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A DATABASE FOR LOW-LEVEL RADIOACTIVE WASTE DISPOSAL SITES

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ABSTRACT

A computerized database was developed to assist the U.S. Environmental Protection Agency (EPA) in evaluating methods and data for characterizing health hazards associated with land and ocean disposal options for low-level radioactive wastes. Information is included on low-level waste as defined in 10 CFR 61, on mixed radioactive/toxic waste, and on naturally occurring and accelerator-produced radioactive waste (NARM). The data cover 1984 to 1987. The types of sites considered include Nuclear Regulatory Commission (NRC) licensed commercial disposal sites, EPA National Priority List (NPL) sites, U.S. Department of Energy (DOE) Formerly Utilized Sites Remedial Action Project (FUSRAP) and DOE Surplus Facilities Management Program (SFMP) sites, inactive U.S. ocean disposal sites, and DOE/Department of Defense facilities. Sources of information include reports from EPA, the U.S. Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC), as well as direct communication with individuals associated with specific programs.

The database, LLWASTE, was developed using R:BASE for DOS, a relational database program with an extensive capability for applications programming. The database consists of seven interrelated tables, each comprising a logical grouping of information and related to other tables by one or more key columns (variables). The data include site descriptions, waste volumes and activity levels, and physical and radiological characterization of low-level wastes. Additional information on mixed waste, packaging forms, and disposal methods were compiled, but are not yet included in the database.

Although LLWASTE was compiled from existing data, it is unique in the variety of information it includes in a computer medium which permits easy and rapid data manipulation. Its potential uses include classification and sorting by various criteria, such as radionucide or source type, preliminary scenario identification for risk assessment efforts, and background information for planning and decision making.

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1 TASK DESCRIPTION

The U.S. Environmental Protection Agency (EPA) is evaluating methods and data to characterize health hazards associated with land and ocean disposal options for low-level radioactive wastes (LLW). As part of this effort, the objective of this task was to collect information on sites in the United States where LLW problems exist due to activities at commercial, industrial and federal installations, as well as on sites where LLW wastes were deliberately placed. In this context the types of sites considered include Nuclear Regulatory Commission (NRC) licensed commercial disposal sites, EPA National Priority List (NPL) sites, U.S. Department of Energy (DOE) Formerly Utilized Sites Remedial Action Project (FUSRAP) and DOE Surplus Facilities Management Program (SFMP) sites, inactive U.S. ocean disposal sites, and DOE/Department of Defense facilities.

Information on waste volume, activity level, and physical and radiological characterization were sought for each site. These data were derived from agency publications and direct contact with program managers and other knowledgeable individuals. This information was then extracted and incorporated into a computerized database. This report describes the sources of information, the structure and content of the database, possible uses of the compiled data, and suggested future efforts to improve the quality and usefulness of the database.

2 DATABASE DESCRIPTION

2.1 Scope of the Database

2.1.1 Definition of Low-Level Waste

The basic definition of LLW used to circumscribe the low-level waste disposal database (LLWASTE) follows 10 CFR 61.2 (NRC 1988). The definition includes radioactive wastes containing source materials, special nuclear materials, or by-product materials that are acceptable for disposal in an NRC-licensed land facility. The definition excludes high level waste, spent nuclear fuel, by-product material specified as uranium or thorium tailings and waste, and TRU waste (waste material contaminated with alpha-emitting radionuclides with atomic numbers greater than 92 and half-lives greater than

20 years in concentrations exceeding 100 nCi/g). Retrievable inventories of TRU stored since 1970 are currently being sampled and characterized. It is estimated that 38 percent (35,800 m^3) of stored TRU can be designated as LLW (ORNL 1988).

In addition to LLW as defined in 10 CFR 61, LLWASTE includes limited information on mixed waste and on NARM. Mixed wastes are those which contain radioactive materials and other materials identified as hazardous according to 40 CFR 261 (NRC 1988) or which can enhance migration of radionuclides into the environment. NARM refers to naturally occurring and accelerator-produced radioactive wastes.

2.1.1.1 Mixed Waste. Interim storage and shallow land burial of mixed waste at commercial disposal sites is now prohibited or closely controlled (e.g., South Carolina 1987, Amendment No. 44). However, this was not the case in the past, and former disposal practices are now creating new disposal problems (for example, the inactive Maxey Flats site is now on the NPL). Site-specific quantitative data on mixed waste generally have not been included in the database, because the data obtainable within the scope of this task tend to be either outdated or limited in scope or detail. Some dat. sources for remedial action sites included limited information on the presence of mixed waste, but estimates of amounts or concentrations of hazardous constituents were not available. Some general comments on mixed waste at commercial and DOE sites follow; possibilities for supplementing the mixed waste information in the database in the future are discussed in Sec. 4.1.1.

A survey of major LLW generators was recently carried out in order to establish a preliminary database on the quantities and characteristics of mixed waste at commercial low-level waste disposal facilities (Bowerman et al. 1985). As an adjunct a document review was carried out using disposal records published reports (Bowerman et al. 1986). The database and accompanying reports are discussed in greater detail in Sec. 4.1.1. Two main sources of potential concern were identified.

One concern was organic solvents, especially liquid scintillation wastes, which contain toluene and/or xylene. Two of the three currently operating commercial disposal sites no longer accept these wastes (Nevada 1985; South Carolina 1987), and stringent packaging requirements have effectively forced generators of such wastes to seek alternative disposal methods, such as

incineration (Bowerman and MacKenzie 1988). Data are available for amounts and activities of commercially disposed scintillation wastes for earlier years, but no data were found for the 1984-1987 period covered in the database.

The second concern cited was lead, either in contaminated shielding from power plants or in containers from other commercial generators of LLW. It was not possible within the scope of this task to segregate these waste elements from the other data.

Specific information on quantities or characterization of mixed waste at DOE/Defense sites was not obtained. While public concern is now focusing on problems of hazardous and radioactive waste disposal at these sites, compiled data are not yet available. DOE published a preliminary environmental survey report (DOE 1988) describing waste disposal problems at its defense production facilities, indicating known or suspected environmental contamination from disposal of mixed wastes exists in at least 13 of the 16 facilities surveyed. At least one DOE site, Hanford, is currently not accepting any mixed waste until a new disposal facility is completed, in 1992 at the earliest (Day 1988). Facilities which formerly shipped mixed waste to Hanford must store their waste on site until that time.

2.1.1.2 NARM. In addition to the radioactive wastes which are created during the operation of particle accelerators used in physics research, NARM wastes range from residual solid wastes from mining operations and various industrial processes to discarded aircraft dials and imported ceramic dinnerware. NARM is classified as diffuse or discrete.

- The occurence of diffuse NARM wastes is often geographically dependent, related to the amounts of radionuclides occurring naturally in groundwater or subsoils. These wastes tend to be difficult to quantify, though they are frequently characterized as being high volume, low activity materials. Examples include fly ash from the burning of some types of coal and building materials incorporating naturally radioactive substances. The wastes are not necessarily associated with particular disposal sites. However, some remediation efforts, such as Superfund and FUSRAP projects,

deal with cleanup of site-specific diffuse NARM wastes; NARM at these sites is included in the database.

- Discrete NARM wastes are considered to be either collectible or noncollectible, according to whether or not they can effectively be segregated from general waste streams for disposal in regulated LLW facilities. Discrete, collectible NARM wastes, such as radium-containing instruments and some water-treatment resins, are usually disposed of at commercial burial sites. These wastes are included in the data tables for commercial LLW and are also characterized separately as NARM. Discrete, noncollectible NARM wastes include widely dispersed consumer goods such as radium-dial watches, fluorescent lamps, and some smoke detectors. Often consumers are unaware that these items contain radioactive materials. This type of NARM is not disposed of as LLW.

No data specifically characterizing accelerator waste products were found; however, these wastes are included in the data for commercial disposal sites.

2.1.2 Sites

The database is oriented toward waste disposal. Therefore the focus is on currently active and formerly used disposal sites. These sites can be divided into two major groups: disposal sites and remedial action sites.

2.1.2.1 Disposal Sites. There are two types of disposal sites for land burial of LLW: licensed commercial sites and DOE/Defense sites.

- Commercial Sites. Commercial sites are licensed by the NRC to receive wastes generated by medical laboratories and hospitals, academic and research institutions, industry, utilities, and some non-DOE government facilities. About 60 percent of the waste received at commercial sites comes from commercial nuclear fuel cycle facilities (ORNL 1988). Of six licensed disposal sites, three are currently active: Barnwell, SC; Beatty, NV; and Richland, WA. Two of the inactive sites, Maxey Flats, KY, and West

Valley, NY, are undergoing remediation. All six sites are included in the database.

- DOE/Defense Sites. DOE/Defense sites dispose of LLW generated on-site and also receive waste from other DOE and Department of Defense (DOD) facilities, including those with inactive disposal areas. Six DOE/Defense sites are responsible for disposal of over 98 percent of DOE/Defense low-level waste: Idaho National Engineering Laboratory (INEL), ID; Hanford Reservation, WA; Savannah River Plant, SC; Los Alamos National Laboratory, NM; Nevada Test Site, NV; and Oak Ridge National Laboratory, TN. In the past some DOE/Defense LLW was disposed of by ocean dumping or by hydrofracture. These currently inactive sites are also included in the database.

2.1.2.2 Remedial Action Sites. Remedial action sites, which will be future sources of LLW, are also included in LLWASTE. Some of these sites may also generate LLW, which enters on-going disposal streams. Waste from remediation activities at these sites is considered separately in the database. Some remediation wastes will be disposed of at the project sites, while some will eventually reach commercial or DOE disposal sites. Where possible, anticipated disposition of remediation wastes is included in the data for these sites. The database contains four types of remediation sites.

- FUSRAP (Formerly Utilized Sites Remedial Action Project) was created in 1974 to identify, characterize, and clean up former MED (Manhattan Project) and AEC (Atomic Energy Commission) sites. Other sites not necessarily connected with MED/AEC activities subsequently were included. Remediation has been completed at nine of the 29 identified sites and is partially complete at six others.

- SFMP (Surplus Facilities Management Program) encompasses surplus DOE-owned, civilian-administered facilities which are radioactively contaminated. These include many types of facilities, such as laboratories, research reactors, and storage tanks. About 75 percent of SFMP LLW is expected to come from the Weldon Springs

site in Missouri, which also has been listed on the NPL. Although about 100 facilities are included in the SFMP, decontamination has been started at only 10 (ORNL 1988) and information is not available for most of the other sites (Murphie 1988).

- Defense Decontamination and Decommissioning (D&D) sites comprise seven locations and approximately 220 separate facilities declared as surplus and owned by DOE. These sites were formerly classified as SFMP/Defense sites, but since 1987 they have fallen under the administration of the DOE Environmental Restoration (ER) Program (Pearson 1988). Defense D&D facilities include production reactors, pipelines, and waste treatment systems. About 40% of the anticipated D&D LLW is expected to be uranium mill tailings and contaminated soils from the Grand Junction (CO) Project Office site (ORNL 1988).

