; Ms; Dr; Sir; etc
	Column	ContactFore	Text	30	Forename of company contact
	Column	ContactSur	Text	30	Surname of company contact
	Column	ContactFunction	Text	20	Job title of company contact
	Column	SAAddress1	Text	50	Company Address line1
	Column	SAAddress2	Text	50	Company Address line2
	Column	SAAddress3	Text	50	Company Address line3
	Column	SATownCity	Text	30	Company TownCity
	Column	SACountry	Text	30	Company Country
	Column	SAPostcode	Text	20	Company Postcode

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
	Column	SATelNo	Text	20	Company Telephone Number
	Column	SAFAxNo	Text	50	Company Fax No
	Column	SAContactEmail	Text	50	Company contact e-mail address
	Column	SACoWWW	Hyperlink	-	Company URL
	Column	SACoQA_Quals	Text	50	QA credentials (namas; rice; iso xx; etc)
	Column	SACoNote	Memo	-	Notes/observations re SA coy
tblSurveyCoAnalyst	Column	Survey	Yes/No	1	Carry out survey work
	Column	Analysis	Yes/No	1	Carry out analysis work
tblSurveyReport	Table	tblSurveyReport			Details of survey report
	Column	SurvSID	Number (Integer)	2	Survey SID
	Column	ReportTitle	Text	250	Title of report
	Column	ByOrganisation	Text	150	Organisation producing the report
	Column	OrganisationRefNo	Text	50	Organisations reference no
	Column	SurveyorSID	Number (Long)	4	Link to Surveyor System ID where appl
	Column	Author	Text	250	Author
	Column	DatePub	Date/Time	8	Date the report was published/released
	Column	ReportLink	Hyperlink	-	Ref for/link to survey report (local or Inet)
tblSurveySampleEvent	Table	tblSurveySampleEvent			Survey sampling event/session
	Column	SurvSID	Number (Long)	4	Survey SID
	Column	SampEventSID	Number (Long)	4	Survey Sampling occasion ID
	Column	SEStartDateTime	Date/Time	8	Date samp occasion began (dd/mm/yyyy:hh:mm)
	Column	SEEndDateTime	Date/Time	8	Date samp occasion ended (dd/mm/yyyy:hh:mm)
	Column	SEDesc	Text	200	Shortnote text description of the samp occ session
	Column	SENoteObs	Memo	-	Notes observations for this event
	Column	SEControlObs	Text	200	Comments observations on the use of controls during sampling session
	Column	SEAvgTemp	Number (Integer)	2	Average air temp Celsius
	Column	SEMinTemp	Number (Integer)	2	Average air temp Celsius
	Column	SEMAxTemp	Number (Integer)	2	Average air temp Celsius
	Column	SERelHum	Number (Integer)	2	% Relative humidity
	Column	SEAtmPress	Number (Integer)	2	Atmospheric pressure mmHg
	Column	SEWindSpeed	Number (Single)	4	Windspeed
	Column	SEPrecipLevel	Text	1	Code for level/severity of preciitation
Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*

	Column	SEPrecipType	Number (Integer)	2	Code for precipitation type (inc none default)
tblSurveySampleSet	Table	tblSurveySampleSet			Basic info on sample set
	Column	SurvSID	Number (Long)	4	Survey SID
tblSurveySampleSet	Column	SampSetSID	Number (Long)	4	Sample Set SID
	Column	SampEventSID	Number (Integer)	2	Survey Sampling occasion ID
	Column	SampleSetType	Number (Integer)	2	Sample set type (PL; PS; SL; SS; CM; Derm; etc
	Column	EmpSID	Number (Integer)	2	Employee SID
	Column	LocalEmpID	Text	10	Local given employee ID
	Column	ForeName	Text	30	Employee forename
	Column	Surname	Text	50	Worker surname
	Column	Gender	Text	1	Sex of worker (M or F)
	Column	DOB	Date/Time	8	Birthdate
	Column	LocalJobSID	Text	50	Local job SID
	Column	LocalJobDesc	Text	120	General description of job
	Column	EmpSOCode	Text	10	Standard occupational code
	Column	EmpDeptSID	Number (Long)	4	Departmental affiliation
	Column	DateJoined	Date/Time	8	Date joined company
	Column	Handedness	Number (Long)	4	L/R or A ambidextrous
	Column	ShiftWorker	Yes/No	1	Shift worker
	Column	Contractor	Yes/No	1	Is a contractor
	Column	JobTime	Number (Long)	4	Full or part time
	Column	EmpRecLink	Yes/No	1	Linked via employee record?
	Column	EmpShiftStart	Date/Time	8	Shift start (as appl)
	Column	EmpShiftEnd	Date/Time	8	Shift end (as appl)
	Column	SampActive	Yes/No	1	Active or passive sampling?
	Column	SampDeviceCode	Number (Integer)	2	Code for the sampling device used
	Column	SampMediaCode	Number (Integer)	2	Code for the samp device media
	Column	SampLocnSID	Number (Integer)	2	Body site of personal sample (pbz; chest etc)
	Column	SampStartDate	Date/Time	8	Samp start date
	Column	SampStartTime	Date/Time	8	Samp start time
	Column	SampEndTime	Date/Time	8	Samp end time
	Column	SampBreakDur	Number (Integer)	2	Duration of meal or other off work break during shift

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblSurveySampleSet	Column	SampOnBreak	Yes/No	1	Was sampling continued during break
	Column	SampWkLoad	Number (Integer)	2	Work load/exertion (light;Moderate;heavy) etc
	Column	SampDuration	Number (Integer)	2	Samp duration-mins
	Column	SampRate	Number (Single)	4	Mean rate of flow through sampler (litres/min)
	Column	SampVolume	Number (Single)	4	Samp volume
	Column	ExpDuration	Number (Integer)	2	Exposure duration-mins
	Column	ExpPattern	Number (Integer)	2	Exposure Pattern: Continuous; intermittent; Occasional;etc
	Column	ExpCondType	Number (Integer)	2	T typica; representative; LT lower than normal; Unknown;etc
	Column	SampBehavObs	Text	250	Observations on behaviours during sampling (Separate multiple table??)
	Column	SampSetNote	Text	250	Note on this sample set
tblSurveySampSetDerm	Table	tblSurveySampSetDerm			Dermal sampling information for derm samp set
	Column	SampSetSID	Number (Long)	4	Sample Set SID
	Column	SampDeviceCode	Number (Long)	4	
	Column	SampMediaCode	Number (Integer)	2	
	Column	UsualSampArea	Number (Long)	4	
tblSurveySampSetPPE	Table	tblSurveySampSetPPE			PPE used in Survey Sample set
	Column	SampSetSID	Number (Long)	4	Sample Set SID
	Column	PPETypeSID	Number (Long)	4	PPE type SID
	Column	PPE_Effective	Yes/No	1	Was PPE used effectively?
	Column	PPE_Obs	Text	100	Observations on PPE Use
tblSymbols	Table	tblSymbols			
	Column	SymbolName	Text	50	
	Column	SymbolPasted_eg	Text	50	
tblTask	Table	tblTask			Task list
	Column	TaskSID	Number (Long)	4	TaskSID
	Column	CEList	Yes/No	1	Available on Coshhe list?
	Column	TaskGroup	Text	255	General task group
	Column	TaskName	Text	255	Name of task
	Column	TaskDesc	Text	50	Full description of task

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tblTask	Column	TaskNote	Text	150	Note on task
tblWorkplace	Table	tblWorkplace			Physical workplaces in premises
	Column	PremSID	Number (Long)	4	Premises SID
	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	WkpLocID	Text	50	The local ID of the workplace
	Column	WkpName	Text	50	Common name of workplace
	Column	WkpDesc	Text	250	General fuller description of the workplace
	Column	WkpType	Number (Integer)	2	Code for type of workplace
	Column	WkpSizeCat	Number (Integer)	2	Workplace size category - volume (cubic metres)
	Column	WkpExpMon	Yes/No	1	Exposure monitoring ever in workplace? (Y/N)
	Column	WkpHealthSurv	Yes/No	1	Worker health surviellance ever in workplace? (Y/N)
	Column	WkpVentilation	Number (Long)	4	Ventiation type employed in workplace
	Column	WkpPPEpolicy	Yes/No	1	PPE policy for this workplace?
	Column	WkpNote	Memo	-	Note on workplace
	Column	WkpDept	Text	50	Primary administering dept(functional) of workplace where app
	Column	WkpPhoto	Hyperlink	-	Photograph(s) of workplace (Link)
tblWorkPlaceHealthSurv	Table	tblWorkPlaceHealthSurv			Health surveillance used in workplace
	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	HealthSurvTypeSID	Number (Long)	4	Health Surveillance SID
	Column	WkPHealthSurvNote	Text	140	Note on this PPE use in workplace
tblWorkPlacePPE	Table	tblWorkPlacePPE			PPE used in workplace
	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	PPETypeSID	Number (Long)	4	PPE type SID
	Column	WKPPPENote	Text	50	Note on this PPE use in workplace
tblWorkplaceProcess	Table	tblWorkplaceProcess			Processes within workplaces
	Column	WkPlaceSID	Number (Long)	4	Workplace SID
	Column	ProcSID	Number (Integer)	2	Process system ID
	Column	WkplProcNote	Text	250	Note on workplace process
tlkpAnalyMethod	Table	tlkpAnalyMethod			Analytical methods

