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LLCEDATA and LLCECALC for Windows

Version 1.0, Volume I: User's Manual

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Abstract: LLCEDATA and LLCECALC for Windows Version 1.0 are user-friendly computer software programs that work together to determine the proper waste designation, handling, and disposition requirements for Long-Length Contaminated Equipment. LLCEDATA and LLCECALC generate characterization information by integrating the acquisition of current tank waste data with the output from the Gamma Energy Analysis System, a component of the Flexible Receiver Radiation Detection System. Documentation for LLCEDATA and LLCECALC for Windows is available in three volumes. Volume I is a user's manual, which is intended as a quick reference; Volume II is a technical manual; and Volume III is a software verification and validation document.

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**LLCEDATA AND LLCECALC FOR WINDOWS VERSION 1.0,
VOLUME I: USER'S MANUAL**

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Prepared by: D. L. Riley
Software: H. L. Roach**

August 1998

**Prepared for the U.S. Department of Energy
by
Engineering
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**LLCEDATA AND LLCECALC FOR WINDOWS VERSION 1.0,
VOLUME I: USER'S MANUAL**

Cognizant Engineer: J. G. McFadden

Prepared by: D. L. Riley

Software: H. L. Roach

ABSTRACT

LLCEDATA and LLCECALC for Windows¹ are user-friendly computer software programs that work together to determine the proper waste designation, handling, and disposition requirements for Long-Length Contaminated Equipment (LLCE). LLCEDATA reads from a variety of databases to produce an equipment data file (EDF) that represents a "snapshot" of both the LLCE and the tank it originates from. LLCECALC reads the EDF and a gamma assay (AV2) file that is produced by the Flexible Receiver Gamma Energy Analysis System. LLCECALC performs corrections to the AV2 file as it is being read and characterizes the LLCE. Both programs produce a variety of reports, including a characterization report and a status report. The status report documents each action taken by the user, LLCEDATA, and LLCECALC.

Documentation for LLCEDATA and LLCECALC for Windows is available in three volumes. Volume I is a user's manual, which is intended as a quick reference for both LLCEDATA and LLCECALC. Volume II is a technical manual, and Volume III is a software verification and validation document..

LLCEDATA and LLCECALC for Windows are sponsored by the U.S. Department of Energy. They were developed and are maintained by Engineering, Waste Management Federal Services, Inc., Northwest Operations. Copies of the software and documentation are available by contacting Engineering, Waste Management Federal Services, Inc., Northwest Operations, Richland, Washington.

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FOREWORD

LLCEDATA and LLCECALC for Windows are software programs developed and maintained by Engineering, Waste Management Federal Services, Inc., Northwest Operations, Richland, Washington, for the U.S. Department of Energy. Documentation for the software programs exists in the form of *LLCEDATA and LLCECALC for Windows Version 1.0, Volume I: User's Manual*; *LLCEDATA and LLCECALC for Windows Version 1.0, Volume II: Technical Manual*; and *LLCEDATA and LLCECALC for Windows Version 1.0, Volume III: Software Verification and Validation*. The software is available from Engineering by calling 509-376-0610 or 509-376-7111. Corrections and suggestions for additions or modifications to LLCEDATA and LLCECALC for Windows are welcome.

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LIST OF TERMS

AV2	gamma assay (file)
CAS	Chemical Abstracts Service
CD-ROM	compact disk read-only memory
DE-Ci	dose equivalent curie
EDF	equipment data file
FGE	fissile gram equivalent
FRRDS	Flexible Receiver Radiation Detection System
GEA	Gamma Energy Analysis (System)
ISB	interim safety basis
LLCE	Long-Length Contaminated Equipment
LLMW	low-level mixed waste
LLW	low-level waste
MB	megabyte
NRC	U.S. Nuclear Regulatory Commission
PDF	portable document format
PE-Ci	plutonium equivalent curie
SARP	safety analysis report for packaging
TRU	transuranic
TWINS	Tank Waste Information Network System (database)

LLCEDATA AND LLCECALC FOR WINDOWS VOLUME I: USER'S MANUAL

1.0 INTRODUCTION

The Long-Length Contaminated Equipment (LLCE) disposal effort involves retrieval, handling, and disposal of the LLCE from any one of the 177 underground waste storage tanks, catch tanks, and lift stations. When the LLCE is retrieved from the tanks, every effort is made to remove any residual tank waste that is on the equipment surfaces. It is expected that some amount of tank waste will remain on the LLCE after retrieval. The radionuclide and chemical content of this residue must be assessed to determine the proper waste designation, handling, and disposition requirements for the LLCE.

It is the purpose of LLCEDATA and LLCECALC for Windows¹ Version 1.0 to generate characterization information by integrating the acquisition of current tank waste data with the output from the Gamma Energy Analysis (GEA) System, a component of the Flexible Receiver Radiation Detection System (FRRDS). LLCEDATA and LLCECALC allow for the quick, accurate, and efficient characterization of an LLCE.

In order for the LLCECALC program to perform an LLCE characterization, LLCEDATA must first be used to create an equipment data file (EDF). The LLCEDATA program reads from a variety of databases, listed in Section 3.2, to assemble the EDF. The LLCEDATA-produced EDF is a "snapshot" of the LLCE and its originating tank. The completed EDF, ready to be used by LLCECALC, contains complete information concerning the LLCE.

In addition to the LLCEDATA-generated EDF, the LLCECALC program requires a gamma assay file, known as the AV2 file. The gamma assay file is produced by the gamma isotope measurements from the GEA System. Once the EDF and AV2 file have been defined in LLCECALC, the LLCE characterization is ready to begin.

LLCEDATA and LLCECALC are Microsoft² Windows Visual Basic³ executable programs that are menu driven and are easy for the user to navigate.

Three volumes document LLCEDATA and LLCECALC for Windows. Volume I is a user's manual, which is intended for quick reference. It is to be used as an aid for learning to use LLCEDATA and LLCECALC for Windows and as a guide to the programs' uses. The user's manual contains a discussion of all the options available to the user for each menu found in both LLCEDATA and LLCECALC. Volume II is a technical manual, which contains in-depth information on both programs. It gives information on the history of LLCEDATA and LLCECALC for Windows as well as the theoretical background and calculational methodology. Volume III is a software verification and validation document for LLCEDATA and LLCECALC for Windows. It documents the quality assurance for the software programs and demonstrates independent confirmation of the algorithms used by LLCECALC.

¹Windows is a trademark of Microsoft Corporation.

²Microsoft is a trademark of Microsoft Corporation.

³Visual Basic is a trademark of Microsoft Corporation.

1.1 USES AND LIMITATIONS OF LLCEDATA AND LLCECALC FOR WINDOWS

LLCEDATA and LLCECALC provide an efficient mechanism to characterize an LLCE. LLCEDATA maintains several databases for its use. The three main databases are (1) a database of all known LLCE, (2) a database of tank chemical and radiochemical constituents, and (3) a database of containers approved by HNF-SD-TP-SARP-013, *Safety Analysis Report for Packaging (Onsite) Long-Length Contaminated Equipment Transport System* (McCormick 1997). It is important that the databases in LLCEDATA be kept up to date. The LLCEDATA code custodian has the responsibility to maintain the databases. The user of LLCEDATA will check with the code custodian to verify that the user has the latest version of the code. The user can make changes to copies of the database used for specific LLCE analyses by using the ability of LLCEDATA to edit any and all fields used in the specification of an LLCE, including a tank's chemical or radiochemical contents. The user should note that these changes or additions that are made are specific to the EDF being edited and are not being made or stored in the actual main databases. The code custodian is required to make the permanent changes to the databases.

Once LLCEDATA has been used to create the EDF, LLCECALC performs two main functions, process the gamma data and characterize the contamination. The first function, process the gamma data, is performed as LLCECALC reads the supplied AV2 file that was created by the FRRDS. During this process, nine steps are performed while LLCECALC reads, adjusts, and calculates the total ^{137}Cs content of the LLCE. User intervention is typically required during these steps, with default values supplied in each case. The second function, characterization, performs 11 steps while LLCECALC calculates the actual characterization of the LLCE.