- Superfund sites in this database are the 20 sites on the EPA National Priorities List (NPL) which contain man-made radioactive wastes. As of December, 1987, remedial investigation and feasibility studies had been completed on eight sites and were in progress at seven others (EPA 1988c). Some FUSRAP and SFMP sites are also Superfund sites.

2.1.3 Time Frame

In accordance with the task description, LLWASTE is concerned with the current disposal situation, providing a static perspective of LLW volumes, characteristics, and disposal problems. The most recent figures available are used; average or typical figures are based on data from 1984-1987, where available. Annual volume and activity data are included for three contiguous years for principal disposal sites. Projections are not included except for data for remediation projects, which are usually reported as estimates of future waste volumes from a site (Sec. 2.1.2.2). Anticipated LLW from future decommissioning of commercial reactors and fuel cycle facilities is not included in the database. In the future LLWASTE may be expanded to include projected inventories from ongoing and decommissioning activities (discussed in Sec. 4.2.1).

2.2 Data Sources

Three main agencies are responsible for the collection of these data: the Nuclear Regulatory Commission (NRC), the Environmental Protection Agency (EPA), and the Department of Energy (DOE). In particular, DOE's Integrated Data Base (e.g., ORNL 1985, 1987, 1988), produced annually by Oak Ridge National Laboratory, is a valuable compilation of information from both published and original sources.

Some data were obtained directly from individuals associated with specific programs. These data cover commercial disposal sites (A. Tyron-Hopko, EG&G Idaho), Defense D&D sites (R. Miller, Westinghouse Hanford, and R. Freeberg, DOE), and FUSRAP sites (J. Beck, Bechtel, and J.F. Wing and J. Wagoner, DOE).

2.3 Structure of the Database

LLWASTE was developed using R:BASE for DOS (Microrim 1987), a relational database program with an extensive capability for applications programming. The database itself consists of seven interrelated tables, each comprising a logical grouping of information, and related to other tables by one or more key columns (variables). Each table also includes a reference to the source(s) of the data in the table and a text note for descriptive or qualifying information. The exception to this is the isotope table, since all data in that table are from a single source (NNDC 1987).

Since data from different sources were often given in different units, the data tables also have a column for UNITS, so that the original data values can be retained, while allowing subsequent standardization through programming or generating reports in the database software.

2.3.1 Tables

Contents of each table in the database are described below. A detailed description of each data table (all tables except BIBLIO) is given in Appendix A. Examples of each data table are shown in Appendix B.

2.3.1.1 SITEID. Keyed by site and type, this table is a basic description of each site, including its location, type of site, accumulated volume and activity through 1986, and, where relevant, areal capacity and area used (disposal sites) and depth and distance from land (ocean sites). Types of sites include commercial disposal, DOE/Defense disposal, ocean disposal, SFMP, Superfund, and FUSRAP sites. NARM is also included as a type, though it is not strictly a site. Some types are also subdivided into categories or subtypes, including various sources of waste shipped to commercial disposal sites, classes of NARM, and the subcategory of Defense D&D sites.

2.3.1.2 ISOTOPES. Keyed by radionuclide, this table includes radionuclide, mass number, proton number, decay constant, and half-life.

2.3.1.3 RADCHAR. Keyed by site and type, this table describes the typical or average LLW for a given site or type by activity levels or sources of activity (e.g., fission, induced).

2.3.1.4 PHYSCHAR. Keyed by site and type, this table describes the typical or average LLW for a given site or type by physical characteristics (e.g., biological, sludge, dry compressible). The presence of mixed waste is also shown in this table.

2.3.1.5 NUKES. Keyed by site, type and radionuclide, this table contains the concentrations or average amounts of isotopes by various categories, including activity sources, generating sources, or environmental areas (e.g., soil, groundwater).

2.3.1.6 YRDATA. Keyed by site and type, annual amounts of disposed waste are given, both as activity and as volume. Waste is broken down by source type, state of origin, and NRC waste class.

2.3.1.7 BIBLIO. Keyed by the abbreviated references (data sources) given in the data tables, this table contains the full reference listings. Some references were consulted but did not yield numbers for the database. These are included for completeness. A listing of references actually used can be compiled from the various data tables.

2.4 Current Status

2.4.1 Content

Because the database represents a collection of information from different sources, not all data columns are complete for all sites, nor are all sites represented in every table. Specific information included the database is summarized by table:

2.4.1.1 SITEID. Currently 112 sites are included. However, some of these are duplicates because a site may be listed twice as two different types, as a DOE site and an SFMP site, for example. For some remediation project sites, one facility may include several distinct locations (e.g., a contaminated building and a former landfill); data for these are grouped by facility as one site. There are 92 unique sites, including "other DOE," which encompasses DOE sites responsible for less than 1% of total annual DOE LLW, and "N/A," a place-holder for cases where data are given for a site type or waste type rather than for individual sites. Appendix C summarizes the sites included in LLWASTE.

2.4.1.2 ISOTOPE. A total of 2641 isotopes are included.

2.4.1.3 RADCHAR. Includes 44 sites, including NRC licensed disposal sites, DOE and FUSRAP sites, five Superfund sites, and two SFMP sites. Commercial disposal sites are broken down by subtype. Ten different units are used, including percentages, volumes, and activities (Ci, m^3).

2.4.1.4 PHYSCHAR. Contains 75 sites and six site types (commercial, DOE, FUSRAP, SFMP, Superfund, and NARM). NARM is subdivided into six waste streams; commercial waste is broken down by source type; Defense D&D sites are included as a separate category. Values are expressed in five different units, either as percentages or as actual volume. Qualitative information on mixed waste pertains only to FUSRAP and Superfund sites only.

2.4.1.5 NUKES. One hundred fourteen radionuclides are shown over 53 sites (listed in Appendix D). All six site types are represented. NARM is

subdivided into waste streams. Only defense subtype SFMP sites are included. Seven units are used; all but one express the concentration of the radionuclide. Many entries indicate the presence of a radionuclide but do not have its concentration.

2.4.1.6 YRDATA. Ten sites are included: three licensed commercial disposal sites, six primary DOE/Defense sites and "Other DOE." Several of the DOE sites are also listed as SFMP sites. Commercial LLW is subdivided by waste class, state of origin, and waste source. A generic annual NARM is also included.

2.4.2 Problem areas

The single greatest potential problem associated with a data collection such as LLWASTE is uncertainty about the quality of the source data. Although every effort was made to check information as it was entered into the database, most data are several times removed from their original sources. As a result, information on quality checks and uncertainties in the original figures was usually unavailable. This does not mean that the data are unreliable, only that quantitative estimates of uncertainty could not be included in the database.

A second source of potential difficulty is that the data for LLWASTE were developed from many different sources. As noted in Section 2.3, data were entered into the database as they were presented in the original sources, without converting them to a uniform format. Therefore there may be some difficulties in using the data:

- Different agencies and programs categorize information in different ways. For example, commercial waste is usually subdivided according to generating source (e.g., medical, utility, industrial) or NRC activity level (A, B, C), while DOE uses a different source grouping (for example, U/Th, fission products, tritium). Such categorization represents assumptions and aggregations which are not always explicitly defined, so that reconciliating of data from different sources is difficult.

- Some kinds of information are available for some site or waste types but not for others. In particular the data on radionuclide concentrations are patchy, especially for remedial action sites where waste characterization is incomplete.

- Often, compiled data are averaged over different times. As indicated in Section 2.1.4, average values were calculated from the annual data for 1984-1987 where possible. Frequently, however, yearly data were not available or documents showed data as averages. This can mask an aberrant year or fail to highlight important trends, such as the recent sharp decline in the amount of commercial LLW shipped for burial.

- Data are given in a variety of units. Volume may be expressed in cubic feet, cubic meters, or percent of total volume in a category. Because of these differences, comparisons among sites and waste types are difficult to prepare. This is a minor problem, however, since these differences can usually be reconciled by simple conversions using the database software.

3 POTENTIAL USES OF LLWASTE

Although the database was compiled from existing data, it is unique in the variety of information included in a computer medium which permits easy and rapid data manipulation. Many parts of LLWASTE are available elsewhere in machine-readable format. However, some of these databases are extremely large (e.g., the SWIMS [Solid Waste Information Management System] database on DOE/Defense sites [Watanabe 1987a, 1987b]), and most are limited to one type of site or one source of waste. In contrast, the ORNL Integrated Data Base (e.g., ORNL 1988) is comprehensive, but is not directly accessible by computer (Kibbey 1988).

LLWASTE does not require great computer power (it was developed in R:BASE on an IBM PC/XT). In addition to programming and optional graphics capabilities, the software permits easy export of the data into a variety of other formats, including LOTUS 1-2-3 (Lotus Development Corp.), DBase III (Ashton-Tate), and ASCII files for use in statistical packages such as SPSS/PC

(SPSS Inc.) or graphics programs such as Harvard Graphics (Software Publishing Corp.).

LLWASTE is comprehensive, including, for example, radionuclide concentration in a given waste type, physical characteristics of the waste, characteristics of the radionuclide, volume and activity of the waste generated annually, and waste disposal location. Thus LLWASTE offers some potential uses not readily provided by its individual sources. For example:

- Classification, sorting, and output by various criteria, including disposal site, radionuclide, activity level, source type, or waste form. For example, Table I is a 1986 summary of activity (Ci) in commercial LLW received at the Barnwell disposal site. The table includes multiple classification levels; column and row totals and subtotals were generated by the database report-writing feature.

- Background information and input for identifying priorities, planning, decision making, and resource allocation. Pre-disposal treatment options include volume reduction, which may increase the specific activity of the remaining waste material, and temporary storage to permit decay of isotopes with short halflives. Table II combines data from two sources on typical industrial low-level waste to provide some of the information necessary to evaluate various waste treatment options.

- Preliminary scenario identification for risk assessment efforts. Figure 1 illustrates the recent decline in volume of LLW shipped to commercial disposal sites. Figure 2, which presents the same data as percentages, shows that the fraction of waste originating from utilities, while still the major source of commercial LLW, has declined, while the share from industrial facilities and non-DOE government agencies has increased. This information can be coupled with information characterizing the waste types, such as that shown in Figures 3 and 4, to provide a perspective on the changing nature of commercial low-level waste.

4 FUTURE WORK

To maximize the potential use of LLWASTE, some additional efforts are required. Some of these can be classified as enhancing the database, including filling in areas in which data are sparse. Other tasks involve expanding the database to include new types of information, yielding a broader range of potential uses.