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpAnalyMethod	Column	AM_SID	Number (Long)	4	Analytical Method SID
	Column	AM_Authority	Text	50	Method authority source
	Column	Method_No	Text	20	Method id no
	Column	Issue_No	Text	20	Method issue no if app
	Column	MethodRef	Text	255	Method reference description
	Column	ISBN_no	Text	255	ISBN ID
	Column	AT_SID	Number (Byte)	1	Analytical technique SID
tlkpAnalyTechnique	Table	tlkpAnalyTechnique			Analytical technique
	Column	AT_SID	Number (Byte)	1	A code for the analysis type
	Column	AT_Desc	Text	50	Descriptive label for the analytical code
	Column	AnalyNote	Text	50	Note on analytical method
tlkpCAS	Table	tlkpCAS			CAS numbers and names
	Column	CAS	Text	15	
	Column	Name	Text	255	
	Column	Dupl_Group	Text	50	
tlkpCEFIC_ProdFam	Table	tlkpCEFIC_ProdFam			CEFIC product families
	Column	CPF_SID	Number (Long)	4	CEFIC product family SID
	Column	CPF_Name	Text	50	Product family name
	Column	CPF_Note	Text	50	Note on CPF
	Column	CPF_txtcode	Text	2	Family text code
tlkpCEFIC_SG	Table	tlkpCEFIC_SG			CEFIC SG Code & managers (ca2001)
	Column	CPF_SID	Number (Long)	4	CEFIC product family SID
	Column	AbbrevSG	Text	16	Abbreviated Sector Group
	Column	GroupName	Text	150	Sector group name
	Column	OrigCEFICCode	Text	10	
tlkpDermSamplingDevice	Table	tlkpDermSamplingDevice			Dermal sampling device
	Column	SampDeviceCode	Number (Long)	4	
	Column	SampDevicedesc	Text	100	
	Column	SortOrder	Number (Long)	4	

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpDermSamplingMedia	Table	tlkpDermSamplingMedia			Dermal sampling media
	Column	SampMediaCode	Number (Integer)	2	
	Column	MediaDesc	Text	50	
	Column	SortOrder	Number (Long)	4	
tlkpDurationUnit	Table	tlkpDurationUnit			Units of time duration lookup
	Column	DurationUnitSID	Number (Long)	4	Process duration units SID
	Column	DurationUnit	Text	1	Process duration unit
	Column	DurationUnitLabel	Text	10	Process duration unit label
tlkpERA_EASE_dustCat	Table	tlkpERA_EASE_dustCat			ERA dustiness categories (EASE related)
	Column	EASEDustSID	Number (Long)	4	EASE dustiness SID
	Column	EASEDustScore	Number (Byte)	1	Dustiness score
	Column	EASEDustCategory	Text	20	Category name
	Column	EASEDustTypEG	Text	40	Typical materials
	Column	EASEDustIntEmm	Text	10	Ease intrinsic emission factor
tlkpERAContAppInPlace	Table	tlkpERAContAppInPlace			ERA current used control approaches
	Column	ControlAppID	Number (Integer)	2	
	Column	ControlAppName	Text	50	
	Column	ControlAppDesc	Text	255	
tlkpERAControlAppName	Table	tlkpERAControlAppName			ERA Control approach name & description
	Column	ControlAppID	Number (Integer)	2	
	Column	ControlAppName	Text	50	
	Column	ControlAppDesc	Text	255	
	Column	CEAdvStartSheet	Number (Long)	4	
tlkpERAControlApproach	Table	tlkpERAControlApproach			ERA Control Approach parameters matrix
	Column	HazGroup	Number (Integer)	2	
	Column	State	Number (Integer)	2	
	Column	StateLevel	Number (Integer)	2	
	Column	Amount	Number (Integer)	2	
	Column	ControlAppID	Number (Double)	8	

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpERASubstDustiness	Table	tlkpERASubstDustiness			ERA Substance dustiness
	Column	SubstDustID	Number (Byte)	1	
	Column	SubstDustName	Text	8	
	Column	SubstDustDesc	Text	100	
	Column	SortOrder	Number (Long)	4	
tlkpExposureConditions	Table	tlkpExposureConditions			Lookup general exposure conditions
	Column	ExpCondCode	Number (Byte)	1	Code for the exposure type
	Column	ExpCondLabel	Text	80	Descriptive label for the exposure type code
tlkpExposurePattern	Table	tlkpExposurePattern			Lookup general exposure pattern
	Column	ExposurePatternCode	Number (Byte)	1	Code for the exposure pattern
	Column	ExposurePatternLabel	Text	50	Descriptive label for the expopsure pattern code
tlkpExtractMedia	Table	tlkpExtractMedia			Extraction media for analysis method
	Column	ExtractMediaSID	Number (Long)	4	Extraction media SID
	Column	ExtractMediaCAS	Text	12	CAS no of extraction media
	Column	ExtractMediaDesc	Text	50	description of extract media
tlkpGender	Table	tlkpGender			Gender
	Column	Gender	Text	1	Code for sex
	Column	GenderLabel	Text	6	Label for sex
tlkpHandedness	Table	tlkpHandedness			Handedness - R L or Ambi
	Column	HandSID	Number (Long)	4	
	Column	Handedness	Text	50	
tlkpHandlingCat	Table	tlkpHandlingCat			ERA substance handling categories
	Column	HandlingSID	Number (Long)	4	Handling SID
	Column	HandlingCatName	Text	12	Handling Category
	Column	HandlingSolidDesc	Text	150	Description for solids
	Column	HandlingLiqDesc	Text	150	Description for liquids
	Column	HandlingLower	Number (Single)	4	Handling factor lower
	Column	HandlingUpper	Number (Single)	4	Handling factor upper
tlkpHealthPolicy	Table	tlkpHealthPolicy			Health policies @ premises lookup

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpHealthPolicy	Column	VarName	Text	14	Variable name
	Column	VarNumValue	Number (Integer)	2	Var Numeric value
	Column	VarTxtValue	Text	6	Var Txt Value
	Column	VarLabel	Text	50	Variable label
tlkpHealthSurveillance	Table	tlkpHealthSurveillance			Health surveillance @ premises lookup
	Column	HealthSurvTypeSID	Number (Long)	4	
	Column	HealthSurvTypeLabel	Text	100	
	Column	SortOrder	Number (Integer)	2	
tlkpInhSamplingDevice	Table	tlkpInhSamplingDevice			Lookup inhalation/atmospheric sampling device
	Column	SampDeviceCode	Number (Long)	4	
	Column	SampDevicedesc	Text	100	
	Column	SortOrder	Number (Long)	4	
tlkpInhSamplingMedia	Table	tlkpInhSamplingMedia			Lookup inhalation/atmospheric sampling media
	Column	SampMediaCode	Number (Integer)	2	
	Column	MediaDesc	Text	50	
	Column	SortOrder	Number (Long)	4	
tlkpISIC3	Table	tlkpISIC3			ISIC 3 digit code
	Column	ISIC3code	Number (Double)	8	
	Column	ISIC3Label	Text	255	
tlkpISIC4	Table	tlkpISIC4			ISIC 4 digit code
	Column	ISIC4code	Number (Double)	8	
	Column	ISIC4label	Text	255	
tlkpJobTime	Table	tlkpJobTime			Job duration FT or PT job
	Column	JobTimeSID	Number (Long)	4	
	Column	JobTimeLabel	Text	50	
	Column	SortOrder	Number (Long)	4	
tlkpMeasurementUnit	Table	tlkpMeasurementUnit			Sample agent measurement units
	Column	MeasUnitID	Number (Long)	4	Numeric coode ID
	Column	MeasUnitLabel	Text	8	Unit name