LLCEDATA and LLCECALC allow the reports that they generate to be viewed, printed, or exported. LLCEDATA allows the user to view, print, or export the following reports: LLCE Physical Data, Tank Characterization Database, and LLCE Geometry Factors. LLCECALC allows the user to view, print, or export the LLCE Characterization Report. In addition to these reports, both programs maintain a status report, which can be viewed, printed, or exported. The status report is a running record of all activities performed by both the user and the two programs. This report can serve as a historical record to show exactly who, what, when, where, and how an LLCE was analyzed.

There are certain limitations imposed by the process used by LLCEDATA and LLCECALC. The software programs themselves, LLCEDATA and LLCECALC, cause none of these limitations. Some of these limitations can be eliminated by improvements that are proposed in Volume II of this document, the technical manual. The limitations are in the actual gamma measurements and the subsequent analyses performed by LLCECALC. The resulting LLCE contamination characterizations are affected by these limitations.

The limitations are fully discussed below and can be summarized as follows:

- Calibration limitations: geometry correction factors
 - Only detector No. 1 calibrated; other two normalized to detector No. 1's response
 - Only ^{137}Cs currently assayed; all other LLCE characterization ratio inferred
 - Single-layer tank model in LLCEDATA's current database
 - Gama interpolation.
1. The gamma assay system is presently calibrated for gamma activity using a point source of known activity. The extended gamma source actually presented to the detector system by the LLCE is detected less efficiently, and so-called "geometry correction factors" are used to account for this difference. Geometry correction factors are determined by computer simulation and are appropriate only for LLCE with negligible self-absorption for the source gammas and for the shielding and collimation used in the computer models. Geometry correction factors that do not account for self-absorption will not, for example, be appropriate for other types of equipment, such as pumps (Nelson 1998). For these types of LLCE, new geometry correction factors will be required that will take this into

account (Nelson 1998). The LLCEDATA program allows the user to input new geometry correction factors into the equipment database. Presently, the database only contains geometry correction factors for several thermocouple trees, which are assumed to be free of self-absorption effects.

2. The calibration procedure presently in use with the gamma assay system is unable to perform an adequate efficiency calibration of the two shielded detectors. Therefore, only the unshielded detector, detector 1, is efficiency calibrated for the ^{137}Cs gamma ray. The shielded detector responses must be compared to the unshielded detector response using the actual LLCE gamma data. This comparison efficiency is determined in the LLCECALC program. Experience has shown that these comparison efficiency factors are variable from one LLCE retrieval to the next, especially for detector 3, and the process is judged to contribute some uncertainty in the overall activity calculation.
3. The gamma assay system presently processes only the gamma signature from ^{137}Cs . There are also detected signatures from ^{60}Co and ^{154}Eu , but these are not used in characterizing the LLCE activity from other radionuclides. Rather, the tank waste database is used to derive a ratio of all other radionuclide activities to that measured for ^{137}Cs . In using these ratios, it is assumed that the contamination remaining on the LLCE has the same mix of radionuclides as the tank waste layer in which it was located before retrieval. The user is cautioned that there has been no experimental verification that the ratio of each radionuclide activity to the measured ^{137}Cs activity for LLCE is the same as that determined from the tank waste database.
4. Although there are typically two or more layers of waste in the tanks, the tank waste characterization database employed by LLCEDATA contains only a single waste layer for each tank containing radionuclide activities appropriate for a homogenized single layer of average composition. This is intended only as a starting point for the tank waste characterization data. It is anticipated that in most cases the tank waste data in the database will be replaced by the most current and accurate tank waste data available prior to when an LLCE is retrieved from a waste tank. The updated tank waste data will be entered into the database using the LLCEDATA program. LLCE is designed to allow for the definition of multiple tank waste layers. With a multi-layer tank waste database, a more realistic analysis of the LLCE contamination can be done with LLCECALC by assigning radionuclide activity relative to the ^{137}Cs measurement for each position according to the adjacent layer of waste.
5. There are instances where gamma data are missing for what are usually small intervals along the length of the LLCE. LLCECALC is designed to place an interpolated value of ^{137}Cs activity in this interval unless the user provides a value when prompted. This is considered a minor, and probably unavoidable, limitation to the system. Only for instances where the ^{137}Cs activity is strongly varying with length, when the gap in data is encountered, will this interpolation method prove inadequate.

These limitations have been a part of the LLCE retrieval system since its conception. It is not the intent or purpose of either LLCEDATA or LLCECALC to correct these limitations. However, given these limitations, the software makes necessary decisions that provide a consistent, standardized, and documented methodology for performing LLCE characterizations that was not previously available.

Information on the history of LLCEDATA and LLCECALC for Windows, as well as the theoretical background, calculational methodology, and algorithms used by the software programs, is documented in companion Volume II: Technical Manual. Companion Volume III: Software Verification and Validation demonstrates the verification and validation for both LLCEDATA and LLCECALC programs. The contents of the databases used by LLCEDATA are verified and referenced. Each step performed by both phases of LLCECALC is independently validated through extensive testing with synthetic data. The synthetic data allowed for direct comparison of hand calculations of results to the results generated by LLCECALC. Test cases confirm that the methodology, algorithms, and data used in LLCECALC are correct.

2.0 INSTALLATION INSTRUCTIONS

2.1 SYSTEM REQUIREMENTS

Before installing LLCEDATA or LLCECALC for Windows Version 1.0, the user will ensure that the user's computer system meets (or exceeds) the following operating system and hardware specifications:

Operating system:

- Microsoft Windows 95 or 98
- Microsoft Windows NT⁴ 4.0, workstation or server version

Hardware:

- Computer: Intel⁵-based personal computer able to run the operating systems listed above (486, Pentium,⁶ Pentium Pro, or equivalent)
- Random access memory: Minimum of 16 megabytes (MB)
- Display: Standard Microsoft Windows display, 640 x 480 minimum
- Free disk space: 25 MB of hard disk space
- Compact disk read-only memory (CD-ROM): Required for loading software. A networked personal computer will be able to access the software and run LLCEDATA and LLCECALC without a CD-ROM.

2.2 SETTING UP LLCEDATA AND LLCECALC SOFTWARE

The program software for both LLCEDATA and LLCECALC is supplied on a single CD-ROM. A setup program takes charge of software transfer to the hard disk. Choose a drive with sufficient space, and the setup program automatically creates the needed directories.

The following steps, found in Section 2.2.1.1 for LLCEDATA and Section 2.2.2.1 for LLCECALC, will guide the user through an installation. Step 3 uses the Start button on the operating system's task bar to start the setup program, *setup.exe*. The user can also use the command prompt or navigate in Explorer and double-click the setup file.

2.2.1 Installing LLCEDATA

2.2.1.1 Six-Step Process for the Installation LLCEDATA.

Step 1:

Start any of the supported operating systems listed in Section 2.1. If the operating system is Microsoft Windows NT 4.0, the person logging on to the system should do so with operating system administrative privileges. If any of the supported operating systems are currently running, close any Windows applications before continuing.

⁴Windows NT is a trademark of Microsoft Corporation.

⁵Intel is a trademark of Intel Corporation.

⁶Pentium is a trademark of Intel Corporation.

- Step 2:** Put the LLCCE program CD-ROM in the computers's CD-ROM drive.
- Step 3:** The taskbar that appears at the bottom of the screen contains the Start button. Click on the Start button, then click on run. Enter the following to start the setup program:

d:\Llcedata\setup

Substitute another drive letter for **d** if the CD-ROM is mapped to another drive.

The first thing the LLCEDATA setup program will do is copy setup files to the Windows temporary directory. When this is done, the user will be reminded to close any Windows applications that may still be running. At this point, the user may continue with setup or exit the setup program to close applications in the operating system.

- Step 4:** Follow on-screen instructions in the setup program. The first choice, **Llcedata Setup**, is shown below:

Choose a directory or accept the default. The default directory is **VProgram Files\Llcedata** on the drive containing the operating system. If **Change Directory** is chosen, the user will be prompted with a standard windows interface for selecting target drives and directories.