4.1 Database Enhancement

4.1.1 Mixed Waste.

The problem of mixed radioactive and hazardous waste disposal is of increasing concern at disposal and remediation sites. Although LLWASTE was intended to include data on mixed waste, such data did not become available until late in the development of the database. Including these and other new data would be valuable. Sources of information include the following:

- Bowerman et al. conducted a survey (1985) and a document review (1986) to establish a preliminary database on quantities and characteristics of commercial mixed waste. Sources for the document review included shipment records from commercial disposal sites, a survey of LLW generators conducted by the Conference of Radiation Control Program Directors, and a number of published reports and journal articles. Bowerman's survey included responses from 97 generators of LLW who were responsible for about one-third of the annual LLW volume. Survey responses were frequently incomplete. Nonetheless, these data coupled with the results from the document review provide a reasonably good estimate of the amounts and kinds of mixed waste which were being shipped to commercial disposal facilties in the early 1980s. Survey results were entered into an R:BASE database, SURVHAZ, which was made available to us. A summary of the contents of SURVHAZ is shown in Appendix E.

- DOE is currently conducting detailed environmental surveys of its facilities. Studies were completed and results were published in draft form for defense production facilities (DOE 1988). Surveys at

non-defense sites are in progress; results should be available by early 1990. The published report does not contain quantitative data on mixed waste. However, original data for two sites (Los Alamos and Lawrence Livermore) have been obtained on floppy disk by BNL through NUS Corp. It may be possible to obtain data for other facilities as well. These files include estimated environmental chemical concentrations based on analyses of groundwater, soil borings and other tests.

- Several reports based on recent studies of the mixed waste problem are to be published soon. These studies include work in progress by Rogers and Associates for the Electric Power Research Institute and a workshop sponsored by the Office of Technology Assessment in December 1988 (Bowerman 1989).

4.1.2 Menus and Applications.

To make the database more user friendly, overlays of menu-driven applications can be constructed using the database software. R:BASE itself can be manipulated either with menus or by use of its own command language. However, some potential database users may require repetitive operations (a particular kind of search or a specific series of computations, for example), yet may be unfamiliar with the programming language. Custom-designed applications can be developed which allow users to carry out particular tasks, coupled with menus to permit easy use.

4.1.3 Data Reconciliation.

As noted in Sec. 2.4.2, LLWASTE retains the units found in the original data sources. These different units (e.g., concentrations in ppm, pCi/l and Ci/m^3) should be converted to comparable uniform formats.

4.2 Expansion of the Database

LLWASTE was developed to provide a "status report" on amounts and characteristics of low-level radioactive waste at active and formerly utilized disposal facilties. By expanding the scope of the database and building on what has already been accomplished, its potential usefulness can be extended.

4.2.1 Projections.

Due to environmental, economic and political concerns, volumes, activities and disposal options for low-level radioactive waste are in flux. To ensure continued usefulness of the database, projections of future inventories should be incorporated. Volumes and waste characteristics would be included and governing assumptions would be defined. These projections could be used for preliminary planning or the assumptions could be altered to compare alternative scenarios. Initial projections would be derived from available sources such as EPA's Draft Environmental Impact Statement for Proposed Rules (EPA 1988b, Appendix A) or the most recent Integrated Data Base (ORNL 1988). This effort would be a logical outgrowth of the inclusion of LLW projections from remedial action sites now in the database.

4.2.2 Source Orientation.

The current database is organized by disposal sites. However, many data sources, especially those for commercial LLW, show figures according to generator sources or waste streams. Expanding the database to permit organization by waste source, or creation of a new, complementary database, would facilitate both incorporation and use of many kinds of information, especially projections as suggested in Sec. 4.2.1.

The potential for geographic organization might be considered as well. As of December 1987, 37 states had joined to form seven interstate low-level waste management compacts according to the Low-Level Radioactive Waste Policy Act of 1980 (Public Law 96-573) and the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240). When out-of-region access to existing commercial disposal sites terminates on January 1, 1993, waste generation and disposal will be linked by these geographic entities.

4.2.3 Packaging and Disposal Options.

Some older (1980) data are available on packaging characteristics of waste received at the three active commercial disposal sites (Colton et al. 1981). Including this information in the database would help compute the picture of the current situation at these sites. Information on past disposal methods at principal commercial and DOE sites is also available, although it is generally descriptive rather than quantitative (Clancy et al. 1981; Benda 1986).

Data concerning waste treatment options would be a final useful addition to the database if waste projections are also included. Volume projections of waste generated could be matched with various treatment options to generate scenarios for estimating future disposal requirements according to volume, specific activity, and physical characteristics of the treated waste.

TABLE I

ACTIVITY OF COMMERCIAL LOW-LEVEL WASTE (C1)

SITE: BARNWELL
YEAR: 1986

STATE OF ORIGIN	WASTE CLASS	MEDICAL	UTILITY	ACADEMIC	GOVERNMENT	INDUSTRIAL	CLASS/ STATE TOTAL
AL	A	0.00	644.25	0.00	1.18E-3	0.68	644.93
AL	B	0.00	2406.32	0.00	0.00	0.00	2406.32
AL	C	0.00	211.00	0.00	0.00	0.00	211.00
	TOTAL	0.00	3261.57	0.00	1.18E-3	0.68	3262.26
CA	A	0.00	0.00	0.00	1.44	0.00	1.44
	TOTAL	0.00	0.00	0.00	1.44	0.00	1.44
CT	A	0.00	428.29	0.00	0.00	2.57	430.86
CT	B	0.00	5279.66	0.00	0.00	0.00	5279.66
CT	C	0.00	2002.81	0.00	0.00	0.00	2002.81
	TOTAL	0.00	7710.76	0.00	0.00	2.57	7713.33
DE	A	0.00	0.00	0.00	1.44	0.09	1.53
DE	B	0.00	0.00	0.00	1.90	0.00	1.90
	TOTAL	0.00	0.00	0.00	3.34	0.09	3.43
FL	A	0.00	93.57	0.06	21.28	0.00	114.91
FL	B	0.00	782.05	0.00	0.00	0.00	782.05
FL	C	0.00	2694.11	0.00	0.00	0.00	2694.11
	TOTAL	0.00	3569.72	0.06	21.28	0.00	3591.06
GA	A	0.00	583.23	0.00	26.70	3.33	613.27
GA	B	0.00	283.22	0.00	330.00	0.00	613.22
GA	C	0.00	15.05	0.00	0.00	0.00	15.05
	TOTAL	0.00	881.50	0.00	356.70	3.33	1241.54
IA	A	0.00	82.73	0.00	8.E-5	0.00	82.73
IA	B	0.00	1460.00	0.00	7.46	0.00	1467.46
	TOTAL	0.00	1542.73	0.00	7.46	0.00	1550.19
IL	A	0.00	4073.61	0.00	0.08	1.28	4074.97
IL	B	0.00	5337.44	0.00	18.48	0.00	5355.92
IL	C	0.00	19794.21	0.00	0.00	0.00	19794.21
	TOTAL	0.00	29205.26	0.00	18.56	1.28	29225.10
KS	A	0.00	126.10	0.00	0.00	0.00	126.10
	TOTAL	0.00	126.10	0.00	0.00	0.00	126.10
KY	A	0.00	0.00	0.00	2.20	0.00	2.20
	TOTAL	0.00	0.00	0.00	2.20	0.00	2.20
LA	A	0.00	82.87	0.00	0.00	0.00	82.87
	TOTAL	0.00	82.87	0.00	0.00	0.00	82.87

STATE OF ORIGIN	WASTE CLASS	MEDICAL	UTILITY	ACADEMIC	GOVERNMENT	INDUSTRIAL	CLASS/ STATE TOTAL
MA	A	0.02	89.25	0.00	9.85	136.42	235.54
MA	B	0.00	57.94	21.20	74.73	0.00	153.86
MA	C	0.00	296.00	0.00	0.00	0.00	296.00
	TOTAL	0.02	443.19	21.20	84.58	136.42	685.40
MD	A	0.00	2.81	0.00	3.60	0.00	6.42
MD	B	0.00	184.41	0.00	0.00	0.00	184.41
MD	C	0.00	261.00	0.00	0.00	0.00	261.00
	TOTAL	0.00	448.22	0.00	3.60	0.00	451.83
ME	A	0.00	6.45	0.00	12.65	0.00	19.10
ME	B	0.00	149.05	0.00	0.00	0.00	149.05
ME	C	0.00	8.94	0.00	0.00	0.00	8.94
	TOTAL	0.00	164.44	0.00	12.65	0.00	177.09
MI	A	0.00	75.40	0.00	0.00	0.00	75.40
MI	B	0.00	304.92	0.00	0.00	0.00	304.92
MI	C	0.00	1672.10	0.00	0.00	0.00	1672.10
	TOTAL	0.00	2052.42	0.00	0.00	0.00	2052.42
MN	B	0.00	175.93	0.00	0.00	0.00	175.93
	TOTAL	0.00	175.93	0.00	0.00	0.00	175.93
MO	A	0.00	0.00	0.00	0.12	0.52	0.64
	TOTAL	0.00	0.00	0.00	0.12	0.52	0.64
MS	A	0.00	1360.14	7.34E-3	0.00	0.15	1360.29
	TOTAL	0.00	1360.14	7.34E-3	0.00	0.15	1360.29
NC	A	0.39	1745.77	5.78	0.09	21.25	1773.27
NC	B	0.00	782.09	0.00	469.99	0.00	1252.09
NC	C	0.00	7765.65	0.00	0.00	5.20	7770.85
	TOTAL	0.39	10293.50	5.78	470.08	26.45	10796.21
NE	A	0.00	16.09	0.00	0.00	0.00	16.09
	TOTAL	0.00	16.09	0.00	0.00	0.00	16.09
NJ	A	2.04E-3	259.36	1.37E-3	0.00	2.62	261.98
NJ	B	0.00	648.00	0.00	0.00	0.00	648.00
NJ	C	0.00	328.80	0.00	0.00	0.00	328.80
	TOTAL	2.04E-3	1236.16	1.37E-3	0.00	2.62	1238.78
NY	A	2.21	932.29	3.74	7.19E-3	71.68	1009.93
NY	B	0.00	785.09	0.00	0.00	4058.08	4843.17
NY	C	0.00	115.32	0.00	325.30	0.00	440.62
	TOTAL	2.21	1832.70	3.74	325.31	4129.76	6293.73
OH	A	0.00	2.19	0.00	1.04	0.31	3.54
OH	B	0.00	0.00	0.00	0.00	335.02	335.02
	TOTAL	0.00	2.19	0.00	1.04	335.33	338.56