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpMeasurementUnit	Column	UnitLabelDesc	Text	50	Units description
tlkpNEDB_ProcessCodes	Table	tlkpNEDB_ProcessCodes			Process details (UK NEDB examples)
	Column	ProcCLCSID	Number (Long)	4	Process system ID
	Column	NEDBOrigCode	Text	50	Process local code
	Column	Indgp1	Text	20	Industrial group level 1
	Column	Indgp2	Text	20	Industrial group level 2
	Column	Indsubj1	Text	20	Sub group
	Column	ProcName	Text	20	Process name
	Column	ProcDesc	Text	200	Process description
tlkpPersDermSampLocn	Table	tlkpPersDermSampLocn			Lookup body location for pers derm samples
	Column	DS_LocnSID	Number (Long)	4	Dermal Sample location SID
	Column	SampLocnDesc	Text	50	Dermal Sample locn description
	Column	BSA_Rep	Number (Long)	4	Usual Body surface area represented
	Column	SortOrder	Number (Long)	4	
tlkpPersInhSampLocn	Table	tlkpPersInhSampLocn			Lookup body location for pers inh samples
	Column	SampLocnCode	Number (Long)	4	Sample body location SID
	Column	SampLocnDesc	Text	50	Sample body location label
tlkpPPE	Table	tlkpPPE			Lookup PPE types
	Column	PPETypeSID	Number (Long)	4	
	Column	PPELabel	Text	50	
	Column	SortOrder	Number (Integer)	2	
tlkpPrecipitationLevel	Table	tlkpPrecipitationLevel			Lookup precipitation levels
	Column	PrecipLevelCode	Text	1	Code for precipitation levels/severity
	Column	PrecipLevelLabel	Text	50	Descriprtion of preciptation level
tlkpPremisesSize	Table	tlkpPremisesSize			Lookup Coy/Premises size (n emps)
	Column	PremSizeNumCode	Number (Byte)	1	Classification by company size
	Column	PremSizeLabel	Text	50	Descriptive label for company size
	Column	PremSizeTxtCode	Text	1	Short text label
tlkpProcessBatchFreq	Table	tlkpProcessBatchFreq			lookup for proc batch freq

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpProcessBatchFreq	Column	ProcBatchFreqClassSID	Number (Long)	4	Process batch freq SID
	Column	ProcBatchFreqClass	Text	50	Process batch freq class description
	Column	SortOrder	Number (Integer)	2	SortID
tlkpProcessType	Table	tlkpProcessType			Lookup for process type
	Column	ProcTypeSID	Number (Long)	4	Process type SID
	Column	ProcTypeLabel	Text	50	Process type description
	Column	SortOrder	Number (Integer)	2	SortID
tlkpRphrase	Table	tlkpRphrase			Standard risk phrases and numbers (from coshh essentials)
	Column	RphraseSID	Number (Long)	4	
	Column	HazClassPrefix	Text	1	
	Column	RiskLevelNum	Text	20	
	Column	RiskPhrase	Text	255	
	Column	CE_HazGroup	Text	1	
	Column	CE_HazGroupScore	Number (Integer)	2	
	Column	CE_SkinGroup	Number (Integer)	2	
	Column	Note	Text	255	
tlkpSampleType	Table	tlkpSampleType			Lookup Sample Type
	Column	SampTypeSID	Number (Long)	4	SamptypeSID
	Column	SampTypeCode	Text	2	Code for the sample type
	Column	SampTypelabel	Text	50	Label describing the code
	Column	SortOrder	Number (Long)	4	
	Column	Perstype	Yes/No	1	Is it a personal type?
	Column	Dermal	Yes/No	1	Is it dermal type?
tlkpSubstCat	Table	tlkpSubstCat			General chemical category of substance
	Column	SubStCatSID	Number (Long)	4	Substance category SID
	Column	SubstCatName	Text	50	Substance category name
	Column	SubstCatDescription	Text	50	Substance category description
	Column	SortOrder	Number (Byte)	1	SortOrder
tlkpSubstQty	Table	tlkpSubstQty			Quantity of substance used

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpSubstQty	Column	SubstQtyID	Number (Byte)	1	
	Column	SubstQtyName	Text	16	
	Column	SubstQtyUnitSolid	Text	16	
	Column	SubstQtyUnitLiq	Text	16	
tlkpSubstState	Table	tlkpSubstState			Substance physical state
	Column	SubstStateID	Number (Byte)	1	
	Column	SubstStateName	Text	10	
	Column	SubstStateScore	Number (Byte)	1	
tlkpSurveyReason	Table	tlkpSurveyReason			Lookup principal survey reason
	Column	SurvReasonSID	Number (Long)	4	Survey reason SID
	Column	SurvReasonLabel	Text	50	Sampling reason full label
	Column	SurvReasonTxt	Text	3	Survey reason short label
tlkpSurveySampStrategy	Table	tlkpSurveySampStrategy			Lookup survey sampling strategy
	Column	SurveyTypeSID	Number (Long)	4	
	Column	SurveyTypeCode	Text	2	
	Column	SurveyTypeLabel	Text	30	
tlkpSurveyWorkerSelMode	Table	tlkpSurveyWorkerSelMode			Lookup survey sampling strategy
	Column	SurvWorkerSelSID	Number (Long)	4	
	Column	SurvWorkerSelLabel	Text	30	
tlkpUK_SIC_92Code	Table	tlkpUK_SIC_92Code			Lookup Standard industrial codes (eg UKSIC92)
	Column	UKSIC92Code	Text	8	
	Column	UKSIC92CodeLabel	Text	130	
tlkpUK_SOC90_JobCode	Table	tlkpUK_SOC90_JobCode			Lookup standard occupational codes (eg UKSOC90)
	Column	UK_SOC90	Number (Integer)	2	
	Column	UKSOC90_JobTitle	Text	25	
	Column	OtherCodes	Text	50	
tlkpVentControl	Table	tlkpVentControl			Ventilation control code
	Column	VentTypeSID	Number (Long)	4	SID for ventilation type
	Column	VentTypeCode	Text	3	Code for the ventilation type

Tablename	*Object Type*	*Name*	*Column Type*	*Length*	*Description*
tlkpVentControl	Column	VentTypeLabel	Text	50	Label describing the ventilation type
	Column	Sortorder	Number (Integer)	2	Sort order for lookups
tlkpWorkplaceConfinement	Table	tlkpWorkplaceConfinement			Workplace confinement levels
	Column	ConfinementSID	Number (Long)	4	SID for confinement
	Column	ConfinementCode	Text	1	Code for the level of confinement or otherwise
	Column	ConfinementLabel	Text	50	Label describing the level of confinement
	Column	SortOrder	Number (Integer)	2	Sort order for lookups
tlkpWorkplaceType	Table	tlkpWorkplaceType			Workplace type & scale
	Column	WkpTypeCode	Number (Long)	4	Code for workplace type
	Column	WkpTypeDesc	Text	50	Description of workplace type
	Column	SortOrder	Number (Integer)	2	Sort order for lookups
tlkpWorkplaceVolCat	Table	tlkpWorkplaceVolCat			Lookup workplace volume category
	Column	WkpVolCatSID	Number (Long)	4	ID of Category for workplace volume (cubic metres)
	Column	WkpVolCatLabel	Text	50	label for Category for workplace volume
	Column	SortOrder	Number (Integer)	2	Column for sort order
tlkpWorkRates	Table	tlkpWorkRates			General personal work rates
	Column	WorkRateSID	Number (Long)	4	
	Column	WorkRateLabel	Text	50	Descriptive label for the work rate code
	Column	WorkRateCode	Text	50	Code for the level of activity by the worker