When the user is ready to install in the directory shown, click on the large install button, shown here. The setup program will create the specified directory and will check available disk space. During the installation, the user will be notified of the installation status as the setup program updates system files, creates program icons, and installs the LLCEDATA program.

If insufficient disk space is available on the drive/directory chosen, the user will be prompted to select an alternative location. If there are any errors during the install the setup program will stop, notify the user of the error, and remove the temporary setup files from the hard disk.

Step 5: After the installation process is completed, the LLCEDATA program may be executed by clicking on Start, Programs, Llcdata, and then the icon Llcdata. The user may add this icon to the desktop if desired.

Step 6: After a successful LLCEDATA install, the user will run the test files and check their results to verify that the program is functioning correctly. Section 8.0 contains the instructions on how to do this and presents the results that the user's new installation results should match. It will be necessary to install LLCECALC to perform this verification.

2.2.1.2 LLCEDATA Setup Program Activity. During the installation process, the LLCEDATA setup program will make several system changes to the operating system. The following list will outline those changes.

- In the operating system install directory; e.g. c:\windows, a directory \crystal will be added. Approximately 13 dynamic link library files will be added into the \crystal directory. These files are needed for LLCEDATA to produce data reports and related files.
- In the operating system install directory the uninstaller application will be added: *St5unst.exe*. This file is for removing the LLCEDATA application.
- In the operating systems system directory, approximately 34 files will be added or updated. It is possible that the computer has applications that already use some of the same utility files (dll and ocx files) that the LLCEDATA program uses. If so, the setup program will compare the users version of the file to the LLCEDATA install version of the file and will update or add files as needed.

When the LLCEDATA installation process is finished, setup will have placed several files in the default or user-specified LLCEDATA folder. Table 2-1 outlines each of these files.

Table 2-1. LLCEDATA Installation Directory File Content List. (2 sheets total)

File Name	File Description
Llcdata.exe	The LLCEDATA Windows ¹ executable file.
Rescue.exe	The Rescue Windows executable file. Rescue allows the Long-Length Contaminated Equipment (LLCE) database to be compressed and uncompressed outside of LLCEDATA. An LLCEDATA password is required. The primary use of Rescue is to save edited data if by some chance LLCEDATA crashes after the main database has been changed.
Llceinfo.bin	The database file that contains the LLCE physical data, tank waste data, LLCE geometry factors, waste container data, elements, radionuclide physical constants, radionuclide and chemical regulatory data, and the list of valid measured gamma isotopes. The LLCEDATA program user must have administrative privileges; i.e., the user is the code custodian, before permanent changes can be made to this database.
Dbchange.mdb	This database maintains a description of all the changes made to the LLCEINFO.BIN database. This database contains the status table information that is generated when editing of the LLCEINFO.BIN file. The code custodian is the only user allowed to start the LLCEDATA program to make changes to the LLCEINFO.BIN database.

Table 2-1. LLCEDATA Installation Directory File Content List. (2 sheets total)

File Name	File Description
TestCalc.edf	A sample equipment data file (EDF). The EDF is generated in LLCEDATA and is required to characterize LLCE waste in LLCECALC. It contains all data required to characterize a selected LLCE.
changeblk.fil	This is a blank DBCHANGE.MDB file. It is used to create a new DBCHANGE.MDB file when DBCHANGE.MDB becomes too large.
blank.fil	This is a blank EDF. It is used when a new EDF is created.
lleccont.rpt llecgeom.rpt llecphys.rpt llecereg.rpt tankchar.rpt licenuc.rpt chemreg.rpt llecagama.rpt status.rpt	These files serve as the template files for the Crystal Reports ² method of generating database print reports from within LLCEDATA.
Deisl1.isu Deisl2.isu Deisl3.isu Deisl4.isu _Deisreg.isr _lsreg32.dll	These files track all files required for deinstalling LLCEDATA.
Readme.doc	This "read me" file contains last-minute product information for LLCEDATA Version 1.0 program. WordPad or Microsoft Word may be used to view the file.

¹Windows is a trademark of Microsoft Corporation.²Crystal Reports is a trademark of Seagate Software, a subsidiary of Seagate Technology, Inc.

2.2.2 Installing LLCECALC

2.2.2.1 Six Step Process for the Installation of LLCECALC.

Step 1: Start any of the supported operating systems listed in Section 2.1. If the operating system is Microsoft Windows NT 4.0, the person logging on to the system should do so with operating system administrative privileges. If any of the supported operating systems are currently running, close any Windows applications before continuing.

Step 2: Put the LLCE program CD-ROM in the computer's CD-ROM drive.

Step 3: The taskbar that appears at the bottom of the screen contains the Start button. Click on the Start button, then click on run. Enter the following to start the setup program:

d:\Llcecalc\setup

Substitute another drive letter for **d** if the CD-ROM is mapped to another drive.

The first thing the LLCECALC setup program will do is copy setup files to the Windows temporary directory. When this is done, the user will be reminded to close any Windows applications that may still be running. At this point, the user may continue with setup, or exit the setup program to close applications in the operating system.

- Step 4:** Follow on-screen instructions in the setup program. The first choice, **Llcecalc Setup**, is shown below:

Choose a directory or accept the default. The default directory is *\Program Files\Llcecalc* on the drive containing the operating system. If **Change Directory** is chosen, the user will be prompted with a standard windows interface for selecting drives and directories to install to.

When the user is ready to install in the directory shown, click on the large install button, shown here. The setup program will create the specified directory, and will check available disk space. During the installation, the user will be notified of the installation status as the setup program updates system files, creates program icons, and installs the LLCECALC program.

If insufficient disk space is available on the drive/directory chosen, the user will be prompted to select an alternative location. If there are any errors during the install the setup program will stop, notify the user of the error, and remove the temporary setup files from the hard disk.

- Step 5:** After the installation process completes, the LLCECALC program may be executed by clicking on Start, Programs, Llcecalc, and then the icon Llcecalc. The icon may be added to the desktop, if desired.

- Step 6:** After a successful LLCECALC install, the user should run the test files associated with LLCEDATA and LLCECALC and have their results checked in order to verify that both programs are functioning correctly. Section 8 contains the instructions on how to do this and presents the results that the users new installation results should match. It will be necessary to install LLCEDATA to perform this verification.

2.2.2.2 LLCECALC Setup Program Activity. During the installation process, the LLCECALC setup program will make several small system changes to the operating system. LLCEDATA is used to make most of the changes that are needed for both programs. Only two files, both *ocx* files, are added to the operating systems *\System* directory.

When the LLCECALC installation process is finished, setup will have placed several files in the default or user specified LLCECALC folder. Table 2-2 outlines each of these files.

Table 2-2. LLCECALC Installation Directory File Content List.

File Name	File Description
Llcecalc.exe	The LLCECALC Windows ¹ executable file.
Llcecalc.ini	This is the LLCECALC initialization file that maintains settings for the following LLCECALC features: (1) the suspect transuranic level and (2) shielding correction factors for ¹³⁷ Cs, ⁶⁰ Co, and ¹⁵⁴ Eu.
report.fil	Used to create the Long-Length Contaminated Equipment (LLCE) characterization report in LLCECALC.
TestCalc.edf	A sample equipment data file (EDF). The EDF is generated in LLCEDATA and is required to characterize LLCE waste in LLCECALC. It contains all data required to characterize a selected LLCE.
Cresults.rpt Crouput.rpt Position.rpt Raw.rpt Status.rpt	These files serve as the template files for the Crystal Reports ² method of generating database print reports from within LLCECALC.
llcecalc/Av2 1001_16a.av2 13aug16b.av2 13ddos.av2 16c_213.av2 Az10113b.av2 Az13a.av2 Readme.doc	This directory contains AV2 files produced in 1996 when Profile and Sludge thermocouples were retrieved from waste tank 241-101-AZ. The file <i>Readme.doc</i> contains a description of these files.
llcecalc/Verify c1_1layer.av2 c2_5layer.edf c1_1layer.edf c2_5layer.av2 T101az13d.av2	This directory contains the EDF and AV2 files used for software verification, Section 8.0. The file T101az13d.av2 is the same as the 13ddos.av2 file in the llcecalc/Av2 directory.
Deisl1.isu Deisl2.isu Deisl3.isu Deisl4.isu _Deisreg.isr _Isreg32.dll	These files track all files required for deinstalling LLCEDATA.
Readme.doc	This "read me" file contains last-minute product information for the LLCECALC Version 1.0 program. WordPad or Microsoft Word may be used to view the file.