STATE OF ORIGIN	WASTE CLASS	MEDICAL	UTILITY	ACADEMIC	GOVERNMENT	INDUSTRIAL	CLASS/ STATE TOTAL
OK	A	0.00	0.00	0.00	0.00	1.05	1.05
	TOTAL	0.00	0.00	0.00	0.00	1.05	1.05
PA	A	0.00	5374.00	0.00	0.00	18.24	5392.24
PA	B	0.00	2605.81	0.00	338.40	62.00	3006.21
PA	C	0.00	15271.78	0.00	0.00	955.00	16226.78
	TOTAL	0.00	23251.59	0.00	338.40	1035.24	24625.22
RI	A	0.32	0.00	0.00	0.00	0.00	0.32
	TOTAL	0.32	0.00	0.00	0.00	0.00	0.32
SC	A	0.00	179.86	0.74	18.08	49.73	248.41
SC	B	0.00	525.69	0.00	79.36	0.08	605.12
SC	C	0.00	370.00	0.26	0.00	152.00	522.26
	TOTAL	0.00	1075.55	1.00	97.44	201.81	1375.79
TN	A	0.08	199.42	0.22	0.00	203.51	403.22
TN	B	0.00	1426.00	0.00	0.00	0.00	1426.00
TN	C	0.00	11562.00	0.00	0.00	0.00	11562.00
	TOTAL	0.08	13187.42	0.22	0.00	203.51	13391.22
TX	A	0.00	0.00	0.00	48.22	1.47	49.69
TX	B	0.00	0.00	0.00	2380.07	0.00	2380.07
	TOTAL	0.00	0.00	0.00	2428.29	1.47	2429.76
VA	A	0.00	162.31	12.38	56.58	1.18	232.45
VA	B	0.00	727.41	0.00	14.85	0.00	742.26
VA	C	0.00	1066.77	0.00	0.00	0.00	1066.77
	TOTAL	0.00	1956.48	12.38	71.43	1.18	2041.47
VT	A	0.00	43.64	0.00	0.00	0.00	43.64
VT	B	0.00	169.47	0.00	0.00	0.00	169.47
VT	C	0.00	69.45	0.00	0.00	0.00	69.45
	TOTAL	0.00	282.56	0.00	0.00	0.00	282.56
WI	A	0.00	51.26	0.00	0.36	0.00	51.62
WI	B	0.00	740.09	0.00	0.00	0.00	740.09
WI	C	0.00	769.60	0.00	0.00	0.00	769.60
	TOTAL	0.00	1560.94	0.00	0.36	0.00	1561.30
WV	A	0.00	0.00	0.00	12.85	0.00	12.85
	TOTAL	0.00	0.00	0.00	12.85	0.00	12.85
YEAR TOTAL:		8.44	1.5889E5	111.41	5932.22	11230.44	1.7617E5

TABLE II

INDUSTRIAL LLW:
RADIONUCLIDE CONCENTRATIONS AND CHARACTERISTICS

NUCLIDE	CONCENTRATION (Ci/m^3)	HALFLIFE ($T_{1/2}$)		DECAY CONSTANT
H-3	13.4	12.33	Y	0.056216
C-14	0.05575	5730.00	Y	0.000121
Cr-51	0.000311	27.70	D	9.138934
Zn-65	0.003275	243.90	D	1.037994
Sr-90	0.000334	28.60	Y	0.024236
Y-90	0.000334	64.10	H	94.78943
Cs-137	0.008831	30.17	Y	0.022975
Ba-137m	0.008354	2.55	M	142891.9
Kr-85	0.001049	10.72	Y	0.064659
I-125	0.01307	60.14	D	4.209624
Ir-192	0.02152	73.83	D	3.429004

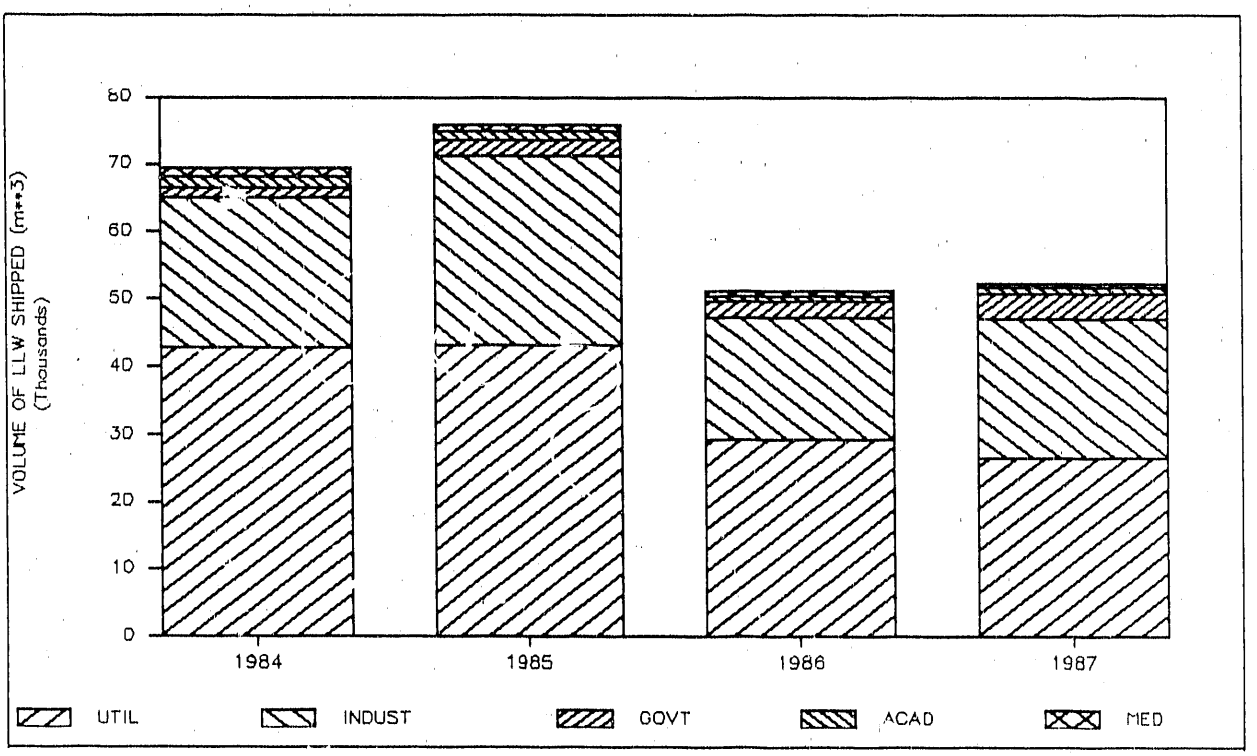

Figure 1. Trends in LLW volumes shipped to commercial disposal sites.

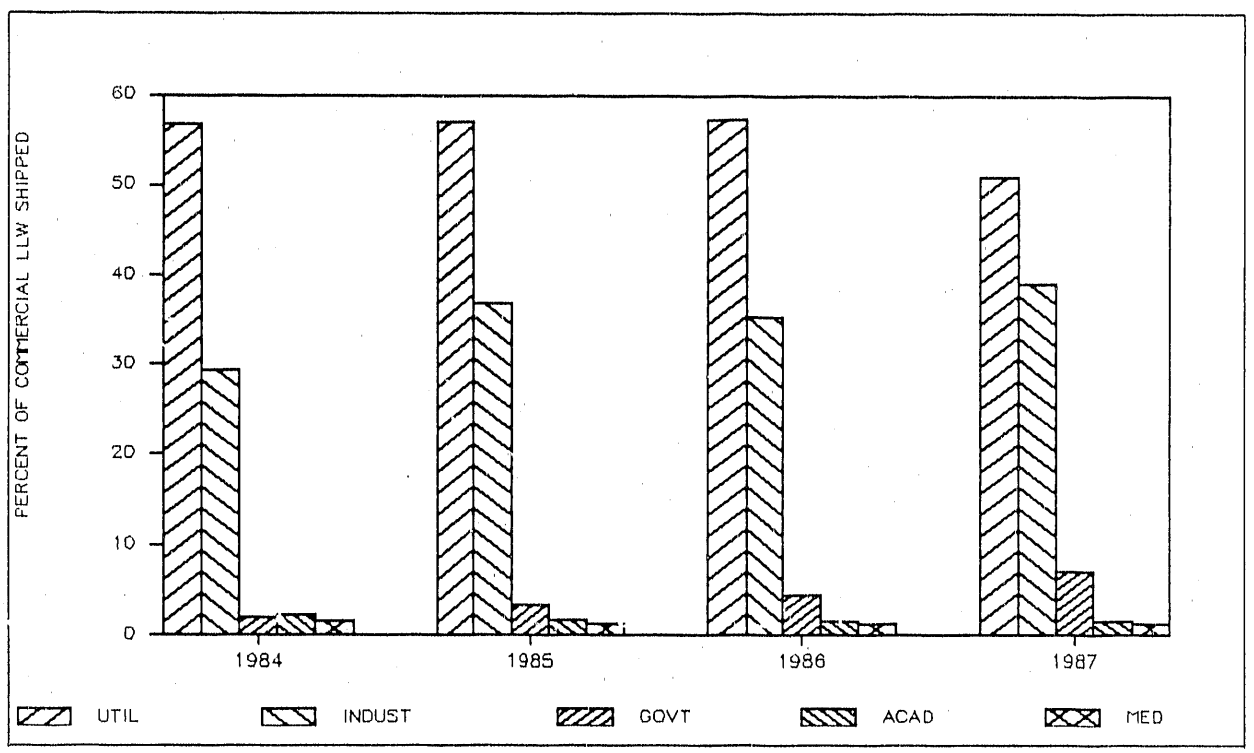

Figure 2. Trends in sources of LLW, by volumes shipped for commercial disposal.

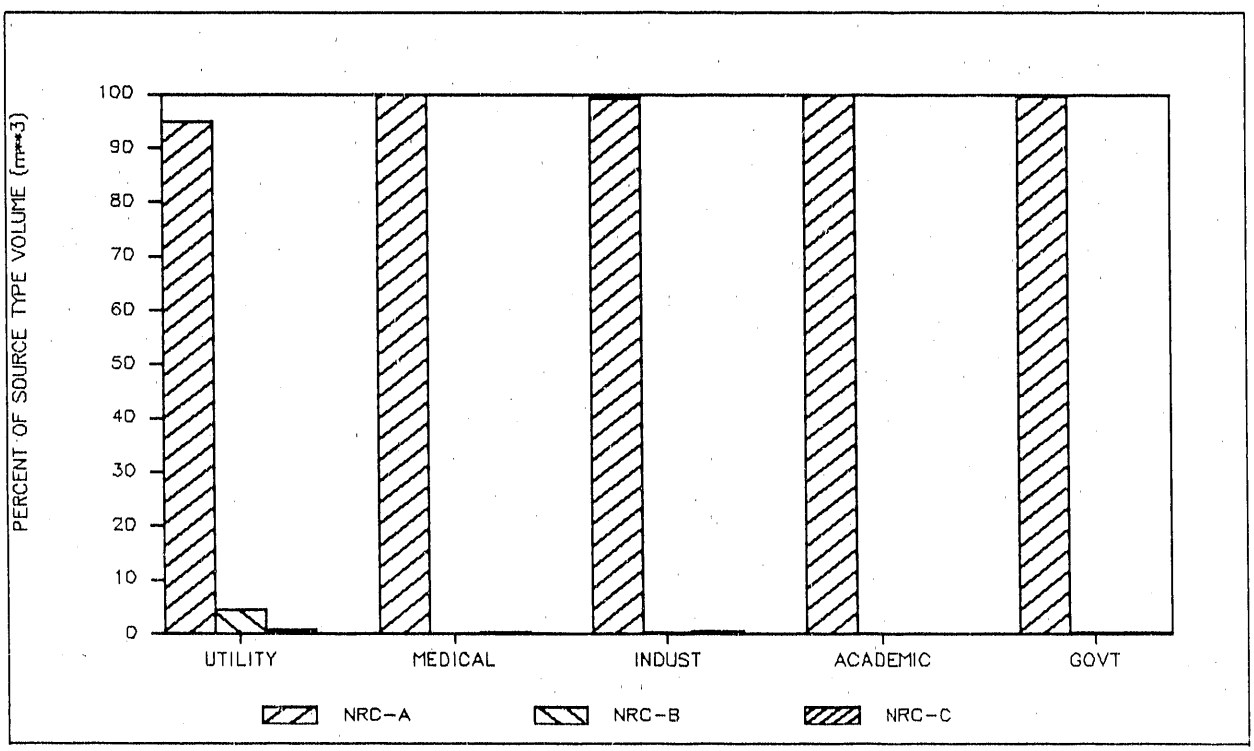

Figure 3. Volume of commercial LLW, by NRC waste class and source type.