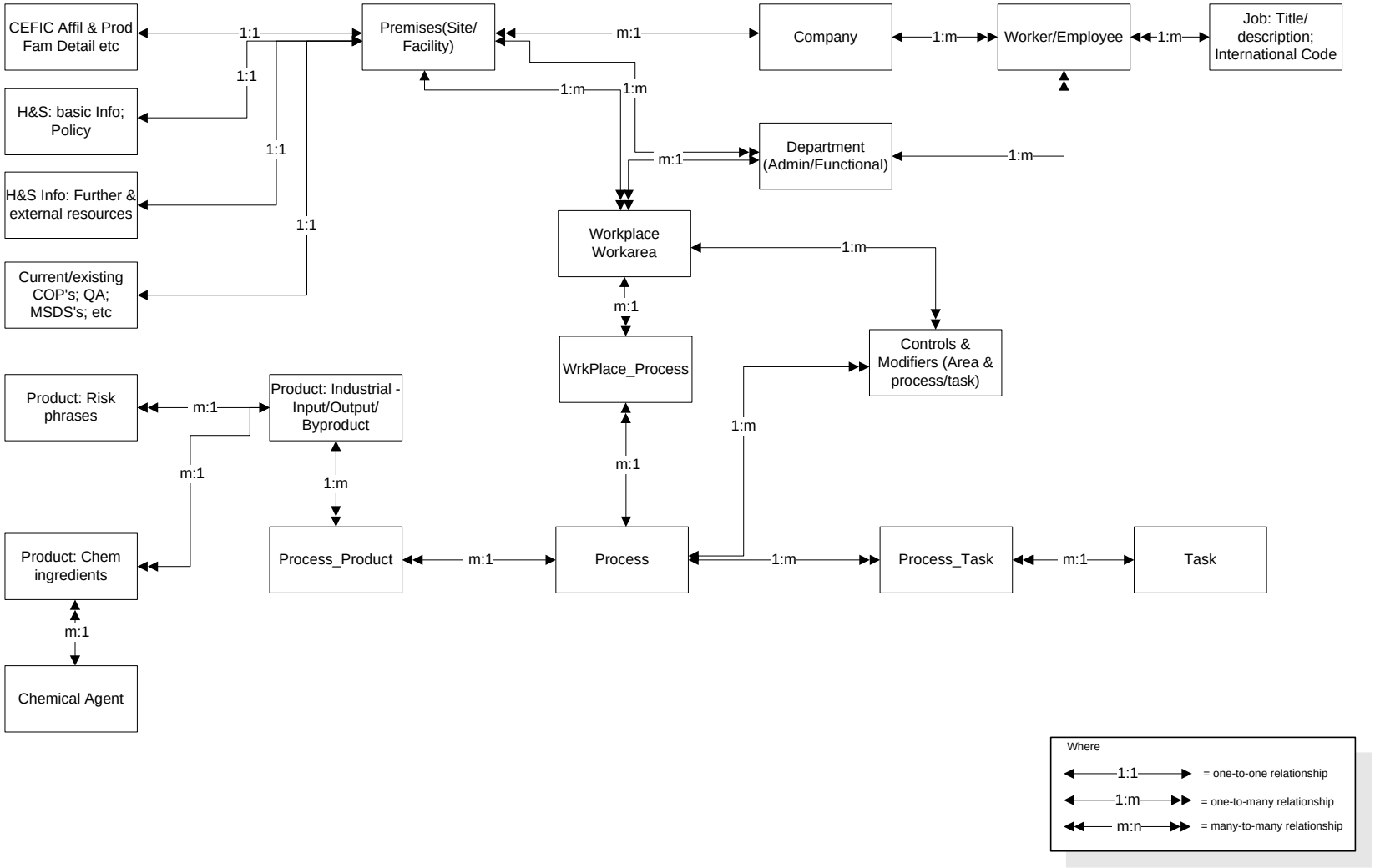

Figure A1.2: Company and premises level entity-relationship data model

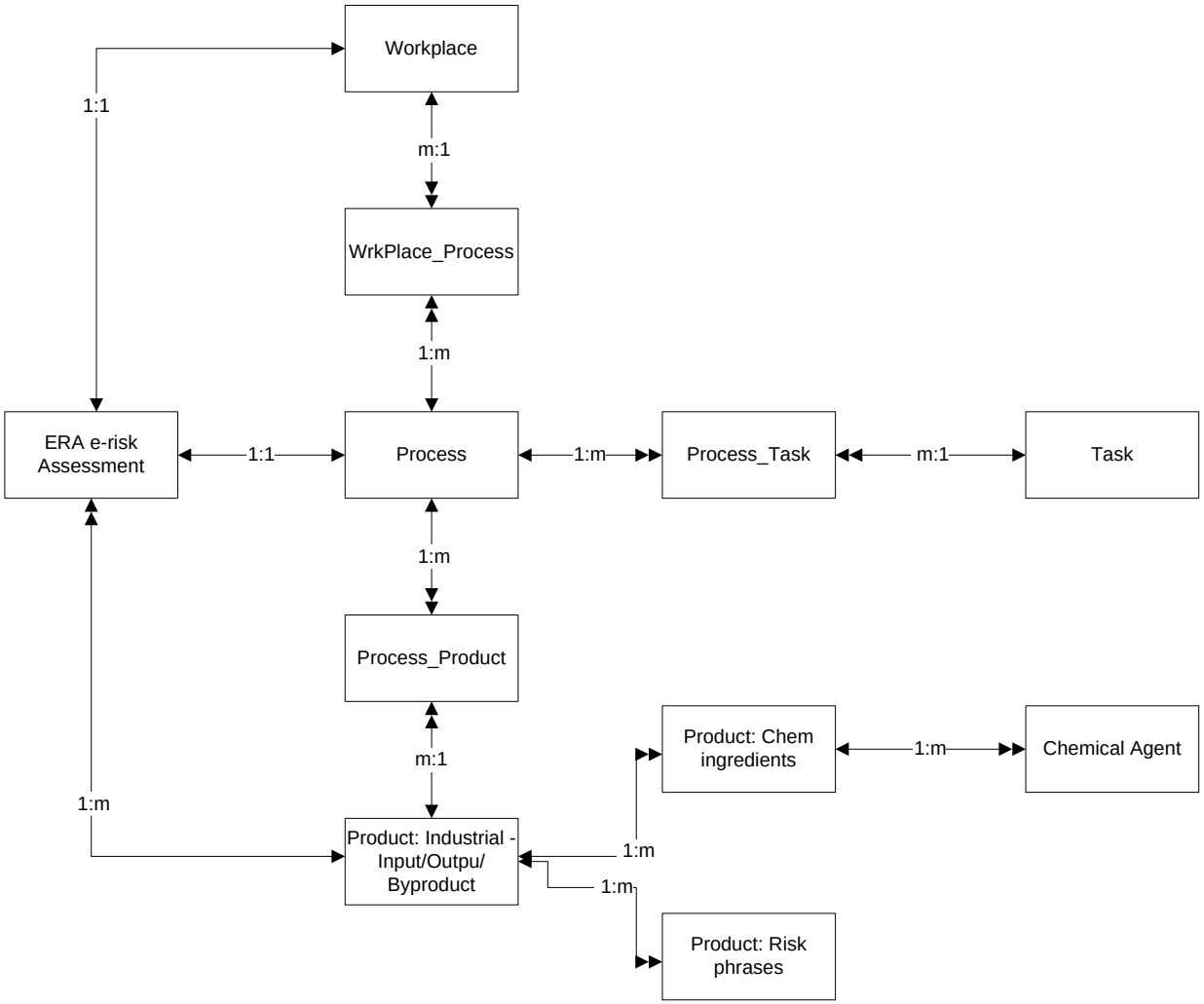

Figure A1.3:e-Risk Assessment level entity-relationship data model

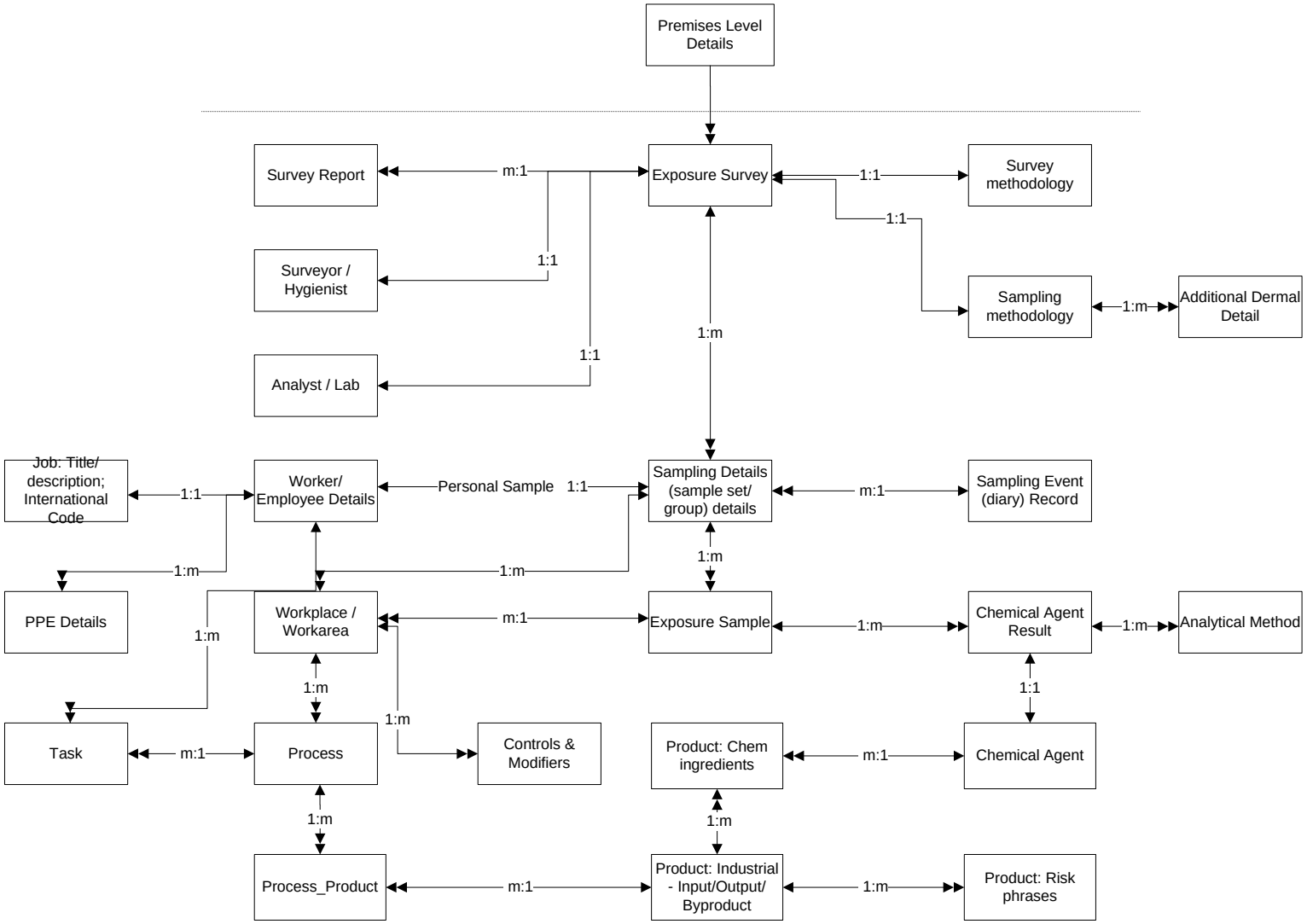

Figure A1.4: Exposure survey level view of key entities and relationships

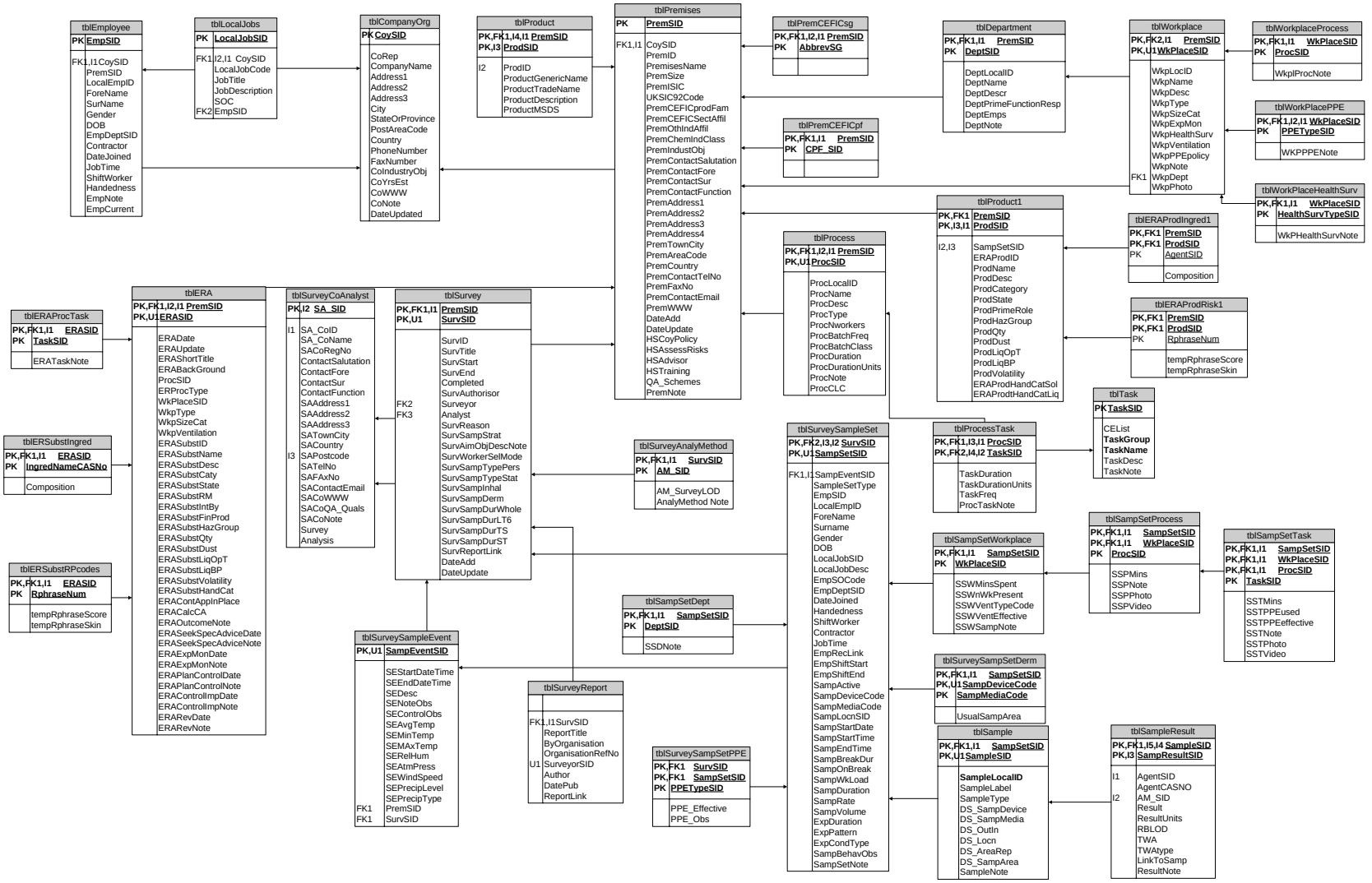

Figure A1.5: CEMAS Database physical model showing main data tables

APPENDIX 2: INITIAL DATA GATHERING RECORD AND FEEDBACK RECORDING FORM - FOR IOM/IRAS INITIAL VISIT AND INSTALLATION SETUP

CEFIC LRI – Development of CEMAS Database for Workplace Exposure

CEMAS user trial and evaluation: Initial data gathering record and feedback recording form

- For IOM/IRAS initial visit and installation setup

Contact details:

Name:	
Position or Job Title:	
Number of years in this Job:	
Company or organisation Name:	
Postal address:	
Telephone number for follow up contact/interview*: Please include country and area codes*	
Phone extension *(where relevant):*	
Fax Number:	
E-mail address:	
CEFIC Sector Affiliation or Organisation (where appropriate)	
CEFIC Product family (where appropriate)	
Notes on contact	

Section A: Background of Organisation and role/experience with exposure data

1. Please describe your particular role and responsibilities in your Job?

2. Do you have responsibility for, and/or make use of, workplace exposure data? (tick all that apply – tata)

Responsible for		Make use of	

2.1 IF YES: At what level? (Collector/ Administrator/ Analyst/ etc etc; directly/indirectly)

3.

What is the size of your company/organisation (n of employees):	Record (approx) actual number	Number:	Small (1-50)	
			Medium (51 - 100)	
			Large (101 – 500)	
			V Large (500 +)	

4. What is the Principal activity or business of your Company / Organisation (C/O)?

5. What are the principal product(s) of your C/O

6. Is your C/O (tick all that apply - tata)

A principal manufacturer/producer of chemicals	
And/or a secondary user of chemicals	
Other - please note	

7. Who collects your exposure data? (tata)

Self	
Company hygienist	
Contractor	
Combination of these	
Other - please note	

8. Does your C/O routinely gather industrial hygiene measurements of exposure to chemicals via :

Inhalation Exposure		Dermal Exposure		If no dermal, why is this?		Other types: Specify	

9. Do you have standard procedures and protocols, for example written guidelines and/or pro-formas for the collection, storage and processing of exposure data?