¹Windows is a trademark of Microsoft Corporation.

²Crystal Reports is a trademark of Seagate Software, a subsidiary of Seagate Technology, Inc.

2.3 INSTALLING ADOBE ACROBAT⁷

The user may install the optional software component, Adobe Acrobat, if desired. Acrobat is a freeware view, navigate, and print portable document format (PDF) file program. The documentation for LLCEDATA and LLCECALC is available in PDF format on the LLCE compact disk.

To start the Acrobat installation, click on the Start button, then click on run, and enter the following to start the setup program:

d:\Acrobat\setup

Follow the on-screen instructions that will guide the user through the remaining installation steps, which can be somewhat unique depending on how the user's computer is configured. Consult the file *Acrobat\README.wri*, the readme notes for Adobe Acrobat Reader, for the latest information on configuring Acrobat with your computer. The README.wri file also contains information similar to Table 2-1 for LLCEDATA or Table 2-2 for LLCECALC, which outlines the Acrobat files copied to the user's computer.

For full instructions on using the Acrobat Reader, please see the Acrobat Reader 3.0 Online Guide, which is located in the file *READER.PDF* in the Help folder, which is the same folder where the user chooses to install the Acrobat Reader. When using Acrobat Reader, selecting the *Help* and then *Reader Online Guide* menu will open *READER.PDF* automatically.

The LLCEDATA and LLCECALC user documentation, in PDF format, is located on the LLCE CD in the directory \User_Man. These PDF files may be copied to the user's computer or accessed directly from the CD.

3.0 PROGRAM OVERVIEW

3.1 LLCE PROGRAM OVERVIEW

The LLCE disposal effort involves retrieval, handling, and disposal of the LLCE from any one of the 177 underground waste storage tanks, catch tanks, and lift stations. When the LLCE is retrieved from the tanks, every effort is made to remove any residual tank waste that is on the equipment surfaces. It is expected that some small amount of tank waste will remain on the LLCE after retrieval. The radionuclide and chemical content of this residue must be assessed to determine the proper waste designation, handling, and disposition requirements for the LLCE.

It is the purpose of LLCEDATA and LLCECALC for Windows Version 1.0 to generate all of the characterization information by integrating the acquisition of current tank waste data with the output from the LLCE GEA System, a component of the FRRDS. LLCEDATA and LLCECALC allows for the quick, accurate, and efficient characterization of an LLCE.

LLCEDATA and LLCECALC are Microsoft Windows Visual Basic executable programs that are menu driven and should be easy to navigate.

⁷ Adobe Acrobat is a trademark of Adobe Systems Incorporated.

3.2 LLCEDATA OVERVIEW

In order for the LLCECALC program to perform an LLCE characterization, LLCEDATA must first be used to create an EDF. The LLCEDATA program reads from a variety of databases to assemble the EDF. The LLCEDATA-produced EDF is a "snapshot" of the LLCE and the tank the LLCE originated from. The completed EDF, ready to be used by LLCECALC, contains complete and accurate information concerning the LLCE. A comprehensive set of databases are maintained to allow LLCEDATA to assemble the information needed for characterization. The following is a list of short names used to refer to these databases with a description of the general content of each database.

- *Chemreg* lists all the chemical regulatory limits.
- *LLCECont* contains physical data for all LLCE waste containers that are currently approved by the safety analysis report for packaging (SARP) (McCormick 1997).
- *LLCEGeom* contains all known geometry correction factors for each LLCE.
- *LLCENuc* contains physical constants for all radionuclides.
- *LLCEPhys* contains the physical data for all known LLCE.
- *LLCEGamma* contains the list of all valid measured gamma isotopes. Currently, the only valid gamma isotope is ¹³⁷Cs. See Section 1.4 for a discussion of this limitation.
- *Radreg* contains the list of all radionuclide regulatory limits.
- *Tankchar* contains the list of all tank waste characterization data from the Tank Waste Information Network System (TWINS) database.
- *Element* contains the list of all radionuclides and chemicals, including description, Chemical Abstracts Service (CAS) number, and chemical formula.

A successful run through LLCEDATA, to produce the EDF for LLCECALC, requires three main steps, discussed in detail in Section 4.2. First, a particular LLCE is selected from a listing of all available LLCE. Second, the tank the LLCE is retrieved from is selected from a listing of tanks. And finally, the geometry correction factors are input for each portion of the LLCE.

Each of these three steps allows the user to edit the content of the particular database used to assemble the specific EDF for the LLCE. The database edit changes, if any, are only stored in the specific EDF, unless the user has administrative privilege to modify the original databases; i.e., the code custodian. There are five optional steps that the user may select to either review or edit the databases. These optional steps are discussed in Section 4.3.

When the user is finished with LLCEDATA, a complete EDF will be ready to be used by LLCECALC.

3.3 LLCECALC OVERVIEW

In order to run the LLCECALC program and perform characterization activities on an LLCE, two files are required. The first is the EDF from the LLCEDATA program. The second file LLCECALC needs is the gamma assay file, known as the AV2 file. The gamma assay file is produced by the gamma isotope measurements from the GEA System. Once these files have been defined in LLCECALC, the LLCE characterization is a two step process. First the LLCECALC program will process the gamma assay file. LLCECALC will perform nine steps while reading the AV2 file. Section 5.3 outlines this process and the

required user interaction needed to confirm certain assumptions and to make corrections when needed. After the AV2 file has been correctly read into LLCECALC, the final step is to perform the actual characterization.

LLCECALC's characterization calculations are discussed in Section 5.4. The following list outlines the characterizations that are performed:

1. Radiochemical and chemical content calculations
2. Check against the LLCE wastes as limited by the SARP (McCormick 1997)
3. Calculations for Categories 1 and 3 low-level waste (LLW)
4. Transuranic (TRU) and Suspect TRU waste determination
5. Plutonium equivalent curie (PE-Ci) calculation
6. Calculate the ^{239}Pu fissile gram equivalent (FGE)
7. Calculate the Alpha Curie Content
8. Calculate the heat generation rate
9. Calculate the Transportation category
10. Calculate the dose equivalent curie (DE-Ci) value
11. Calculate the hazardous waste codes.

The methodology and algorithms used to calculate each of these quantities are discussed in Volume II: Technical Manual, Section 2.0. The limits used by LLCECALC to perform the characterizations listed above are documented in Volume III: Software Verification and Validation, Section 3.2.

While the LLCECALC program is running, a summary of the calculations that are performed, listed above, is displayed on the LLCECALC window. When the program is done, the user has the opportunity to view, print, or export the waste characterization report.

4.0 LLCEDATA PROGRAM OPERATION

For any particular LLCE, the user must create a unique EDF. LLCEDATA allows the user to create an EDF or, if needed, will allow editing of existing EDFs. The user interface of LLCEDATA for Windows is a sequence of prompting windows that walks the user through the creation or editing of an LLCE EDF. There are three main sections that follow. Section 4.1 provides program startup and initiation. Section 4.2 provides a detailed step-by-step description of a typical LLCE EDF creation. It is to serve as a straightforward guide to creating an LLCE data file using the LLCEDATA program. Section 4.3 is an exhaustive detailed explanation of all other options available to the user. This section will serve to answer questions that may arise while creating a nontrivial LLCE EDF. Detailed explanation will be given explaining how to add, remove, or edit data. Changes made to the data are only saved in the LLCE's EDF.

4.0.1 GENERAL WINDOWS OPERATIONS

Many of the windows that will be described in the following sections have some general functions that will be explained here and not individually for each window. It is also assumed that the user is familiar with standard windows applications.