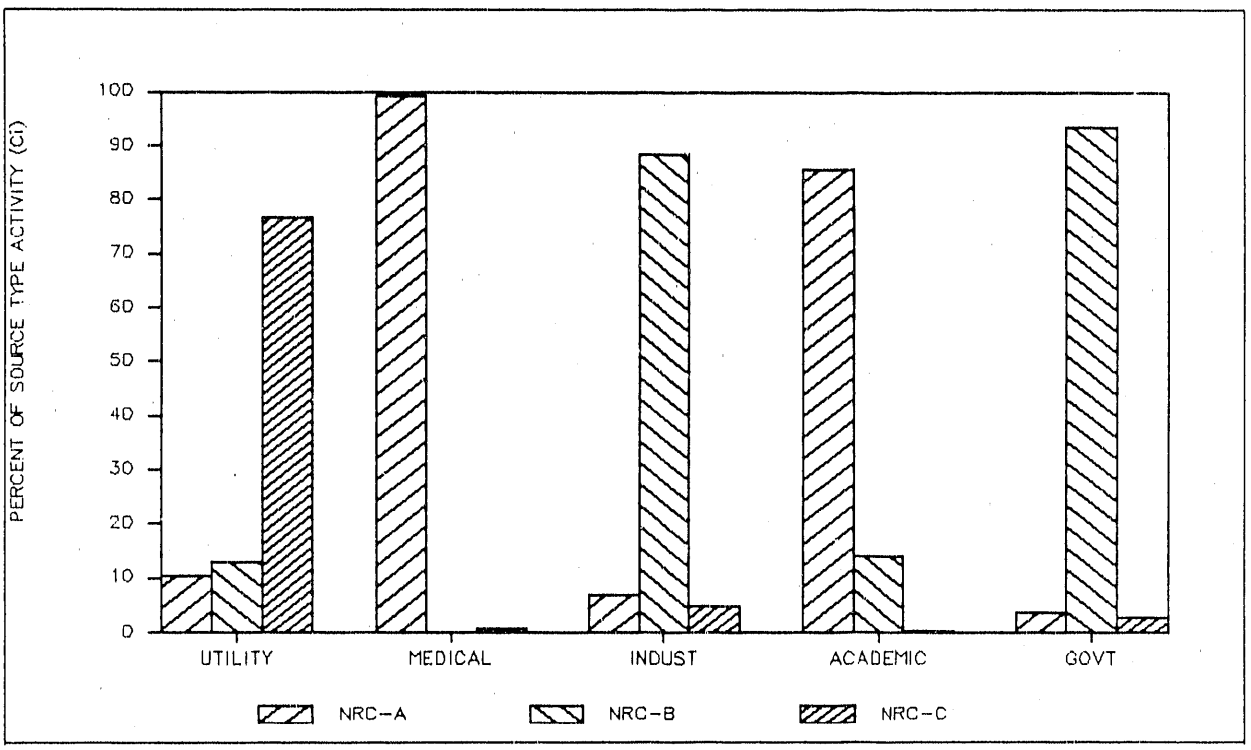

Figure 4. Activity of commercial LLW, by NRC waste class and source type.

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APPENDIX A

TABLES IN THE DATABASE LLWASTE

Summary:

Name	Columns	Rows	Name	Columns	Rows
YRDATA	20	485	BIBLIO	4	35
NUKES	24	309	SITEID	16	112
RADCHAR	17	85	PHYSCHAR	14	106
ISOTOPE	6	2641			

Table: SITEID General information about sites.

Column definitions

#	Name	Type	Length	Key	Description
1	SITE	TEXT	20 char	*	Abbreviated site name (ID)
2	SITEINFO	TEXT	70 char		Brief description of site
3	LOCALE	TEXT	12 char		Place name
4	STATE	TEXT	2 char	*	State
5	LAT	REAL			Latitude, degrees
6	LONG	REAL			Longitude, degrees
7	TYPE	TEXT	8 char	*	Site classification
8	SUBTYPE	TEXT	8 char	*	Subset of site type
9	CAPACITY	REAL			Capacity of disposal sites
10	USED	REAL			Area filled @ disposal sites
11	ACCUMVOL	REAL			Total volume (m^3), 1986
12	ACCUMCI	REAL			Total activity (Ci), 1986
13	DEPTH	INTEGER			Burial depth, ocean sites
14	DISTANCE	INTEGER			Distance from land (ocean)
15	REF	TEXT	15 char		Data reference in BIBLIO
16	NOTE	TEXT	500 char		(Discussion)

Current number of rows: 112

Table: RADCHAR Radiological characterization of waste.

Column definitions

#	Name	Type	Length	Key	Description
1	SITE	TEXT	20 char	*	Site ID
2	TYPE	TEXT	8 char	*	Site classification
3	SUBTYPE	TEXT	8 char	*	Site subtype
4	UThUNITS	TEXT	15 char		Units for U/Th
5	U/Th	REAL			Amount U/Th
6	UNITS	TEXT	15 char		Units for DOE classes
7	FISSION	REAL			Activity as fission products
8	INDUCED	REAL			Induced activity
9	TRITIUM	REAL			Activity from ^3H

Table: RADCHAR, cont.

#	Name	Type	Length	Key	Description
10	ALPHA	REAL			Alpha activity >100 nCi/g
11	ROTHER	REAL			Other activity
12	NRCA	REAL			NRC waste class A (10 CFR 61)
13	NRCB	REAL			NRC waste class B
14	NRCC	REAL			NRC waste class C
15	RTOT	REAL			Total activity
16	REF	TEXT	15 char		Data reference in BIBLIO
17	NOTE	TEXT	500 char		(Discussion)

Current number of rows: 85

Table: PHYSCHAR Physical characterization of waste.

Column definitions

#	Name	Type	Length	Key	Description
1	SITE	TEXT	20 char	*	Site ID
2	TYPE	TEXT	8 char	*	Site classification
3	SUBTYPE	TEXT	8 char	*	Site subtype
4	UNITS	TEXT	15 char		Units of measure used
5	BIO	REAL			Biological material
6	EQUIP	REAL			Equipment (metal)
7	DEBRIS	REAL			Non-compressible dry material
8	DRYSOLID	REAL			Compressible dry material
9	SLUDGE	REAL			Absorbed waste, solidified sludge
10	POTHER	REAL			Other, unknown, not classified
11	PTOT	REAL			Total amount
12	MIXED	TEXT	1 char		Mixed waste (yes/no/unknown)
13	REF	TEXT	15 char		Data reference in BIBLIO
14	NOTE	TEXT	500 char		(Discussion)

Current number of rows: 106

Table: YRDATA Annual volume and activity for specific years.

Column definitions

#	Name	Type	Length	Key	Description
1	SITE	TEXT	20 char	*	Site ID
2	TYPE	TEXT	8 char	*	Site classification
3	SUBTYPE	TEXT	8 char	*	Site subtype
4	YEAR	INTEGER			Year
5	WORIGIN	TEXT	8 char		State of waste origin
6	WCLASS	TEXT	1 char		NRC waste class
7	MEDVOL	REAL			Volume, medical

Table: YRDATA, cont.

#	Name	Type	Length	Key	Description
8	UTILVOL	REAL			Volume, utility
9	ACADVOL	REAL			Volume, academic
10	GOVTVOL	REAL			Volume, government
11	INDUSVOL	REAL			Volume, industrial
12	TOTVOL	REAL			Total volume
13	MEDRAD	REAL			Activity, medical
14	UTILRAD	REAL			Activity, utility
15	ACADRAD	REAL			Activity, academic
16	GOVTRAD	REAL			Activity, government
17	INDUSRAD	REAL			Activity, industrial
18	TOTACTIV	REAL			Total activity
19	REF	TEXT	15 char		Data reference in BIBLIO
20	NOTE	TEXT	500 char		(Discussion)

Current number of rows: 485

Table: NUKES Amount of radionuclides in waste.

Column definitions

#	Name	Type	Length	Key	Description
1	SITE	TEXT	20 char	*	Site ID
2	TYPE	TEXT	8 char	*	Site classification
3	SUBTYPE	TEXT	8 char	*	Site subtype
4	REF	TEXT	15 char		Data reference in BIBLIO
5	NAME	TEXT	8 char	*	Name of radionuclide
6	UNITS	TEXT	15 char		Units of measurement
7	DOEUTh	REAL			Amount nuclide in U/Th
8	DOEFISS	REAL			Fission products
9	DOEIND	REAL			Induced activity
10	DOEALPHA	REAL			Alpha <100 nCi/g
11	DOEOTHER	REAL			Other activity
12	INDUSCON	REAL			Amt nuclide in indust waste
13	BIOCON	REAL			Biological I/I
14	MEDCON	REAL			Medical
15	NBIOCON	REAL			Nonbiological I/I
16	UTILCON	REAL			Utility
17	LLWCONC	REAL			Amount in avg commercial waste
18	SCON	REAL			Concentration in soil
19	SSCON	REAL			Subsurface soil
20	SWCON	REAL			Surface water sediment
21	GWCON	REAL			Groundwater
22	SITECON	REAL			Overall amount at site
23	SRPFRAC	REAL			Fraction in SRP saltstone (est.)
24	NOTE	TEXT	500 char		(Discussion)

Current number of rows: 3098

Table: ISOTOPE Characterization of radionuclides.

Column definitions

#	Name	Type	Length	Key	Description
1	NAME	TEXT	8 char		Name of radionuclide
2	DK	REAL			Decay constant (y^{-1})
3	N	INTEGER			Nuclear proton number
4	A	INTEGER			Nuclear mass number
5	SYMBOL	TEXT	2 char		Name of element
6	HALFLIFE	TEXT	10 char		Halflife

Current number of rows: 2641

Table: BIBLIO References consulted in task.

