PERSONAL COMPUTER SOFTWARE TOOLS FOR EFFECTIVE DATA MANAGEMENT OF ENVIRONMENTAL, SAFETY, AND HEALTH COMPLIANCE AT A REMEDIAL ACTION PROJECT

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ABSTRACT

The use of personal computers as effective tools in environmental monitoring and regulatory compliance is best demonstrated by an hands-on session with the software tools developed during conduct of the Weldon Spring Site Remedial Action Project (WSSRAP). Various software and data bases have been created at WSSRAP using personal computers for data management of environmental monitoring and compliance data. These include E.S.T. - "Environmental Systems Tracking", G.U.R.U. - "Generic Universal Reporting Utility", S.H.A.R.P. - "Safety, Health and Radiation Protection" which is a personnel training and participation records system, and W.I.T.S. -"Waste Inventory and Tracking System".

These practical database tools allow fast information access, flexible reporting formats (as compliance requirements change), and timely automatic notification of upcoming training or submittal needs. Using readily available applications software for personal computers, tailored programs are demonstrated on actual remedial action project databases. Specific examples include:

- Tracking of a mixed waste environmental sample all the way from collection through analysis and reporting with invoice payment authorization (EST and GURU).
- Training refresher documentation for 40-hour OSHA (29CFR1910.120) requirements, personnel dosimetry, and medical surveillance results on a typical radiation worker handling mixed waste at a NPL site (SHARP).
- Disposition and reporting requirements for capacitors containing PCB dielectric oil and exhibiting surface radioactivity in excess of releasable limits (WITS).

INTRODUCTION

Regulatory compliance concerns cross many inter-disciplinary boundaries at Department of Energy (DOE) facilities across the country today. Specific areas which have received great scrutiny within the last year include compliance with RCRA and TSCA waste management laws, Occupational Safety and Health Administration (OSHA) training requirements for personnel working with hazardous substances, and Comprehensive Environmental Resource Compensation Liability Act (CERCLA) characterization guidelines for RI/FS environmental documentation needs. While originally focused on operating facilities, these concerns extend to remedial action projects which DOE is conducting as well. At the Weldon Spring Site Remedial Action Project (WSSRAP), a number of practical database tools have been developed to help track compliance with these complex and extensive regulatory requirements.

To facilitate compliance demonstration and reporting under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA), and to meet the requirements of the DOE Order 5820.2A, a database structure and program named WITS (Waste Inventory and Tracking System) have been developed. This application allows the project to inventory multiple waste classes including such diverse media as containers, contaminated soil, or even contaminated structural material. Information about the waste itself is also tracked with analytical results from samples, waste volumes, storage disposition and even location on the site readily available.

Because of the complexity of training, monitoring, and certification involved in the health and safety aspects of hazardous and low-level radioactive waste handling, a database structure and program called SHARP (Safety, Health, And Radiation Protection) was developed and is in use at the WSSRAP. Results from external and internal dosimetry analyses, medical monitoring results, training status (radiation worker, 40-hour OSHA hazardous material worker, first aid, etc.) and worker limitation information are tracked and reported through the use of interactive menus.

Several requirements exist for rigorous data verification and validation programs at DOE remedial action sites. The Environmental Protection Agency (EPA) has issued general recommendations in their "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA/540/G-89/004). In addition, DOE Order 5400.1 also calls for formal verification and validation. These requirements along with the large and varied database of analytical sample results from characterization activities, led the project to develop a database structure

and two programs called GURU (Generic Universal Reporting Utility) and EST (Environmental Sample Tracker).

EST allows timely inventory of analytical sample status from collection through receipt of laboratory results and even invoice payment authorization. GURU is an information extraction tool which allows users to extract complex arrangements of sample data from the large and varied database. It allows multi-parameter sorting and correlation. GURU is primarily used by engineers and scientists involved in interpreting the analytical results from characterization efforts.

Each of these databases and program capabilities are discussed in the following sections.

WASTE INVENTORY AND TRACKING SYSTEM (WITS)

The fundamental purpose behind development of WITS was the goal to accurately identify and track waste or contaminated materials through all phases of the remedial action project. This ability is essential to support waste control efforts and for project planning and assessment.

During the project, accurate data will be required to support interim activities such as decontamination, storage, transport, etc. Additionally, the data will be required to support the RI/FS process on key issues of waste treatment and disposal. Because of the detailed inspection through RCRA and TSCA compliance audits that the project is likely to receive, a computerized system was also needed to facilitate the audit process. At the conclusion of the project, data will also be required as a basis for assessing the overall project performance.