Scroll Bars Many windows have such a large quantity of information that it can not all be displayed at once. There are thus scroll bars located to the right of the window to allow for vertically scrolling through the information and scroll bars near the bottom of the window that allow for horizontally scrolling through the information. The following window **Select LLCE for Retrieval** is an example that shows scroll bars on both the right and bottom for horizontal and vertical scrolling.

Select LLCE for Retrieval

Default Units of Measure and Key are shown

LLCE	Ordering	Part	Description	Mass (kg)	Volume (m³)	Weight (kg)	Cost (\$)	Weight Ratio	Ordering Unit	Part Name
64601	2	Sluicer	1.37E+00	1.45E+01	1.10E+01	0	0.00E+00	H-2-64601	A	
64601	1	Sluicer	1.37E+00	1.63E+01	1.28E+01	0	0.00E+00	H-2-64601	A	
64648	1	Acid distributor	1.16E+00	1.68E+01	1.32E+01	7	0.00E+00	H-2-64648	A105	
64672	1	Steam coil	7.87E-01	1.65E+01	1.58E+01	5	0.00E+00	H-2-64672	A101	
65054	0	Pump, Salt Well	9.94E-01	1.90E+01	1.39E+01	5	0.00E+00	H-2-65054, 69898	A101, 10	
65054	0	Pump, Salt Well	9.94E-01	1.45E+01	1.34E+01	5	0.00E+00	H-2-65054, 69898	A102	
65054	0	Pump, Salt Well	9.94E-01	1.55E+01	1.44E+01	5	0.00E+00	H-2-65054, 69898	AX101, 1	
66024	1	Acid distributor	0.00E+00	1.69E+01	1.61E+01	0	0.00E+00	H-2-66024	A105	
67455	1	Pump, EPN P-241A-105	1.40E+00	1.60E+01	1.43E+01	0	0.00E+00	H-2-67455	A	
68154	1	Sluicer	1.26E+00	1.79E+01	1.44E+01	7	0.00E+00	H-2-68154	AX	
68245	1	Pump, heel	9.74E-01	1.49E+01	0.00E+00	5	0.00E+00	H-2-68245	A	
68279	1	Pump, submersible	1.20E+00	6.84E+00	6.08E+00	6	0.00E+00	H-2-68279	244-AR	
68339	4	Thermocouple, sludge	2.79E-01	1.77E+01	1.73E+01	2	1.81E+02	H-2-68339	AZ	
68339	3	Thermocouple, profile	2.79E-01	1.74E+01	1.70E+01	2	1.34E+02	H-2-68339	AZ	
68339	5	Tank pressure	2.79E-01	4.52E+00	4.06E+00	1	0.00E+00	H-2-68339	AZ	

Record 270 of 501

Window Size Window that have scroll bars will also allow for resizing. The user may move the mouse arrow near the edge of a window and when the arrow changes the user may then click and drag that side of the window to make it larger or smaller. This is quite standard to most Window's applications and was made available to LLCEDATA.

Maximize/Minimize The user may also make use of the three buttons in the upper right corner of most windows. The exits the current window. The will toggle between minimized and maximized windows. The will close the window but not exit it. An icon will be left on the task bar for the user to click on to resume the window to its last full state.

4.1 PROGRAM INITIALIZATION

This section will provide information about the startup and initialization of the LLCEDATA program.

4.1.1 Starting the LLCEDATA Program

The first step in creating an LLCE EDF using the LLCEDATA program is to get the program running on the computer. The default installation location is *c:\Program Files\llcedata*; go to this location or the specific location where LLCEDATA as installed. Using Explorer, or Start/Run, initialize the program by selecting the *llcedata.exe* file or the installation directory (see Section 2.2).

4.1.2 Login

When the LLCEDATA program starts up, the **Program Startup** window will be the first window the user sees. It is shown below and is followed by a detailed explanation of the options available to the user.

What Would You Like to do? Select either **Create a new** or **Edit Existing** by clicking in the appropriate circle.

Allow Edit of Databases This option is available only to users with administrative privileges; i.e., the code custodian. It allows permanent editing of the various databases.

Start Program Once the above options are specified, click this button to move to the next window in the program initialization process.

Exit Program Click this button to exit LLCEDATA.

If this is the first time running LLCEDATA for a particular LLCE, then select **Create a new LLCE Data File**. If an EDF already exists, then the user may select it. Make the necessary selections and then click the **Start Program** button. As the program starts, the **Database Changes** window, shown below, appears and the program reminds the user that changes will not be made to the databases. Any changes will be saved instead to the LLCE's EDF:

Selection of the **Yes** button moves the user to the **User Name and Password Required** window. If the **No** button is selected, the program returns the user to the **Program Startup** window.

At this point, the program prompts the user to enter a user name in the following window:

A password is not required, and is only used for the **Allow Edit of Databases** option by the code custodian. After the user enters a user name, the **Ok** button should be activated to continue. Clicking the **Cancel** button will return the user to the **Program Startup** window.

4.1.3 Selecting the EDF

Once the user has entered the user's name, completing the login process, the program prompts the user to open either a new or existing EDF. A standard windows dialog box like the one below appears. If the user has selected, in Section 4.1.2, to **Edit Existing LLCE Data File**, then the user should now select the file to be edited. If the user has selected **Create a new LLCE Data File** in Section 4.1.2, a new filename can be entered or an existing filename can be selected to be overwritten. Each button in the **Open New LLCE Equipment Data File** window is described below. Shown in the sample window are the two verification EDFs used in Section 8.0 to verify the program.

This option allows the user to specify a specific drive or directory in which to save the new EDF being created or where to find an existing EDF to open or overwrite. To activate, click the down arrow at the right of this field and then select from the drop-down window that appears.

File name: Enter from the keyboard a new file name to be created or an existing file to be edited or overwritten. If an existing file is to be edited or overwritten, it can be selected by clicking on the file name in the listing just above the **File name** field.

Files of type: Click the down arrow at the right of this field and then select the file type to view. The default file type is EDF, and no other options are currently available.

Click this button to view the contents of the parent folder of the current folder.

Click this button to create a new folder in the current folder.

Open

Click this button to open/create the file specified in the **File name** field. This button will do nothing if this field is empty.

Cancel

Click this button to cancel file selection and close the **Open New LLCE Data File** dialog box.

Make the appropriate selections from this window then click the **Open** button. If the cancel button is clicked, a **Nothing Selected** window appears. Click the **Ok** button and the program returns to the **Program Startup** window (4.1.2).

4.2 STANDARD LLCE EDF CREATION PROCESS

After the EDF has been selected, the **LLCE Data Selection and Edit** window will open, indicating that the program is ready to start defining/modifying the contents of the selected EDF. For a standard LLCE data file creation, the four required steps are the only ones of concern. For information on the optional steps 5-9, see Section 4.3. The **LLCE Data Selection and Edit** window is shown next, and each of the first four options are described in a four-step process.

Required Steps		Status
1	Select/Edit LLCE Physical Data	Required Step Not Complete
2	Select/Edit Tank Waste Data	Required Step Not Complete
3	Select/Edit LLCE Geometry Factors	Required Step Not Complete
4	Finish Data File	EDF Data File Not Complete

Optional Steps		Status
5	Review/Edit Waste Container Data	Optional Step Not Complete
6	Review/Edit Radionuclide Constants	Optional Step Not Complete
7	Review/Edit Radionuclide Limits	Optional Step Not Complete
8	Review/Edit Chemical Limits	Optional Step Not Complete
9	Review/Edit Valid Gamma List	Optional Step Not Complete

Go To Selected Step Exit Program

Required Steps Select one of the available steps by clicking in the appropriate circle.

Optional Steps Not considered here; see Section 4.3.

Go To Selected Step Click this button to initiate the program for the currently selected step. An equivalent option is to double click on the **Required Step** directly.

Exit Program Click this button to terminate this session of LLCEDATA.

Following is a four step process that walks the user through a standard LLCE equipment data file creation process. At the end of the forth step the creation of an EDF will be complete.