Column definitions

#	Name	Type	Length	Key	Description
1	REF	TEXT	15 char		Abbreviated reference
2	AUTHOR	TEXT	150 char		Author
3	TITLE	TEXT	200 char		Title
4	ETC	TEXT	300 char		Publisher, date, report number, etc.

Current number of rows: 35

APPENDIX B

EXAMPLE TABLES

TABLE B-1. SITEID

SITE: *Fallaron Islands (A)*

SITE INFO: *Used 1951-1953.*
PLACE: *Pacific* STATE: *-0-* LAT: *37.63*
LONG: *123.13*

TYPE: *OCEAN*
DOE = DOE/Defense
COM = Commercial
OCEAN = Ocean burial
HYDRO = ORNL hydrofracture
FUSRAP = Formerly Utilized MED/AEC Sites Remedial Action Project
SFMP = Surplus Facilities Management Program
SFUND = EPA Superfund (NPL)
NORM = Naturally-occurring radioactive material

SUBTYPE: *-0-*
MED, UTIL, ACAD, GOVT, INDUS (INDUS incl fuel cycle; may be subdivided into BIO, NBIO)

RASOURC = Radium sources
RAIXRSN = Radium ion-exchng resins
GLASDS1 = Glass, discrete, widely distributed
GLASDS2 = Glass, collectible
INST1 = Instruments, diffuse, widely distributed
INST2 = Instruments, collectible

ER/DD = Defense D&D

CAPACITY (ha.): *-0-*
USED (ha.): *-0-*
DEPTH (m): *900*
DISTANCE (from land, km): *60*

TOTAL ACCUMULATED VOLUME (m^3, 1986): *3500.*
(n of containers for ocean, hydrofracture)
TOTAL ACCUMULATED ACTIVITY (Ci, 1986): *1100.*
(decay not allowed for)

REF: *HOLCOMB*

NOTE: *-0-*

TABLE B-2. ISOTOPE

NAME: *H-3*

DK (decay constant): *0.056216*

N (nuclear proton number): 1

A (nuclear mass number): *3*

SYMBOL: *H*

HALFLIFE: *12.33 Y*

TABLE B-3. RADCHAR

SITE: *SRP*
TYPE: *DOE*
SUBTYPE: *-0-*

Units (U/Th): *Avg annual Ci*
Uranium/Thorium: *5.755*

Units: *Avg annual Ci*

Fission products:	*879.364*
Induced activity:	*16747.05*
Tritium:	*90675.78*
Alpha (<100 nCi/g):	*16.114*
Other activity:	*6782.843*

NRC Waste Class A:	*-0-*
B:	*-0-*
C:	*-0-*

TOTAL: *115100.0*

REF: *IDB-87*

NOTE: *From Table A.6.*

TABLE B-4. PHYSCHAR

SITE: *MOUND*
TYPE: *DOE*
SUBTYPE: *ER/DD*

UNITS: m^3

WASTE TYPE:

Biological:	*-0-*
Contaminated equipment, metal:	*5305.*
Non-compactible (decontamination debris, soil, tailings, building rubble:	*8540.*
Compactible (dry solids, trash, ashes):	*10530.*
Solidified sludge, resins, absorbed waste:	*50.*
Other or Not Classified:	*0.*

TOTAL: *24425.*

MIXED WASTE: - [Y = yes, N = no, U = unknown]

REF: *IDB-87, MILLER*

NOTE: *Scheduled FY 1983-1997. Includes H-3 oxide contaminated combustible and non-combustible lab trash, solidified water; Pu-238 oxide contaminated soil, solidified sludges, trash, building debris.*

TABLE B-5. NUKES

RADIONUCLIDE: *H-3* UNITS: *Ci/m^3*

SITE: *N/A*
TYPE: *COM*
SUBTYPE: *-0-*

DOE/DEFENSE		COMMERCIAL	
U/Th:	*-0-*	Industrial:	*13.4*
Fission:	*-0-*	Bioresearch:	*0.03139*
Induced:	*-0-*	Medical:	*0.*
Alpha:	*-0-*	Nonbioresearch:	*0.004919*
Other:	*-0-*	Utility:	*-0-*
SRP/saltstone:	*-0-*	Commercial avg:	*0.05897*

ENVIRONMENTAL

Surface soil:	*-0-*
Subsurface soil:	*-0-*
Surface water sediments:	*-0-*
Groundwater:	*-0-*
Overall site:	*-0-*

REF: *IDB-87*

NOTE: *Average commercial concentration from Table A-8; I/I from Table A-13; volumetric composition = 17% industrial, 65.6% bio, 5.8% medical, 11.6% nonbio; presented as Ci/m^3 of I/I waste, not the indiv. category.*

TABLE B-6. YRDATA

SITE: *BARNWELL*
TYPE: *COM*

YEAR: *1986*

ORIGIN OF WASTE: *AL* NRC WASTE CLASS: *A*

	VOLUME (m^3)	ACTIVITY (Ci)
MEDICAL	*0.*	*0.*
UTILITY	*1498.159*	*644.249*
ACADEMIC	*0.*	*0.*
GOVERNMENT	*15.773*	*0.00118*
INDUSTRIAL	*27.448*	*0.6846*
TOTAL	*1541.38*	*644.9348*

REF: *ALEX*

NOTE: *-0-*

APPENDIX C

LISTING OF SITES IN THE DATABASE LLWASTE

SITE	TYPE	SITEINFO
BARNWELL	COM	Operated by Chem-Nuclear Systems; 5 mi W of town. See REF p. 3-46.
BEATTY	COM	Near NTS; owned by State, operated by US Ecology, Inc. (KY)
MAXEY FLATS	COM	(closed 27 December 1977). *NOTE* Also a Superfund site
RICHLAND	COM	On Hanford Reservation; operated by US Ecology, Inc. (KY)
SHEFFIELD	COM	(closed 8 April 1978)
WEST VALLEY	COM	(closed 11 March 1975)
AI	DOE	Atomics International
ANL	DOE	Argonne National Lab
BNL	DOE	Brookhaven National Lab
GRAND JUNCTION	DOE	Grand Junction Projects Office site (D&D)
HANF	DOE	Hanford Reservation; incl. open area only (16.8 ha closed)
HANF	DOE	Hanford Site (20 sites) (D&D)
INEL	DOE	Idaho National Engineering Lab
INEL	DOE	Idaho National Engineering Lab (8 sites) (D&D)
KAPL	DOE	Knolls Atomic Power Lab, operated by General Electric (3 sites)
KAPL	DOE	Knolls Atomic Power Lab (D&D)
LANL	DOE	Los Alamos National Lab
LLNL	DOE	Lawrence Livermore National Lab
MOUND	DOE	Mound Lab Facility

SITE	TYPE	SITEINFO
MOUND	DOE	Mound Lab Facility (4 sites) (D&D)
NEW BRUNSWICK	DOE	New Brunswick Laboratory, Phase II (D&D)
NTS	DOE	Nevada Test Site
ORGDP	DOE	Oak Ridge Gasous Diffusion Plant
ORNL	DOE	Oak Ridge National Lab
ORNL	DOE	Oak Ridge National Lab (7 sites) (D&D)
OTHER DOE	DOE	Usually includes PORTS, WMCO, ORGDP, Y-12, PAD, SNL, LLNL
PAD	DOE	Paducah Gaseous Diffusion Plant
PANTEX	DOE	Pantex Plant
PNRO	DOE	Pittsburgh Naval Reactor Office, operated by Westinghouse Electric
PORTS	DOE	Portsmouth Gaseous Diffusion Plant
ROCKY FLATS	DOE	Rocky Flats Plant (weapons et al.). *NOTE* also a Superfund site
SNL	DOE	Sandia National Lab
SRP	DOE	Savannah River Plant
WMCO	DOE	Westinghouse Materials Co. (formerly National Lead of Ohio)
WVDP	DOE	West Valley Demonstration Project
Y-12	DOE	Y-12 plant, gas diffusion plant 4-8 km from Oak Ridge
ACID CANYON	FUSRAP	Acid/Pueblo/Los Alamos Canyons
AIRPORT/VICINITY	FUSRAP	St. Louis Airport (vicinity properties)
ALBANY METAL	FUSRAP	Albany Metallurgical Research Center (Teldyne/Wah Chang)

SITE	TYPE	SITEINFO
ALIQUIPPA FORGE	FUSRAP	Formerly Universal Cyclops, Inc. (new site ownership)
ARMORY	FUSRAP	National Guard Armory
ASHLAND (1)	FUSRAP	Ashland Oil Co. No. 1
ASHLAND (2)	FUSRAP	Ashland Oil Co. No. 2
BAYO CANYON	FUSRAP	Bayo Canyon
BERKELEY	FUSRAP	Gilman Hall, Univ. California @ Berkeley
CHUPADERA MESA	FUSRAP	Chupadera Mesa, White Sands Missile Range
DUPONT	FUSRAP	E.I. du Pont de Nemours and Co.
GM	FUSRAP	General Motors
KELLEX	FUSRAP	Kellex Research Facility
LATTY AVE	FUSRAP	Latty Avenue
LINDE	FUSRAP	Linde Air Products Div.
MIDDLESEX (L)	FUSRAP	Middlesex Municipal Landfill
MIDDLESEX (S)	FUSRAP	Middlesex Sampling Plant
NFSS	FUSRAP	Niagara Falls Storage Site (vicinity properties)
NL BEARINGS	FUSRAP	NL Bearings Plant & properties on Central, Palmer, Yardboro Aves.
PALOS PARK	FUSRAP	Palos Park Forest Preserve
SEAWAY	FUSRAP	Seaway Industrial Park
SEYMOUR	FUSRAP	Seymour Specialty Wire
SHPACK	FUSRAP	Shpack Landfill. *NOTE* also a Superfund site.
ST. LOUIS AIRPORT	FUSRAP	St. Louis Airport
ST. LOUIS DOWNTOWN	FUSRAP	Formerly Mallinckrodt, Inc.
STEPAN	FUSRAP	Stepan Chemical Co., vicinity properties. *also, MAYWOOD (SFUND)*

SITE	TYPE	SITEINFO
U-CHICAGO	FUSRAP	Laboratories at University of Chicago
VENTRON	FUSRAP	-0-
W.R. GRACE - MD	FUSRAP	W.R. Grace and Company
W.R. GRACE - NJ	FUSRAP	W.R. Grace / Sheffield Brook / other properties (also in Pequannock)
ORNL	HYDRO	Bedded Conasauga shale underlying the ORNL site
ATLANTIC (A)	OCEAN	Used 1951-1956, 1959-1962
ATLANTIC (B)	OCEAN	Used 1957-1959
CAPE HENRY	OCEAN	Off coast of Virginia, east of Norfolk; used 1949-1967. Also see REF.
CAPE SCOT	OCEAN	(2 sites) west of Vancouver Is. (Canada); used 1958-1969.
CENTRAL ATLANTIC	OCEAN	(2 sites, but inclusive data...); used 1959-1960. Also see REF.
FARALLON IS (A)	OCEAN	Used 1951-1953
FARALLON IS (B)	OCEAN	Used 1946-1950, 1954-1956
MASS BAY	OCEAN	Massachusetts Bay; used 1952-1959
SAN DIEGO	OCEAN	Used 1959-1962. Depth varies from 2210-3660 m.
SANTA CRUZ	OCEAN	Santa Cruz Basin; used 1946-1962. Also see REF.