Throughout any remedial action project, waste materials will be subjected to activities such as consolidation, treatment, storage, and transfer. As a result, both material quantity and location can be expected to continually change. Therefore, the WITS is designed to easily determine these parameters. In support of assessing final project performance, WITS also allows summaries of individual activities (e.g., history of storage, containment, spills, treatment, and off-site shipping and destruction of a group of waste chemicals found during remedial action).

Specific parameters required for material inventory and control:

1. Initial Material location

a. Grid map designation (e.g., AY30)

b. Material origin (e.g., equipment from Building 409)

c. Drum ID (if containerized) or sequential number

d. Accumulation date at the origin

2. Material Description

a. Primary description category (e.g., chemical, radiochemical, wood, concrete, etc.)

b. Secondary description category (e.g., slab, liquid, etc.)

c. Class (e.g., acid, base, piping, etc.)

d. Subclass (e.g., HNO3, TBP, etc.)

3. Material Quantity or Volume

4. Material Contamination

a. Specific contaminant parameters (e.g., Nitrate, Uranium, etc.)

b. Concentration or activity

c. Units of measurement

5. Waste Type (e.g., TSCA, RCRA, Mixed)

a. EPA Hazardous Waste Number (if RCRA waste type)

6. Source of Information

a. Engineering estimates

b. Laboratory analyses

Specific parameters required for the material tracking ledger are:

a. Current location

b. Transfer date

c. New location

d. Quantity transferred

e. Manifest

f. Transaction type (e.g., consolidation, disposal, etc.)

The WITS utility is extremely dependent on the timely and accurate entry of information. Therefore, the primary mechanism for providing input to the database is through the site operating procedures. These procedures have a data entry component built into each one:

- On-site material transfer
- Waste handling
- Excavation control (both radiological and chemical)
- Material stockpiling
- Structural dismantlement
- Waste analyses
- Off-site material release

WITS allows the PMC at the WSSRAP to track all wastes and associated contamination at the WSSRAP from origin to its final disposal. It provides reporting formats which range in scope from broad information about all

materials that are radiologically contaminated to narrow information about a single piece of equipment.

WITS users can select a specific contaminant, determine the original locations, all intermediate storage locations, and the final disposal sites of that contaminant. In addition, users are able to select a specific location or building and determine what contaminants were present at that site and the current disposition of the materials associated with that contaminant.

Plans for WITS improvement call for the ability to sort and identify materials and areas by waste types. It will be possible to look only at the chemical wastes, or the radioactive wastes, or select regulated wastes by waste classification (TSCA, RCRA, etc.).

SAFETY, HEALTH, AND RADIATION PROTECTION (SHARP)

Regulatory requirements for health and safety protection of workers involved with remediating hazardous and radioactive materials have been in constant change over the last several years. Probably the most significant driving force behind this evolution was the passage of SARA (Superfund Amendments and Reauthorization Act) in 1986. This legislation required OSHA to promulgate training and exposure requirements for all workers involved in remedial actions under CERCLA. Other changes include hazard communication (29CFR1910.1200), dosimetry (DOE Order 5480 Chapter 11), and medical surveillance (29CFR1910.120).

During the life of a remedial action project, literally thousands of different subcontractor workers may be involved in various stages of the clean-up or treatment effort. Keeping track of the status of worker training, documenting fitness for duty (e.g., respiratory protection certification), and reporting exposures to both radioactivity and chemical agents requires use of a computerized database. At the WSSRAP the SHARP system provides a total inventory and tracking method which performs all of these functions.

The purpose of the SHARP system is to allow health and safety staff the ability to track the constantly changing status of training and certification of all project workers. It also provides a means of consolidating all health and safety information about each individual into a single database. This makes periodic exposure reporting simple and consistent across the project. The SHARP system also alerts the health and safety staff as an individual's refresher training becomes due.