4.2.1 **STEP ONE** Select/Edit LLCE Physical Data

The first step in the creation of an EDF is the selection of the LLCE that is being retrieved. From the **LLCE Data Selection and Edit** window select the **Select/Edit LLCE Physical Data** option. This brings up the **Select LLCE for Retrieval** window. The window is shown below and is followed by the explanation of the options available:

H-2 Drawing #	Part #	Description	Unit	Min Dia (in)	Max Length (in)	Flange To Tip	Cont #	Weight (kg)	Drawing Link	Form #
64601	2	Shuicer		1.37E+00	1.45E+01	1.10E+01	0	0.00E+00	H-2-64601	A
64601	1	Shuicer		1.37E+00	1.63E+01	1.20E+01	0	0.00E+00	H-2-64601	A
64648	1	Acid distributor		1.16E+00	1.68E+01	1.32E+01	7	0.00E+00	H-2-64648	A105
64672	1	Steam coil		7.87E-01	1.65E+01	1.58E+01	5	0.00E+00	H-2-64672	A101
65054	0	Pump, Salt Well		9.94E-01	1.50E+01	1.39E+01	5	0.00E+00	H-2-65054, 69898	A101, 10
65054	0	Pump, Salt Well		9.94E-01	1.49E+01	1.34E+01	5	0.00E+00	H-2-65054, 69898	A102
65054	0	Pump, Salt Well		9.94E-01	1.55E+01	1.44E+01	5	0.00E+00	H-2-65054, 69898	AX101, 1
66024	1	Acid distributor		0.00E+00	1.63E+01	1.61E+01	0	0.00E+00	H-2-66024	A105
67455	1	Pump, EPN P-241A-105		1.40E+00	1.60E+01	1.43E+01	0	0.00E+00	H-2-67455	A
68154	1	Shuicer		1.26E+00	1.79E+01	1.44E+01	7	0.00E+00	H-2-68154	AX
68245	1	Pump, heat		3.74E-01	1.49E+01	0.00E+00	5	0.00E+00	H-2-68245	A
68279	1	Pump, submersible		1.20E+00	6.84E+00	6.00E+00	6	0.00E+00	H-2-68279	244-AR
68339	4	Thermocouple, sludge		2.79E-01	1.77E+01	1.73E+01	2	1.81E+02	H-2-68339	AZ
68339	3	Thermocouple, profile		2.79E-01	1.74E+01	1.70E+01	2	1.34E+02	H-2-68339	AZ
68339	5	Tank pressure		2.79E-01	4.52E+00	4.06E+00	1	0.00E+00	H-2-68339	AZ

Select and Edit

Make this selection after finding and selecting the LLCE being retrieved. Selection of this button moves the user to the **LLCE Physical Data** window displaying the physical constants of the selected LLCE. The **LLCE Physical Data** window is described in detail later in this section.

Add New LLCE

Make this selection if the LLCE that is being retrieved is not in the database. Selection of this button moves the user to the **LLCE Physical Data** window, with the fields empty, prompting the user to enter physical constant data for a new LLCE. See Section 4.3 for further help on this option.

Delete LLCE

This option is only available to a user with administrative rights; i.e., the code custodian. See Section 4.3 for assistance.

Cancel

This takes the user back to the last window.

Search Drawing

This field allows the user to search for a specific LLCE by entering the Drawing Number. As the Drawing Number is entered the listing will advance to the correct location. The label to the right of the field (in the example it reads "No Match") will indicate if an exact match was found, but if not, it shows the closest match.

This area allows the user to move through the records one at a time by pressing the arrow (← or →) buttons. The user may also jump to the last record or the first record from anywhere in the list by pressing the [R] (first record) or [L] (last record) buttons.

LLCE selection

This is accomplished by clicking anywhere in the row corresponding to the LLCE that is being retrieved. The mouse arrow switches to a horizontal black arrow pointing right when this selection can be made. This action highlights the entire row and places an arrow in leader to that row. The following shows an example:

3213	1	Pump, Turbine	5.59E-01	1.51E+01	0.00E+00
3753	1	Air lift circulator	1.30E+00	1.40E+01	1.35E+01
4582	1	Pump, supernatant	1.33E+00	8.75E+00	8.00E+00
5725	1	Pump	1.07E+00	6.40E+00	3.35E+00

This example shows the "Air lift circulator" selected.

Once the user has selected an LLCE, the **Select and Edit** button should be used to move to the **LLCE Physical Data** window. This window allows the user to verify the Physical Data for the LLCE selected. A sample window is shown below and is followed by a description of its options:

LLCE Physical Data

LLCE Description: Thermocouple, profile

Max Diameter: 0.27940 meter

Max Tip-to-Tip Length: 17.42140 meter

Sample-to-Tip Length: 16.96090 meter

LLCE Weight: 133.81200 kg

Drawing List: H-2-68339

Drawing Number: 68339

Part Number: 3

Form: AZ

Waste Container Size: 2

Comment: Last Retrieved From Risers 13A, 13B, 13C, and 13D

Last Revision Date: Time: 08-59 PM Date: 5/07/98

Units: meter kg

Action: Done Cancel

Units

meter

kg

The default units are meter and kg, but length can be expressed in units of cm, ft, or in, and mass can be expressed in units of grams or lbs. Simply click on the arrows and select the desired unit combination from the drop-down options that appear. When selected, units update in the **LLCE Physical Data** window. This will allow the user to conveniently verify the data in the fields.

Done BUTTON

Use this option to finish this window after the physical constants have been verified. If the user tries to make this selection and there are required fields that are empty, the user will be prompted to supply the needed data before continuing.

Cancel

This option takes the user back to the last window and allows another LLCE to be selected if an incorrect LLCE was selected the first time.

Last Revision Date:

This section indicates to the user when the record was last edited in the main database; i.e., by the code custodian.

Comment:

This field allows the user to add comments that will be included in the final characterization report.

In general all of the necessary data for the selected LLCE will already be in the corresponding fields of this window. There are times, however, when some data will not be present. When this is the case, the user will need to enter the missing data. Some fields, such as the LLCE weight field, can be left blank for now, but the user will be prompted to enter it while using LLCECALC, discussed in Section 5.4. If a waste container of the needed size is not present in the database, a message will be displayed, indicating that there is no existing waste container for the selected LLCE. If this happens, the user should

contact the code custodian. It is acceptable for some of the fields to be left blank, but the program will not allow the user to complete selection of the LLCE until all required fields have been filled in. When all required fields are complete, the **Done** button is clicked to complete STEP ONE in the LLCE data file creation process.

The user will be returned to the **LLCE Data Selection and Edit** window. If the LLCE was successfully selected and edited, the status field on the right of this window will read "Required Step Completed" and be highlighted in green. The **1** on the left will also be green. This indicates that STEP ONE is completed and the user should go to STEP TWO.

4.2.2 STEP TWO Select/Edit Tank Waste Data

To initiate STEP TWO activate the **Select/Edit Tank Waste Data** option from the **LLCE Data Selection and Edit** window. The **Select Tank Waste Source** window will appear. At this point, the window is mainly blank.

Cancel

Returns the user to the last window.

The user must now select the tank farm and tank that the LLCE is being retrieved from. This is done using the following section of the above window:

Tank Farm

Click the down arrow on the Tank Farm field and a drop-down window will appear. From that listing select the Tank Farm from which the specified LLCE is being retrieved.

- Tank** Click the down arrow to the right of the Tank field, and a drop-down window will open. From that listing, select the Tank from which the specified LLCE is being removed.
- Riser** Enter in this field the Riser number from which the specified LLCE is being removed. Note that this field can be left blank, but the user will be asked to verify this option.

Once the Tank Farm and Tank number have been selected, the **Select Tank Waste Source** window will update with tank specific information and new user options. An example of this window follows:

This field will update automatically when a tank is selected that is multi-layer. It is also possible for the user to specify layers in a tank that is not already specified as such. For more information on this option see Section 4.3.2.

For typical EDF creation, no changes should be necessary in this section of the window. See Section 4.3.2 for more information about making changes to this window.

Units Section

The center section of this window, displaying the currently selected units, will be grayed out during the creation of a standard LLCE data file. See Section 4.3.2 for further details.