SITE	TYPE	SITEINFO
ANL	SFMP	Argonne National Lab (2 sites)
HANF	SFMP	Hanford Site (2 sites)
INEL	SFMP	Idaho National Engineering Lab BORAX V Facility
LANL	SFMP	Los Alamos National Lab (3 sites)
MAYAGUEZ	SFMP	Center of Energy & Environmental Research Facility
MONTICELLO	SFMP	Monticello Mill Tailings and vicinity prop. *NOTE* also Superfund.
MOUND	SFMP	Mound Lab Facility (2 sites)
NFSS	SFMP	Niagara Falls Storage Site
ORNL	SFMP	Oak Ridge National Lab (8 sites)
SANTA SUSANA	SFMP	Santa Susana Field Lab (3 sites)
SHIPPINGPORT	SFMP	Shippingport Station
SRP	SFMP	Savannah River Plant Reactor
UC-DAVIS	SFMP	Univ. of Calif. @ Davis Waste Rentention System
WELDON	SFMP	Weldon Spring raffinate pits, quarry, more. *NOTE* Also SFUND site
DENVER RADIUM	SFUND	Former Denver Nat'l Radium Instit & others; Ra processing 1917-1925.
HOMESTAKE	SFUND	Homestake Mining Co. Uranium Mill, Anaconda tailings, Ambrosia Lake
KERR-McGEE	SFUND	Kerr-McGee Off-Site Properties; waste from The Rare Earths Facility.
KRESS CREEK	SFUND	Kress Creek & the West Branch of the DuPage River (Rare Earths Fac.)
LANSDOWNE	SFUND	Basement operation for Ra purification, packaging by former occupant.
LINCOLN PARK	SFUND	Cotter Corp. uranium mill

SITE	TYPE	SITEINFO
LODI	SFUND	Lodi Municipal Well; ?? nearby Th processing facility or NORM ??
MAXEY FLATS	SFUND	(see MAXEY FLATS where TYPE EQ COM)
MAYWOOD	SFUND	Maywood Chemical Co. & Sears property *also see STEPAN (FUSRAP)*
MONTCLAIR	SFUND	alleged to be former radium-processing facility nearby; incl 2 sites
MONTICELLO	SFUND	(see MONTICELLO where TYPE EQ SFMP)
REED-KEPPLER PARK	SFUND	Source = The Rare Earths Facility, former ore processing facility.
ROCKY FLATS	SFUND	(see ROCKY FLATS where TYPE EQ DOE)
SHPACK	SFUND	(see SHPACK where TYPE EQ FUSRAP)
U.S. RADIUM	SFUND	Former radium ore processing plant, lab & manuf facility
UNITED NUCLEAR	SFUND	United Nuclear Corp. (uranium mill site)
URAVAN	SFUND	Uravan Uranium Project; U, V recovery plant; little current activity
W.R. GRACE - NJ	SFUND	Thorium ore (monazite) extraction plant on-site. *Also FUSRAP*
WELDON	SFUND	(see WELDON where TYPE EQ SFMP)
WEST CHICAGO	SFUND	West Chicago Sewage Treatment Plant (source = Rare Earths Facility)

APPENDIX D

RADIONUCLIDES IN THE TABLE NUKES

Ac-227
Ac-228
Ag-110m
Am-241
As-76
Ba-137m
Ba-139
Ba-140
Be-7
Bi-207
Bi-212
Cd-109
Ce-137
Ce-141
Ce-144
Cm-242
Cm-243
Cm-244
Co-57
Co-58
Co-60
Cr-51
Cs-134
Cs-136
Cs-137
Cu-64
C-14
Eu-152
Eu-154
Eu-155
Fe-55
Fe-59
Ga-67
Hf-181
H-3
Ir-192
I-125
I-129
I-131
I-132
I-133
I-135
Kr-85
K-40
La-140
Mn-54
Mo-99
Na-24
Nb-94
Nb-95
Nb-95m
Nb-97
Ni-59
Ni-63
Np-237
Np-239
Pa-231
Pa-234
Pa-234m
Pb-210
Pb-212
Pm-147
Po-212
Po-216
Pr-144
Pu-238
Pu-239
Pu-240
Pu-241
Pu-242
P-32
Ra-224
Ra-226
Ra-228
Rh-106
Rn-222
Ru-103
Ru-106
Sb-122
Sb-124
Sb-125
Sb-127
Sc-46
Se-75
Sm-151
Sn-113
Sn-125
Sr-89
Sr-90
Sr-91
Sr-92
S-35
Tc-99
Tc-99m
Te-125m
Th-228
Th-230
Th-231
Th-232
Th-234
Tl-201
Tl-208
U-234
U-235
U-238
W-187
Xe-131m
Xe-133
Xe-135
Y-90
Y-91M
Y-92
Zn-65
Zr-95

APPENDIX E

TABLES IN THE DATABASE SURVHAZ

Summary:

Name	Columns	Rows	Name	Columns	Rows
GINFO	8	98	QUEST7	34	27
TOTWASTE	20	97	QUEST8	12	18
EPTOX	31	19	Q9a	2	92
LEADPB	17	34	Q9b	4	91
LIQORG	39	85	QUEST9c	5	89
QUEST4	39	30	Q9d	5	91
QUEST5	31	41	Q9e	7	92

Table: GINFO General information.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	gname	TEXT	40 char		
3	address1	TEXT	35 char		
4	address2	TEXT	35 char		
5	address3	TEXT	35 char		
6	contact	TEXT	25 char		
7	phone	TEXT	20 char		
8	comments	TEXT	80 char		

Current number of rows: 98

Table: TOTWASTE Total radioactive waste disposal.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	vol83	REAL			Volume shipped/yr (1983) (ft^3)
3	vol84	REAL			Volume shipped/yr (1984) (ft^3)
4	act83	REAL			Activity shipped/yr (1983) (Ci)
5	act84	REAL			Activity shipped/yr (1983) (Ci)
6	avol3	REAL			% NRC class A (1983 volume)
7	avol4	REAL			% NRC class A (1984 volume)
8	aact3	REAL			% NRC class A (1983 activity)
9	aact4	REAL			% NRC class A (1984 activity)
10	bvol3	REAL			% NRC class B (1983 volume)
11	bvol4	REAL			% NRC class B (1984 volume)
12	bact3	REAL			% NRC class B (1983 activity)
13	bact4	REAL			% NRC class B (1984 activity)
14	cvol3	REAL			% NRC class C (1983 volume)

Table: TOTWASTE, cont.

#	Name	Type	Length	Key	Description
15	cvol4	REAL			% NRC class C (1984 volume)
16	cact3	REAL			% NRC class C (1983 activity)
17	cact4	REAL			% NRC class C (1984 activity)
18	broker1	TEXT	20 char		Broker to whom shipped
19	broker2	TEXT	20 char		Broker to whom shipped
20	comments	TEXT	80 char		

Current number of rows: 97

Table: EPTOX Extraction procedure toxicity contaminants.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	concn	TEXT	16 char		Contaminant concen (ppm or %)
3	contam	TEXT	25 char		Contaminant name
4	stream	TEXT	25 char		Waste stream of contaminant
5	chemcpd	TEXT	25 char		Chem form of contaminant
6	genvol	REAL			Annual volume as generated (ft^3)
7	genact	REAL			Annual activity as generated (Ci)
8	rn1	TEXT	8 char		Radionuclide name
9	rnact1	REAL			Radionuclide concen (Ci/ft^3)
10	rn2	TEXT	8 char		Radionuclide name
11	rnact2	REAL			Radionuclide concen (Ci/ft^3)
12	rn3	TEXT	8 char		Radionuclide name
13	rnact3	REAL			Radionuclide concen (Ci/ft^3)
14	mix[y/n]	TEXT	8 char		Mixed w/ other waste streams?
15	mixwith	TEXT	25 char		Which other waste streams?
16	mixwhen	TEXT	30 char		When mixed?
17	treat	TEXT	25 char		Treatment used
18	shpvol	REAL			Annual volume as shipped (ft^3)
19	shpwt	REAL			Annual weight as shipped (lb)
20	shpact	REAL			Annual activity as shipped (Ci)
21	rnshp1	TEXT	8 char		Radionuclide shipped
22	rnashp1	REAL			Radionuclide concen (Ci/ft^3)
23	rnshp2	TEXT	8 char		Radionuclide shipped
24	rnashp2	REAL			Radionuclide concen (Ci/ft^3)
25	rnshp3	TEXT	8 char		Radionuclide shipped
26	rnashp3	REAL			Radionuclide concen (Ci/ft^3)
27	cntnr	TEXT	20 char		Container type
28	cntrvol	REAL			Container volume
29	dsite	TEXT	8 char		Disposal site
30	brk[y/n]	TEXT	8 char		Broker used?
31	comments	TEXT	80 char		

Current number of rows: 19

Table: LEADPB Shipments of lead metal.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	stream	TEXT	25 char		Waste stream
3	shpact	REAL			Annual activity as shipped (Ci)
4	shpwt	REAL			Annual weight as shipped (lb)
5	shpvol	REAL			Annual volume as shipped (ft^3)
6	rnshp1	TEXT	8 char		Radionuclide shipped
7	rnshp2	TEXT	8 char		Radionuclide shipped
8	rnashp1	REAL			Radionuclide concen (Ci/ft^3)
9	rnashp2	REAL			Radionuclide concen (Ci/ft^3)
10	mix[y/n]	TEXT	8 char		Pb mixed w/ other waste streams?
11	mixwith	TEXT	25 char		Which streams?
12	mixwhen	TEXT	30 char		When mixed?
13	cntnr	TEXT	20 char		Container type
14	cntrvol	REAL			Container volume
15	dsite	TEXT	8 char		Disposal site
16	brk[y/n]	TEXT	8 char		Broker?
17	comments	TEXT	80 char		

Current number of rows: 34

Table: LIQORG Organic liquids.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	chemnm	TEXT	18 char		Chemical (brand) name
3	stream	TEXT	25 char		Waste stream containing chemical
4	genvol	REAL			Annual volume as generated (ft^3)
5	genwt	REAL			Annual weight as generated (lb)
6	genact	REAL			Annual activity as generated (Ci)
7	rn1	TEXT	8 char		Radionuclide name
8	rnact1	REAL			Radionuclide concen (Ci/ft^3)
9	rn2	TEXT	8 char		Radionuclide name
10	rnact2	REAL			Radionuclide concen (Ci/ft^3)
11	rn3	TEXT	8 char		Radionuclide name
12	rnact3	REAL			Radionuclide concen (Ci/ft^3)
13	rn4	TEXT	8 char		Radionuclide name
14	rnact4	REAL			Radionuclide concen (Ci/ft^3)
15	rn5	TEXT	8 char		Radionuclide name
16	rnact5	REAL			Radionuclide concen (Ci/ft^3)
17	mix[y/n]	TEXT	8 char		Mixed w/ other waste streams?
18	mixwith	TEXT	25 char		Which other waste streams?
19	mixwhen	TEXT	30 char		When mixed?
20	sorb	TEXT	20 char		Absorbant used
21	binder	TEXT	20 char		Solidification binder
22	shpvol	REAL			Annual volume as shipped (ft^3)
23	shpwt	REAL			Annual weight as shipped (lb)
24	shpact	REAL			Annual activity as shipped (Ci)

Table: LIQORG, cont.