Specific parameters required for the SHARP system are:

1. Employee Profile:

a. Employee full name

b. Social Security No. (Key Field)

c. Date of Birth

d. Company or Organization

e. Class (Subcontractor, Project Management, Field Technician, Temporary)

f. Employment Status (Active or Inactive)

g. Employment Dates

2. Employee training requirements and dates of participation:

a. Safety (Safety orientation date and updates)

b. Hazard communication program (orientation and updates)

c. Personnel protective equipment usage requirement training

d. Hazardous waste training (Forty hour OSHA)

e. Medical Surveillance program (Baseline physical/exit physical exam dates)

f. Medical history and restrictions

g. Asbestos removal and sampling training program

h. First Aid and CPR training (initial and updates)

i. Radiation protection program External Dosimetry (baseline and quarterly dosimeter issue dates and analysis data) Internal Dosimetry and Bioassay (baseline and annual)

3. Radiation dose calculation

Year-to-date and lifetime deep and shallow dose calculation

The following is a list of reporting capability which is built into the SHARP system:

1. Bioassay dose history

2. Dosimetry (TLD) dose history

3. Employee training status and scheduling report

4. Employee physical exam scheduling report

GENERIC UNIVERSAL REPORTING UTILITY (GURU)

The database resulting from a complex characterization effort performed in support of the CERCLA process is extensive. Sampling programs typically require months to complete with the acquisition of hundreds and even thousands of samples for multiple media (e.g., surface water, groundwater, soil, sediments, wastes, biological species, etc.). Each sample may then have tens or more associated analytes. When multiple operable units are characterized simultaneously, the task of interpreting the information becomes immense.

To provide scientists and engineers at the WSSRAP with a tool to interpret the results from the environmental and waste characterization database in a user-friendly fashion, GURU was developed. It was designed to allow easy access while providing necessary security to the data integrity.

GURU offers a user-friendly interface to the data via pop-up light bar menus and simple one word responses to the software prompts. The user need not know the database programming system in order to effectively access any information needed. Through the system of prompts and menus, GURU features user-defined search criteria which enables the scientist or engineer to easily query the database to view or access data. Searches may be performed on any combination of sample location, date sampled, analyte, or analyte concentration.

GURU was designed to provide data security. Unlike most commercial database programs, all file access through GURU is "read-only". The protected database cannot be modified. Password access requirements are optional.

After a user has defined the search criteria, GURU requests definition of the output format. The user has the option of obtaining any or all fields in the database indexed to the requested information. Data may be output in several different forms. The requested data may be directed to other databases (original or tabularized format), to spreadsheet input format files, or to a direct ASCII file. In addition, hard copy output may be directed to several different printers (including laser).

The GURU has the built in ability to do descriptive statistics on the user selected data set. This allows the users to calculate the basic minimum, maximum, mean, and the standard deviation on the selected data set.

Plans for GURU improvements call for the ability to graphically interface with several popular computerized drawing programs. This will allow direct posting of information extracted by GURU onto graphics displays of maps, contours, etc. Another improvement currently under development consists of the ability for automatic identification of outliers.

The structure of the database file structure used in the GURU data management system is presented in Table I.

ENVIRONMENTAL SAMPLE TRACKER (EST)

The WSSRAP sends many shipments of many samples to several laboratories to be analyzed for multiple parameters. Because of the expense of most laboratory analyses,

TABLE I
GURU Database File Structure

Field	Field Name	Width	Description
1	WSSRAP_ID	30	Sample ID
2	LAB_ID	9	Laboratory Sample ID
3	DATE_SAM	10	Date sample collected
4	DATE_EXT	10	Date sample extracted
5	DATE_ANA	10	Date sample analyzed
6	METHOD	12	Method used
7	MATRI	15	Sample matrix (Groundwater,etc.)
8	PARAMETER	30	Analysis parameter (Nitrate,etc.)
9	CONC	12	Concentration/Activity
10	ERR	5	Measurement uncertainty
11	UNITS	7	Unit of measurement
12	DL	9	Method detection limit
13	CATEGORY	16	General category (Metals,, Nitroaromatics, Anions, etc.)
14	COMMENTS	30	Comments
Total		206	

precise accounting is necessary. There are also numerous cost accounts that different samples must be tracked against. It is not uncommon to have many samples under different cost accounts being sent to multiple laboratories on the same day.

To serve as an accounting function for this activity, EST was developed. It is designed primarily to perform accruals and to track sample inventories. Costs may be tracked according to specific cost account, by individual laboratory, or as total cost by month or cumulative to date. Currently, improvements are being planned to include tracking of sample status. EST was written in a common database programming language and was designed to be user-friendly so that the user need not understand programming details in order to effectively track samples.

As samples are collected, prepared, and sent to the laboratories for analysis, information about each sample and shipment is entered into EST. This data includes the sample identification as well as the requested analyses. Using this basic information, several inventory and accrual reports in different formats may be generated.