View Tank Waste Data

Use this option to view the waste contents of the selected tank. For a standard LLCE equipment data file creation, this will be the option to select to move to the next window.

Edit Tank Waste Data

Use this option if the contents of the selected tank needs to be edited. Selection of this option takes the user to the **Waste Characterization Data for Tank XXX-X-XXX** window, which is described more completely in Section 4.3.2.

Now that the tank farm and tank are selected, the user should click on the **View Tank Waste Data** button. This will open a **Waste Characterization Data for Tank XXX-X-XXX** window that displays the current contents of the selected tank. An example of this window follows:

Waste Characterization Data for Tank 241-C-105											
Element	Concentration	Concentration	Unit	Unit	Volume	Layer	Thickness	Sp. Gr.	Chemical Type	Sample Source	Sample
Aluminum	7429-90-5	3.15E+04	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Bismuth	7440-69-9	3.40E+02	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Calcium	7440-70-2	3.97E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Carbonate	189	5.43E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	HANFORD DEFIN	
Chloride	16897-00-6	2.87E+02	kg	BULK	1	0.00E+00	0	0	CHEMICAL	HANFORD DEFIN	
Chromium	7440-47-3	6.80E+02	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Fluoride	16984-48-8	0.00E+00	kg	BULK	1	0.00E+00	0	0	CHEMICAL	HANFORD DEFIN	
Hydroxide	HYDROXIDE	7.48E+04	kg	BULK	1	0.00E+00	0	0	CHEMICAL	CALCULATED BY	
Iron	7439-89-6	5.40E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Lanthanum	7439-91-0	1.70E+01	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Lead	7439-92-1	4.80E+02	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Manganese	7439-96-5	1.26E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Mercury	7439-97-6	2.69E+02	kg	BULK	1	0.00E+00	0	0	CHEMICAL	HANFORD DEFIN	
Nickel	7440-02-0	1.09E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Nitrate	14797-55-8	1.13E+04	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Nitrite	14797-65-0	1.68E+04	kg	BULK	1	0.00E+00	0	0	CHEMICAL	HANFORD DEFIN	
Phosphate	14265-44-2	5.30E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Potassium	7440-09-7	8.40E+02	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Silicon	7440-21-3	2.03E+04	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Sodium	7440-23-5	5.68E+04	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Strontium	7440-24-6	9.00E+01	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Sulfate	14808-79-8	1.23E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	HANFORD DEFIN	
Total organic carbon	TOC	1.01E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	
Uranium	7440-61-1	5.18E+03	kg	BULK	1	0.00E+00	0	0	CHEMICAL	SAMPLE-BASED	

Record: 1 of 69

This area allows the user to move through the records one at a time by pressing the arrow (←) or (→) buttons. The user may also jump to the last record or the first record from anywhere in the list by pressing the (F1) (first record) or (F2) (last record) buttons.

Done

Use this option to complete STEP TWO.

Edit Data

Use this option to add or edit data in the database. Selection of this option takes the user to the **Waste Characterization for Tank XXX-X-XXX** window. This window is more fully described in Section 4.3.2.

Cancel

This option returns the user to the **Select Tank Waste Source** window. Note that all selections previously made in **Select Tank Waste Source** window are gone and new selections must be made.

After clicking on the Done button the user will be returned to the **LLCE Data Selection and Edit** window. The status field, on the right, for STEP TWO should read "Required Step Completed" and be highlighted green. The 2 on the left should also be green. This indicates that STEP TWO is completed and the user should go to STEP THREE.

4.2.3 STEP THREE Select/Edit LLCE Geometry Factors

The user should again be looking at the **LLCE Data Selection and Edit** window. To initiate STEP THREE activate the **Select/Edit LLCE Geometry Factors** option from this window. The **Define LLCE Geometry Correction Factors** window will now appear. This window is more complex than the others. In general, for each isotope, the user will be prompted to enter three geometry correction factors, one for each detector. These geometry correction factors will be input at a minimum resolution of 1 ft and a maximum resolution of any significant geometry change along the length of the LLCE. Contact the code custodian if new geometry correction factors are needed. Take note of two features of this window. There is an area to enter the geometry correction factors for the corresponding length segment of the LLCE. Next, there is a column of buttons, on the right, that will be used to make and save records for each minimum resolution step along the length of the LLCE.

The default units (meters) can be changed to cm, ft, or in. Click on the arrow and select the desired units from the drop down window that appears. This will allow the user to enter distances in the most convenient units. Note when the units are changed, it affects the entire window.

Cancel

Clicking this option returns the user to the start of STEP THREE.

To complete the **Define LLCE Geometry Correction Factors** window, follow the four steps outlined below. Completion of these four steps will complete STEP THREE in the LLCE EDF creation process.

Step 1

Define Segment Define the segment of the LLCE for which the geometry correction factors will be entered. This is done in the following portion of the **Define LLCE Geometry Correction Factors** window:

The screenshot shows a window with two main input areas. The left area is labeled 'Start Point' and contains a text box with '1' and a unit dropdown set to 'feet'. The right area is labeled 'End Point' and contains a text box with '2' and a unit dropdown set to 'feet'. Below the 'End Point' unit dropdown is a checkbox labeled 'To Flange (End)'.

The left-hand box above will be continually updated, to the last end point coordinate, for each record. Enter, in the right-hand box, the coordinate of the end point of the current segment. Here is an example:

This screenshot is similar to the previous one, but the 'Start Point' text box now contains '1' and the 'End Point' text box contains '2'. The unit dropdowns are still set to 'feet'.

This box shows a segment starting at 1 ft from the bottom and ending 2 ft from the bottom of the LLCE. At this point, the user is ready to move to step 2 and define the geometry correction factors.

Clicking this box, in the **End Point** field, will automatically enter the appropriate distance measured from the start point for this segment, to the end of the LLCE.

Step 2**Define Correction Factors**

The user is now ready to enter the values for the geometry correction factors. There are three factors required, one for each detector. Look at the following portion of the **Define LLCE Geometry Correction Factors** window, to input the factors.

The screenshot shows a window titled 'For this isotope:'. Below the title is a dropdown menu showing '137CS'. There are three rows, each with a label and a text box: 'Correction Factor Detector 1' with '1.44100', 'Correction Factor Detector 2' with '1.93400', and 'Correction Factor Detector 3' with '1.95700'.

First, select the isotope that corresponds to the correction factors to be entered. Click the down arrow which will open a drop-down window showing the isotopes that can be selected. Select from that list the correct isotope. At present, there is only one isotope, ¹³⁷CS.

Now enter the correction factors for each detector. Simply click in the field next to each heading and enter the factor. The example above shows the defaults, for this LLCE, entered for each detector.

Step 3**Save**

This step will save the record corresponding to the current segment of the LLCE.

Save

Click on the **Save** button. This will save the record that has just been created or edited.

Step 4**Add New/Done**

This step has two possible outcomes. If the segment's end point has been defined up to the flange end point, during step three above, then the following **Geometry Factors Defined** window appears. The **Done** button will become active and the user should then select the **Done** button. This will complete STEP THREE of the LLCE data file creation process.

If this **Geometry Factors Defined** window does not appear the geometry correction factors for each segment up to the flange end point of the selected LLCE have not been completely defined. The user must then select the **Add New** button.

Add New

Use this button to add a new record that will correspond to the next segment of the LLCE.

Repeat steps 1 through 4 until step 4 can be completed by clicking the **Done** button. When the **Done** button is clicked, STEP THREE of the LLCE data file selection process is completed and the user is returned to the **LLCE Data Selection and Edit** window. Note that the status field to the right of the **Select/Edit LLCE Geometry Factors** option now reads "Required Step Completed" and is highlighted green. Also the **3** to the left of this option should be highlighted green.

Misc. Button/Option Explanations for Select/Edit LLCE Geometry Factors window:

This area allows the user to move through the records one at a time by pressing the arrow (**Left** or **Right**) buttons. It is possible to jump to the last record or the first record from anywhere in the list by pressing the **First** (first record) or **Last** (last record) buttons. This also allows the user to know which record is currently being viewed. In the example shown: The 1 of 3 indicated that record one is being viewed out of 3 records. When a new record is being defined, the "1 of 3" is replaced with "New Record".