#	Name	Type	Length	Key	Description
25	rnshp1	TEXT	8 char		Radionuclide shipped
26	rnashp1	REAL			Radionuclide concen (Ci/ft^3)
27	rnshp2	TEXT	8 char		Radionuclide shipped
28	rnashp2	REAL			Radionuclide concen (Ci/ft^3)
29	rnshp3	TEXT	8 char		Radionuclide shipped
30	rnashp3	REAL			Radionuclide concen (Ci/ft^3)
31	rnshp4	TEXT	8 char		Radionuclide shipped
32	rnashp4	REAL			Radionuclide concen (Ci/ft^3)
33	rnshp5	TEXT	8 char		Radionuclide shipped
34	rnashp5	REAL			Radionuclide concen (Ci/ft^3)
35	cntnr	TEXT	20 char		Container used
36	cntrvol	REAL			Container volume
37	dsite	TEXT	8 char		Disposal site
38	brk[y/n]	TEXT	8 char		Broker?
39	comments	TEXT	80 char		

Current number of rows: 85

Table: QUEST4 Specific chemical constituents.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	shpwt	REAL			Annual weight as shipped (lb)
3	chemical	TEXT	12 char		Chemical (brand)
4	stream	TEXT	25 char		Waste stream containing chemical
5	strcode	TEXT	8 char		Waste stream code (rept, p. 150)
6	chemcpd	TEXT	25 char		Chemical compound
7	annuse	REAL			Annual use (lb) of chemical
8	chemconc	REAL			Chem concen in stream (ppm, %)
9	genact	REAL			Annual activity as generated
10	rn1	TEXT	8 char		Radionuclide name
11	rnact1	REAL			Radionuclide concen (Ci/ft^3)
12	rn2	TEXT	8 char		Radionuclide name
13	rnact2	REAL			Radionuclide concen (Ci/ft^3)
14	rn3	TEXT	8 char		Radionuclide name
15	rnact3	REAL			Radionuclide concen (Ci/ft^3)
16	rn4	TEXT	8 char		Radionuclide name
17	rnact4	REAL			Radionuclide concen (Ci/ft^3)
18	rn5	TEXT	8 char		Radionuclide name
19	rnact5	REAL			Radionuclide concen (Ci/ft^3)
20	mix[y/n]	TEXT	8 char		Mixed w/ other waste streams?
21	mixwith	TEXT	25 char		Which other waste streams?
22	mixwhen	TEXT	30 char		When mixed?
23	shpvol	REAL			Annual volume as shipped (ft^3)
24	shpact	REAL			Annual activity as shipped (Ci)
25	rnshp1	TEXT	8 char		Radionuclide shipped
26	rnashp1	REAL			Radionuclide concen (Ci/ft^3)
27	rnshp2	TEXT	8 char		Radionuclide shipped
28	rnashp2	REAL			Radionuclide concen (Ci/ft^3)

Table: QUEST4, cont.

#	Name	Type	Length	Key	Description
29	rnshp3	TEXT	8 char		Radionuclide shipped
30	rnashp3	REAL			Radionuclide concen (Ci/ft^3)
31	rnshp4	TEXT	8 char		Radionuclide shipped
32	rnashp4	REAL			Radionuclide concen (Ci/ft^3)
33	rnshp5	TEXT	8 char		Radionuclide shipped
34	rnashp5	REAL			Radionuclide concen (Ci/ft^3)
35	cntnr	TEXT	20 char		Container used
36	cntrvol	REAL			Container volume
37	dsite	TEXT	8 char		Disposal site
38	brk[y/n]	TEXT	8 char		Broker?
39	comments	TEXT	80 char		

Current number of rows: 30

Table: QUEST5 Special wastes.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	annusep	REAL			
3	chemnm	TEXT	18 char		Chemical (brand) name
4	timestor	TEXT	15 char		Length of time stored
5	stream	TEXT	25 char		Waste stream of contaminant
6	annuse	REAL			Annual use
7	genact	REAL			Annual activity as generated
8	rn1	TEXT	8 char		Radionuclide name
9	rnact1	REAL			Radionuclide concen (Ci/ft^3)
10	rn2	TEXT	8 char		Radionuclide name
11	rnact2	REAL			Radionuclide concen (Ci/ft^3)
12	rn3	TEXT	8 char		Radionuclide name
13	rnact3	REAL			Radionuclide concen (Ci/ft^3)
14	rn4	TEXT	8 char		Radionuclide name
15	rnact4	REAL			Radionuclide concen (Ci/ft^3)
16	rn5	TEXT	8 char		Radionuclide name
17	rnact5	REAL			Radionuclide concen (Ci/ft^3)
18	sto	TEXT	2 char		Is waste stored?
19	stortime	REAL			How long waste stored
20	mix[y/n]	TEXT	8 char		Mixed w/ other waste streams?
21	mixwith	TEXT	25 char		Which other waste streams?
22	mixwhen	TEXT	30 char		When mixed?
23	shpvol	REAL			Annual volume as shipped (ft^3)
24	shpwt	REAL			Annual weight as shipped (lb)
25	sorb	TEXT	20 char		Absorbant used
26	binder	TEXT	20 char		Solidification binder
27	cntnr	TEXT	20 char		Container used
28	cntrvol	REAL			Container volume
29	dsite	TEXT	8 char		Disposal site
30	brk[y/n]	TEXT	8 char		Broker?
31	comments	TEXT	80 char		

Current number of rows: 41

Table: QUEST7 Hazardous waste characteristics (40 CFR 261).

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	comp	TEXT	25 char		Component of stream w/ haz char
3	stream	TEXT	25 char		Which waste stream
4	char	TEXT	1 char		Hazardous characteristic (I,C,R)
5	compconc	REAL			Component concen (ppm or %)
6	ph	TEXT	8 char		pH
7	listed	TEXT	20 char		Component listed in prev question(s)?
8	genvol	REAL			Annual volume as generated (ft^3)
9	genwt	REAL			Annual weight as generated (lb)
10	genact	REAL			Annual activity as generated (Ci)
11	rn1	TEXT	8 char		Radionuclide name
12	rnact1	REAL			Radionuclide concen (Ci/ft^3)
13	rn2	TEXT	8 char		Radionuclide name
14	rnact2	REAL			Radionuclide concen (Ci/ft^3)
15	rn3	TEXT	8 char		Radionuclide name
16	rnact3	REAL			Radionuclide concen (Ci/ft^3)
17	mix[y/n]	TEXT	8 char		Mixed w/ other waste streams?
18	mixwith	TEXT	25 char		Which other waste streams?
19	mixwhen	TEXT	30 char		When mixed?
20	treat	TEXT	25 char		Treatment
21	shpvol	REAL			Annual volume as shipped (ft^3)
22	shpwt	REAL			Annual weight as shipped (lb)
23	shpact	REAL			Annual activity as shipped (Ci)
24	rnshp1	TEXT	8 char		Radionuclide shipped
25	rnashp1	REAL			Radionuclide concen (Ci/ft^3)
26	rnshp2	TEXT	8 char		Radionuclide shipped
27	rnashp2	REAL			Radionuclide concen (Ci/ft^3)
28	rnshp3	TEXT	8 char		Radionuclide shipped
29	rnashp3	REAL			Radionuclide concen (Ci/ft^3)
30	cntnr	TEXT	20 char		Container used
31	cntrvol	REAL			Container volume
32	dsite	TEXT	8 char		Disposal site
33	brk[y/n]	TEXT	8 char		Broker?
34	comments	TEXT	80 char		

Current number of rows: 27

Table: QUEST8 Listed hazardous constituents (Fed. Reg. Oct. 1984).

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	stream	TEXT	25 char		Waste stream
3	clcon1	TEXT	15 char		Class/constituent name
4	chemcon1	TEXT	8 char		Concentration
5	listed1	TEXT	20 char		Listed in another question?
6	clcon2	TEXT	15 char		Class/constituent name
7	chemcon2	TEXT	8 char		Concentration

Table: QUEST8, cont.

#	Name	Type	Length	Key	Description
8	listed2	TEXT	20 char		Listed in another question?
9	clcon3	TEXT	15 char		Class/constituent name
10	chemcon3	TEXT	8 char		Concentration
11	listed3	TEXT	20 char		Listed in another question?
12	comments	TEXT	80 char		

Current number of rows: 18

Table: Q9a Estimated accuracy of data.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	error	TEXT	8 char		Estimated error (%)

Current number of rows: 92

Table: Q9b Source of survey estimate values.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	account	TEXT	1 char		Materials accounting
3	labtest	TEXT	1 char		Lab test/analysis
4	other	TEXT	20 char		Other (specify)

Current number of rows: 91

Table: QUEST9c In-house facilities for testing.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	subc	TEXT	1 char		Facilities for testing Subpart C char?
3	chars	TEXT	6 char		Which characteristics?
4	att3	TEXT	1 char		Facilities for testing other haz chars?
5	const	TEXT	30 char		Which constituents?

Current number of rows: 89

Table: Q9d Familiarity with EPA regulations.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	know	TEXT	1 char		Know regs exist
3	notknow	TEXT	1 char		Didn't know regs exist
4	read	TEXT	1 char		Have read regs
5	eval	TEXT	1 char		Have evaluated wastes per regs

Current number of rows: 91

Table: Q9e Expected future shipment trends.

Column definitions

#	Name	Type	Length	Key	Description
1	gencode	TEXT	5 char		Generator code
2	volincr	TEXT	2 char		Expected volume increase (%)
3	voldecr	TEXT	2 char		Expected volume decrease (%)
4	actincr	TEXT	2 char		Expected activity increase (%)
5	actdecr	TEXT	2 char		Expected activity decrease (%)
6	nochgev	TEXT	1 char		Expect no volume change
7	nochgea	TEXT	1 char		Expect no activity change

Current number of rows: 92

-END-

DATE FILMED

11/05/90