Procedures & Prototcols	
Pro-formas	
Others? Please note	

10. Do you have Quality Assurance standards or procedures that verify or validate your exposure data against, for example, a required core or minimum-set of mandatory data items, or that validates individual data items to agreed criteria?

YES		NO		Note methods or criteria	

11. Are you aware of currently existing, or any evolving, guidelines and recommendations for the collection and gathering and storage of (core &/or accessory) datasets for exposure data? (EU & US).

YES		NO	

12. Do you make use of these guidelines etc or any other recommendations? Which ones? If not - reasons? Discuss awareness & note/describe any used:

13 How are Occupational Hygiene / Exposure Measurements currently stored by your C/O? (tata)

Paper records/reports	
Computerised Health records	
Word processed lists/tables of data/results/report	
Spreadsheets / ad-hoc database of data results	
In-house produced Exposure Monitoring system/database(s) (Note package name)	
Commercial Exposure monitoring database/system (Note package name?)	
In other company Occupational or Health records system (Name?)	

14 Do you perform statistical analysis or compile statistical summaries of occupational exposure measurement data you collect?

YES		NO		Note:

15 If "yes", what is the reason for you to perform statistical analysis (*tick all that apply*):

Evaluation of compliance with regulatory limits (RL)	
Identification of exposure controls	
Documentation of trends in exposure	
Risk assessment	
Exposure assessment in epidemiological studies	
Hazard surveillance	
Other (please specify	

16. How are Occupational Hygiene / Exposure Measurements currently analysed by your C/O? (tata)

Excel	
Access	
Minitab	
SPSS	
SAS	
SYSTAT	
Others (specify nature and name of)	

SECTION B: Installation And Initial Running Of Cemas

1. Current version of Windows used:

2000		XP		Other OS.....

2. Current version of Office/Access used (if any)

97		2000		XP (2002)		2003		Other	

3. Was Access runtime module required/installed?

Yes		No	

4. Was system Installed from CD or “manually” from zip file or other supplied folders/source

CD		Other	

5 Did the CEMAS Database system install ok?

Yes		No	

***If NO**, what problems did you experience and how were these resolved? Make notes on setup*

6 After installation, did the CEMAS database operate OK in general?

Yes		No	

***If NO**, what problems did you experience and how were these resolved?*

7. After installation, Could the Help pages be located and navigated OK?

Yes		No	

***If NO**, what problems did you experience and how were these resolved?*

8. Other comments observations, suggestions or findings on the installation of CEMAS

SECTION C: System Overview and Demo –

These are some general instructions for IOM or IRAS visitor/interviewer:
Try to follow in general terms but it may be necessary to adjust detail to the circumstances and preferences of the user, and the time available

We will look briefly at some anonymised data that is currently entered in CEMAS to give a quick overview of its features and facilities. It should be kept brief to allow time for users own data to be entered next.
Give reminder that this is a prototype,not all of the functions or features are complete or 100% operational yet. We need the users input to refine and evolve the CEMAS application.

CEMAS accommodates one Parent Company or Organisation, that can have multiple Premises. Some data has been added for a fictional Company, that has one Premises. Following a quick inspection of the data, we will overwrite the fictional Company with your details, and add one or more new Premises for your purposes, with some of your own data. The fictional Premises can be left in the database so that you can experiment with the database and test out producing reports etc.

The following should be briefly visited using the demo data, and after that, using the users example data (that we have asked them to look out prior to the visit, (when we phoned to arrange the visit). Then with the user, based upon their details, enter a New Premises and some details for it; then do an e-risk assessment with their circumstances as an example, and add some initial exposure data.

Remember that further details on each of the areas outlined briefly below can also be accessed in the Help files.

A summary of the features to cover, as an “aide memoir”, so we are generally covering the same ground, is given below.

1. View of Company Organisation screen

Show Tooltips over fields
Use Help for screen
Standard navigation bar at foot of screen

2. View of Premises screens:

Main components & Tabs of Premises Details
Tooltips & Help
Standard navigation bar at foot of screen

CEFIC related info for members
Coding schemes – UK & International – adaptations can be made for national purposes
Departments – Administrative function – not geographical –
Processes – distinct set of operations/tasks to produce goods or services
Workplaces – physical locations where work and processes take place

Jobs and SOCs –Local definitions of jobs – can be classified by standard occupational codes – at moment uses UK standard but can be nationalised and internationalised. Jobs.

Employees: List of personnel, that can be referenced when collecting exposure data. Not mandatory to use - Employee List is shared across different Premises in the company

Reminder: NB that as this bank of background data built it can be referenced by the other data recording components, although they can also be added to incrementally, as required from other screens.

3. View of e-Risk assessment screens

Risk assessment approach Links to COSHH essentials concepts and algorithms.
Workplace and process based
Products and hazardous materials
Requirement fore MSDS info
Report and summaries

4. Exposure Survey Screens

Three Tiered Concept: Survey Planning and Management
Sample Sets (Groups of related samples);
sample types & single sample type within set
Samples and results
Reports and summaries and Data output

SECTION D: Adding some user data

Now using the users own example data, Change the Company Data, and add a new Premises

1. Add some Premises related data, at least One each of, Workplace and related process and task that can be used (referred to) in e-Risk and survey data entry.

Notes / observations on this process

2. Add an e-Risk Assessment, and produce a report for it

Notes / observations on this process

3. Add an exposure survey and some results

Notes / observations on this process

SECTION E: User reactions Installation and Demo Problem Log:

Please note below any particular problems encountered with different aspects of the CEMAS database. Add any suggestions for improvements made or arising over the visit. Add more general notes if a suitable category is not found below. These will be re-assessed, in some more detail, at the end of the user trial period.

As far as possible please assess/record the particular or general user reaction to the following aspects of CEMAS:

1. The intention, data coverage and data contents contents of the database

1a For company/organisation and premises level data

1b For e-Risk assessments

1c For Exposure survey data

2. The concepts, terms/definitions and coding schemes used in the database

2a For company/organisation and premises level data

2b For e-Risk assessments

2c For Exposure survey data

3. The coding schemes and coding methods used in the database

3a For company/organisation and premises level data

3b For e-Risk assessments

3c For Exposure survey data

4. The general navigation modes and facilities used in the database

5. The HTML help system used – its contents and navigation

6. Other notes or findings of the visit, the reaction of the user, problems encountered and ways in which the system could be improved.

Issue some problem log sheets to the user, with full contact details.

APPENDIX 3: CEMAS USER TRIAL: LOG SHEET FOR PROBLEMS, OR RECORDING OTHER REMARKS ON USE

CEMAS USER TRIAL: log sheet for problems, or recording other remarks on use

Please retain any completed record sheets and return with other materials at the end of the project evaluation period.

Contact Name: Organisation:

Date problem was experienced: (dd/mm/yy): / /

Which of the following areas was the problem related to?

- Installation ☐
- Documentation or help files ☐
- Data entry ☐
- Classification or coding scheme ☐
- Report generation ☐
- General navigation ☐
- other ☐

1. Please give details of the problem that you have experienced with CEMAS database: (Please continue overleaf if required).

2. Did you manage to resolve the problem yourself? Yes ☐ No ☐

If YES, *please give details below*

3. If you were unable to resolve the problem yourself, which of the following actions did you take?

- no action ☐
- contacted IOM or IRAS contact ☐
- contacted own company IT department ☐
- other (please give details) ☐

Did any action detailed in **3** above resolve the problem? Yes ☐ No ☐

Has this problem occurred previously? ☐ ☐

4. How often has this problem occurred? Please give approximate frequency ☐

Additional space for recording details of problem or remarks with CEMAS (continue on reverse if necessary).

APPENDIX 4: CEFIC LRI – DEVELOPMENT OF CEMAS DATABASE FOR WORKPLACE EXPOSURE - CEMAS USER TRIAL AND EVALUATION: RETURN INTERVIEW AND REVIEW FORM

CEFIC LRI – Development of CEMAS Database for Workplace Exposure

CEMAS user trial and evaluation: Return Interview and Review Form

Contact details – with further details from initial contact record form :

Name:	
Position or Job Title:	
Organisation	
Date of review	

(Cover page details can be copied-in from original visit record if required)

For IOM/IRAS Representative:- General Principles for Gathering Review Data On CEMAS User Trials

We are seeking to collect information on users feedback, comments and opinions on the application in general, and as far as possible, for each of the main user areas in CEMAS by gathering data on the following main aspects:

General appearance and layout

General data contents

Data items: their meaning, role, purpose, usefulness, appropriateness:
What data items should be added, or deleted, if any.

General functionality/utility of system

General usability / “User friendliness”
General navigation
Utility and functionality: does it have expected and sufficient features?
What functions or utilities should be added, supplemented or removed

Help system: was it used? Was it useful / helpful?

Did they add own real data, or just (or mostly) use/update the existing demo data?

If real data was added, if possible establish how many records at each of the relevant levels/areas, when they are visited in the relevant area below.

For those with appreciable numbers of records get a copy of the database from them for examination.

For those who have added data that demonstrates or reveals errors in the logic or functions in the interface or programming, please note the error and describe the problem (having also gathered any error or problem log sheets from the user) and get a copy of the database so we can examine it to fix the problem.

We may need some additional aspects for exposure survey users, differentiating on non – dermal & dermal users where applicable.

Make qualitative notes as necessary. Try to establish and record users own assessment but, if this is not easy then assessment may be aided by allowing the user to grade some of these aspects. If so then can we standardise on the use of very good, good, fair, poor, very poor.

Please note in the results/findings/feedback below any particular problems encountered within the different aspects of the CEMAS database covered in the sections Also add any suggestions for improvements made or arising through the course of the checklist. Add more general notes where a specific suitable category is not found in those below.

Assessment of main components of CEMAS

1 General CEMAS

Please assess as many of the following aspects of the CEMAS application, giving your own opinion in your own words.
(Encourage users own assessment and comments, but if not forthcoming could prompt and, if useful, use scale - (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad])

Were the aims and intentions of the CEMAS project and database tool, clear and well understood by you?
General appearance and layout of the application
Assess the general data coverage and data contents of the database, in relation to that required by your job and your company?
Data items: their meaning, role, purpose, usefulness, appropriateness:
What data items should be added, or deleted, if any.
General functionality/utility of system
General usability / “User friendliness”
General navigation

Utility and functionality: does it have expected and sufficient features?
What functions or utilities should be added, or removed
Were you satisfied with the application through general use? Please comment on how easy or otherwise it was to use the system overall.
The Help system in CEMAS / the CEMAS.info website: was it used? The Help files - their informational content and clarity. Their structure; Were they helpful / useful?
What particular problems or faults were encountered in using the application – have you any completed error / problem recording forms?
How could or should it interface with other related applications, if any (eg H&S, exposure or coshh systems etc. and for further reporting and analysis. Please provide any examples or suggestions.
Please provide any other overall/general suggestions as to how it could be augmented or improved.
If an updated CEMAS database were to be made available free to you or other users in the future, what factors do you think would make you decide to use it?

2 Premises A: Basic details, Contact details, Indl coding; CEFIC affili; ;H&S;QA

Did you Edit/add data? Y/N or View/edit demodata Y/N

If you edited and added Premises records, how many records: ……

Please provide observations and comments on the following. [Where helpful in making an assessment possibly standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad]

Aspect/feature	Feedback / comments or 5 point score
Data items – concepts terms and definitions: their meaning, role/ & purpose;	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

3 Premises B: Departments; Processes; Workplaces; Jobs; Employees

Did you Edit/add data? Y/N or View/edit demodata Y/N

If you edited and added records here, how many records: ……

Please provide observations and comments on the following. [Where helpful in making an assessment possibly standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad]

Aspect/feature	Feedback / comments or 5 point score
Data items – concepts terms and definitions: their meaning, role/ & purpose;	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

4 E-Risk Assessments

Did you Edit/add data? Y/N or View/edit demodata Y/N

Please provide observations and comments on the following. [Where helpful in making an assessment possibly standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad]

If you edited and added records here, how many records: ……

Aspect/feature	Feedback / comments or 5 point score
General appearance and layout	
General navigation	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Reports: please comment on the reports provided for E-Risk assessment data	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

5 Exposure Surveys

Did you Edit/add data? Y/N or View/edit demodata Y/N

If you edited and added records here, how many records: ……

Please provide observations and comments on the following. [Where helpful in making an assessment possibly standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad]

Aspect/feature	Feedback / comments or 5 point score
Data items – concepts terms and definitions: their meaning, role/ & purpose;	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Reports: please comment on the reports and data output facility provided for Exposure Survey level data And for the Sample and results level data	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

6 Exposure Survey Data - Sample Set Level: <u>Non dermal type</u>

Did you Edit/add data? Y/N or View/edit demodata Y/N

If you edited and added records here, how many records: ……

Please provide observations and comments on the following. [Where helpful in making an assessment possibly standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad]

Aspect/feature	Feedback / comments or 5 point score
Data items – concepts terms and definitions: their meaning, role/ & purpose;	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

7 Exposure Survey Data - Sample and results Level: <u>Non dermal type</u>

Did you Edit/add data? Y/N or View/edit demodata Y/N

If you edited and added records here, how many records: ……

Please provide observations and comments on the following. [Where helpful in making an assessment possibly standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad]

Aspect/feature	Feedback / comments or 5 point score
Data items – concepts terms and definitions: their meaning, role/ & purpose;	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

8 Exposure Survey Data - Sample Set Level: Dermal type (where used)

Did you Edit/add data? Y/N or View/edit demodata Y/N

Please provide observations and comments on the following. Where helpful in making an assessment please standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad))

Aspect/feature	Feedback / comments or 5 point score
Data items – concepts terms and definitions: their meaning, role/ & purpose;	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

9 Exposure Survey Data - Sample and results Level: <u>Dermal type</u> (where used)

Did you Edit/add data? Y/N or View/edit demodata Y/N

Please provide observations and comments on the following. Where helpful in making an assessment please standardise response to (**V**ery good, **G**ood, **F**air, **P**oor, very poor/**B**ad))

Aspect/feature	Feedback / comments or 5 point score
Data items – concepts terms and definitions: their meaning, role/ & purpose;	
Was General data contents and coverage for this area: sufficient?:	
Any data items to add	
Any data items to remove	
The coding schemes (& drop-downs) used and presented for the data	
Help files: Used?; Useful? ; If not, why not?	
Any other particular problems or faults encountered with this component of CEMAS	
Other comments/observations suggestions (good points/bad points) on this component of CEMAS (continue on back of this page if required)	

10. Record here any other notes or findings of the assessment , user reaction; other problems encountered; ways in which the system could be improved; etc.

Collect any completed problem log sheets from the user.

APPENDIX 5: FURTHER DETAILED COMMENTS, FEEDBACK AND SUGGESTIONS ARISING FROM THE USER TRIALS AND RECORDING SHEETS

The following listing incorporates the comments and feedback from the user trials recording sheets where they suggest revisions and improvements that could be made in the CEMAS software. It contains some additional information that that was mentioned by users but wasn't necessarily included in the results section of the main project report

Where appropriate the item may be followed by remarks or comments on the feasibility of the suggestion.

A5.1 GENERAL CONCEPT AND STRUCTURE OF CEMAS

A5.1.1 General structure and user navigation

- For users gathering data in the field it was suggested that subsets (child databases) of the main company databases (mother database) could be used to collect data in the field, then uploaded to the main database.
    - *Conceptually this concurs with the aim to make a central "hub" CEMAS DB that could import data from subsidiary satellite databases; analogous to chemical sectors "harvesting" data from member company databases (anonymous or otherwise)*

- Is it possible to make a specific **structure** per company that is added. For instance as a selection of different parts of the model (dept, process, work place etc) It is more orderly for people that work with CEMAS to recognize the structure of their company rather than choosing to skip or add parts of the model.
    - *This level of customisation currently – the relational database needs well established pre-defined structures upon which to operateand to maintain consistency; also consistency in formats and data required for objectives of checking and validation and for the production of standardised datasets*

- More attention should be given to **carcinogenic** compounds

- Is CEMAS useless when no **MSDS** is available?
    - *No - Some users perceived that sampling would not work when no MSDS is available – a method is required – MSDS are included by default but any other methods can be defined and added by the user; perhaps a default non or null method could be added as a default so that exposure data can be added even where the method is not (yet) specified*

- 'Even after working with CEMAS for quite some hours I still cannot understand the structure of the software' Because of all its possibilities, it will consume a lot of time to add data. For a non-experienced user it's not clear what data is really needed an what part is facultative I'm quite sure that a number of companies I'm working for would never work with a tool like this, it has too much impact and they probably won't see it overlap with their own situation
    - *See discussion in results section on data entry.*
    - *There is a large initial investment and smaller firms will find crossing this hurdle proportionately harder than larger companies*
    - *Also several additional variables, over and above the core required for exposure assessment, were retained in the interests of the epidemiological requirements of some of our colleagues – researchers who also have an interest in CEMAS. Also we could have removed some of the apparent complexity by more effective layering of the software and marking of mandatory and optional data fields, but unfortunately there were not sufficient*

software development resources to effectively do this without affecting the overall integrity of the software at that stage in the project.
    - *It was decided to allow the data items to be viewed so that the testers could see all of the existing data and related features, and so would be able to comment on them, favourably or otherwise.*
    - *More needs to be done to mark up core/mandatory and optional variables, and layer away some of the accessory information that is off-putting for early users*

- Suggestion that adapted CEMAS could be used as teaching tool for those training in exposure assessment

A5.2 DATA INPUT: ADDING USER DATA

A5.2.1 Company and Premises Level Data

- The purposes of **Jobs & SOCs** for employees was not really clear to Dutch users, based as it was principally on UK example. What can I do with this and how is it related to my data?
    - *Explanations were provided that highlighted that it was for personal exposure sampling, and that where necessary the relevant person data could be anonymised for confidentiality reasons.*

- Categorization of data with drop down lists was very well appreciated. For some of these it would be very useful to allow the user to amend/add to the list

- Search abilities for extended coding lists - CAS, Jobs, methods, etc, - very well liked; although ……

- When looking for certain compound in list, too many different choices
    - *CAS list is very long, covers the majority of compounds available, others wre impressed by its comprehensiveness, but could be reduced to more common core of compounds*

- Being able to see at a glance processes and tasks is very good, and being able to identify by ERA which are “out of control” is very useful

- It was suggested that some more information about PPE could be capture, to do with maintenance, face fit testing etc
    - *It would be feasible to add features to capture this*

A5.2.2 Exposure survey management

- Further attention was asked for in the areas of task and exposure group based sampling:

- Whenever a non-task based sample is taken how can this be added to a specific workplace? Workers tend to have multiple tasks/functions during the day. Samples are usually not taken per task but per shift. Maybe worker can make list of task performed during measurement, but than still no solution for task based results

- No homogeneous exposure groups can be added. For instance number of employees working in the same group. Concerning some national laws, samples have to be taken per SEG and not per individual. Same story for surveillance. Now worker is not connected to certain exposure group.

- *Consideration needs to be given to better defining and incorporating such sampling strategies and procedures – there were insufficient resources to include further permutations in this area in the prototype*

- Link between environmental sampling and biomarkers – biological monitoring – can this be included in CEMAS?
  - *This was agreed not to be included at this stage but is certainly an option for future versions; has also been requested separately by informal e-mail reviewers of the database, particularly those working in metal industry*

- Suggested use of Photos/videos for workplaces/processes/tasks recording –
  - *Photos yes definitely seen as useful/helpful additional info for recording items and context these items;*
  - *safety wise - impossible in some chemical manufacturers (contained) specialist workplaces and workplaces.*
  - *Video potentially useful but possibly overkill? would have time constraints to review*

- change results from measurements: better control of read and write editing suggested
  - *This ability should generally be added for all data entry forms*

- please add also microgram range in the result section; sometimes the unit milligram is not relevant. When added in mg range the field size on-screen is not wide enough

- possible to add fibres?
  - *Yes, but rudimentary; could be augmented for the appropriate parameters*

- Sampling time notation (xx;xx;x) is nonsense no one is ever noting the time that precise
  - *Caused by a formatting error that included too many digits*

A5.2.3 E-risk

- For Dutch users: a shortcoming of COSHH essentials is that only substances with R phrases can be used is known, but how many companies work with substances that all have R phrases? Majority of companies have to do with substances that have no R phrases. Still E-risk is a major component of in CEMAS?
  - *See also results section on this –*
  - *COSHH essentials (control banding) type approach deliberately chosen to be incorporated, to encourage updake and "lighter" entry point; used COSHH essentials algorithm as pre existing methodology – relies upon facts from MSDS via R phrases; approach still controversial/being debated by some, but does not purport to be able to cover all situations*

- Is E-risk a sensitive tool? User tried to adjust substance/compound and working time to find out how E-risk changed.

- General: since the Dutch system doesn't really require an ERA style assessment some users don't see the benefits of these assessments as integrated in E-risk in Nl.

- Whenever a user doesn't understand or is not used to the structure and features of COSHH essentials, E-risk can cause misunderstanding. For Dutch situation not many people know COSHH essentials

- Allow product categories list to be updated/added

- *Need to be itemised only as far as appropriate for the COSHH Essentials algorithm*

- Assessment needs vapour pressure for some compounds as in coshh essentials website.
  - *Should be added*

- Create new ERA from a copy of previous era and update/amend it to save much time. Lock ERAs to prevent accidental editing of old ones.
  - *Both suggestion should be added*

- UK educ user with many small risk assessments for many, relatively small scale, processes: Was viewed as very superior to HSE COSHH essentials as it stores the assessments long tem, tied the data together via key data items, and would provided for cross-cutting analysis over the organisation when sufficient data is added.

- Would be nice to get a good overview of the full dataset when performing a ERA. In the current model it is not transparent when a ERA is performed on what data this is based. To get more feeling with the data it would be nice to see the actual results of measurements that are worked with.
  - *Step wise implementation used to simplify stages of data entry, but summary overview could be added (effectively available in the report currently*

- Difficult to change existing E-risk?Difficult to remove/replace R-phrases?
  - *This is currently possible*

- How to categorize ERA situations where there is not even good natural ventilation? Can we account for this?
  - *Investigate COSHH essentials algorithm*

- E-risk might be too extensive especially for smaller companies. On the other hand other users see simple step wise approach as useful and not too overbearing – perception issue? Do you agree with control banding approach issue?

- Would it be possible to simplify by categorising more of the data the data into more drop down boxes where the value can be chosen from a list?
  - *The vast bulk of data is already collected in this way and the remainder quantitative data is particular and required for the algorithm to work*

- Some users reported that it would be useful to see better linkage between the product and substance data in different parts of CEMAS (ie its used for the ERA; and then also for exposure surveys). Like other attributes, could it be added once, say at the premises level, and referred to (& updated by?) the other areas where it is needed for exposure recording/assessment?
  - *It would be better to be stored centrally in appropriately linked records: this should be implemented and analysis and reporting can also benefit through the linkage between the three main areas in CEMAS*

- Make able to customize Processes for specialist purposes – eg “raw material charged to a reactor from a bulk tank”
  - *Is this another/new process, rather than a modified one*

- Can we link directly to manufactures safety data sheets via the web as this could considerable data entry, for ERA and Product info
  - *Conceptually yes – but needs to be investigated further for actual feasibility and availability and format of any information*

A5.3 OUTPUT: REPORTING AND ANALYSIS

- The Report format expected by the user is not the same in all occasions. There tends to be a need for different report formats in order to apply to the demands of different users.
    - *Can implement more standard appearance in reports formats, possible report wizard to select desired format and display*

- Like the reports, can save to pdf, ability to save to MS Word desired.
    - *Could be incorporated into more sophisticated version*

- Would like for users to be able to define their own reports
    - *Yes, for more sophisticated software version beyond prototype this could be made feasible*

- Import export and communicating data to downstream users? (viz communication of exposure scenarios in REACH where suppliers need to give info to downstream users. (and vice verse)) Can CEMAS be used for this?
    - *Not currently though right from the beginning this has been one of the longer term aims of CEMAS, particularly so that anonymised data would be transferable between different parties.*

- All UK users very keen on ability to transfer (or link well to) other related information from other (H&S) systems and msds data
    - *Related to the same aim of data transferrability. Propose that we look at of promotion of agreed standard for (at least core) exposure data and import/export specifications via xml, to link separate systems and databases*

- Calculation of overexposure is missed –
    - *IRAS propose SPEED for exposure calculations. Data can/should be exported to other packages, which can be done in prototype may be a need for definition and methods for summary calculations in CEMAS at level less sophisticated than SPEED. This would be implemented in the CEMAS or add on software.*

- Request for more aggregated reports across time – eg workers exposure over weeks months years; compounds and groups/families of compounds;
    - *Could be added to reports - theoretically possible if there is sufficient data to support it; corollary may be more data entry and maintaining linkage*

- Help needs to be made searchable

Needs to fit in with company's current IT systems, the further the better, if it were to be selected for future use; either integrated in some way, or with transferable/readable data formats.

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