Edit

Click this button if the record currently being viewed needs editing. When this button is activated, the user may change the data entered in steps 1 and 2 above.

Delete

Use this button to delete the current record. When the user selects delete, a **Delete?** window will appear, asking the user to confirm that the user wants to delete a geometry factor record. The confirmation window will display the active range, along the length of the LLCE, where the deleted geometry factors were applied.

Done

Click on this option when all of the geometry correction factors have been defined. This button is grayed out until the geometry correction factors have been adequately defined. This option completes STEP THREE in the LLCE data file creation process.

4.2.4 STEP FOUR Finish Data File

The user should now see the **LLCE Data Selection and Edit** window. The status field for each of the first three options should be highlighted green and read "Required Step Completed." If this is not the case, one of the steps was not completed properly, and the user should return to that STEP and complete it. Assuming that all have been completed, item 4, **Finish Data File**, will be active. Select this option and the following window will appear.

Exit Program This exits the program and completes the creation of the LLCE data file.

Print This opens the following **View / Print For Selected LLCE** window. From this window the user may preview, print, change printer setup, or cancel.

Cancel Returns user to the **LLCE Data Selection and Edit** window.

Click on the **Print** button to start report output.

4.2.5 Report Output

The **View / Print Data for Selected LLCE** window will be open, indicating that the program is ready to output reports. It is shown below and has the following options available:

- Preview** Opens a preview window showing the selected item. From the preview window, the user may also print or export the data.
- Print** This actually sends the selected document to the printer that is specified under the **Setup** option.
- Setup** This opens a standard windows printer setup dialog box that allows the user to select a printer and other standard options.
- Cancel** This returns the user to the **Completed LLCE Data File** window.

- Light Blue Strip** This strip indicates the printing/preview activity. The "Idle" changes to indicate the current activity.

For **Preview** and **Print** above, the user must first select one of the document options listed. Only the options in black can be selected. Simply click in the white circle on the left margin. Once it is selected, **Print** or **Preview** can now be selected.

When the user has completed making the desired printouts, click **Cancel** and return to the **Completed LLCE Data File** window. Then click the **Exit Program** button. The EDF is now ready for use in LLCECALC. For nonstandard LLCE data file creation, refer to Section 4.3 for an exhaustive explanation of all the options.

4.3 ADDITIONAL LLCEDATA EDIT CHOICES AND OPTIONAL STEPS

This section documents all program options that were not discussed in Section 4.2. These additional program options manipulate data and perform edits to the data in the LLCE databases. All options that allow editing of the database will only store the edited data in the current EDF. The code custodian is the only authorized user to perform permanent changes to the main LLCE databases.

The following explanation will assume that the user can start with the **LLCE Data Selection and Edit** window, from Section 4.2, and can get to each window under consideration. Each right-most numbered suffix heading, in this section, refers directly to the option in the **LLCE Data Selection and Edit** window. An example would be Section 4.3.5 **Review/Edit Waste Container Data** which refers to option 5 of the **LLCE Data Selection and Edit** window.

The information provided in this section will not duplicate the information provided in Section 4.2. It is assumed that the user is already familiar with the basic operations as outlined in that section.

4.3.1 Select/Edit LLCE Physical Data

In the **Select LLCE for Retrieval** window there are two options that were not fully explained in Section 4.2.1. They are:

Delete LLCE	This option becomes active only for the code custodian.
Add New LLCE	The LLCES added will only be saved in the EDF that is being edited.

4.3.2 Select/Edit Tank Waste Data

The first window to appear, **Select Tank Waste Source**, is somewhat complex. There are multiple possibilities for the user. The user may need to refer to Section 4.2.2 for assistance in trying to understand this section.

The following discussion will be a specific explanation of how to define a multi-layer tank, but it will also provide a complete explanation of all the options that are possible for the user that were not fully explained in Section 4.2.2. It should be noted that specifying a new multi-layer tank in LLCEDATA is possible, but is a time consuming task. The user is advised to contact the code custodian if needed.

The user should go to the **Select Tank Waste Source** window. If the tank selected is defined as a multi-layer tank, the layer field will update automatically. But if the tank is not defined as a multi-layer tank, and it is desired to define it as one, the user should enter into the **# Layers** field the number of layers to be defined. If an attempt is made to proceed by clicking the **View Tank Waste Data** button, a **Number of Layers Mismatch** error window will appear as follows:

To correctly proceed when trying to redefine a tank as multi-layer, the user should change the selection in the "Option for Existing Data" section of the window.

Clicking in the "Change Existing Units" circle makes the units section, located above this section in the window, become active. Also the **View Tank Waste Data** button

disappears from the window. Thus, the only way to leave the window now is to use **Cancel** or **Edit Tank Waste Data**.

With the units section of the window now active, the user must define what units to use when entering the new tank waste layer data. To select new units, activate the drop-down windows on each field and select the desired unit (click the down-arrow on the left side of the field). The units section is shown below:

Select the Mass units for the Radionuclides from either Ci or pCi, the Mass units for the Chemicals from either µg, g, or kg, and the volume for Radionuclides and Chemicals from either BULK, L, m³, or g. Once the units are selected, the user should click the **Edit Tank Waste Data** button. This will move to the following **LLCE Tip To Tank Bottom Dim 5-layer sample** window:

Click the down-arrow and a drop-down list appears. Select the desired units.

Input:

Click in the field and then enter the distance from the bottom of the LLCE to the bottom of the tank. Be careful that the default value of "0" is removed from the field before entering the correct value, to avoiding having the "0" appended to the number.

Return

Click this button after entering the correct distance. The user will be asked in the next window, **Input Correct?**, to verify that the distance entered is correct:

The user will now see the **Waste Characterization Data For Tank XXX-XX-XXX** window appear. The following window is an example for tank 241-AX-103:

 A large window titled "Waste Characterization Data For Tank 241-AX-103". It contains several sections:

- Select Waste Type:** A dropdown menu showing "CHEMICAL".
- Select Units for Layer Thickness:** A dropdown menu showing "meter".
- Select Constituent:** Radio buttons for "Description" and "CAS". Below "Description" is a text field. Below "CAS" is a text field with a "Quick Search" button.
- Enter Layer Content and Source:** A section with "Content" (text field with "kg/500L"), "Waste Source" (text field), and "Description" (text field).
- Select Record #:** A section with "New Record" and navigation buttons (left, right, first, last).
- Buttons:** "Edit", "Save", "Add New", "Delete", "Done", and "Cancel" are located on the right side.
- Last Revision Date:** A section at the bottom with "Time" (dropdown showing "09:26 PM") and "Date" (dropdown showing "8/10/98").

The user should notice the six different sections and the six buttons on the above window. Each one of these sections and buttons will be explained; then the process for defining the constituents for each layer will be explained.

Click the down-arrow to open the drop-down list. Choose either Chemical or Radiochemical. The remainder of the **Waste Characterization Data For Tank XXX-XX-XXX** is the same no matter which type is selected.

Click the down-arrow to open the drop-down list. Choose the units that will be used for the thickness of each waste layer.

A screenshot of a software interface showing three input fields. The first field is labeled 'Layer #' and contains the number '1'. The second field is labeled 'Specific Gravity' and contains the number '0'. The third field is labeled 'Layer Thickness' and contains the number '0'.

Layer #

Click the down-arrow to open the drop-down list of layer numbers. Changing this selection moves to the next layer.

Specific Gravity

Click the field and enter the specific gravity for the layer or the substance being defined. This can be changed or left the same for each record. The user should be careful to make sure the default value of zero is deleted before entering a new value.

Layer Thickness

Click in the field and enter the thickness of the current layer defined in the Layer # field above it.

A screenshot of a software interface showing four options: 'Select by Description', 'Select by CAS', 'Quick Search', and 'Edit List'. Each option has a radio button to its left. The 'Select by Description' option is selected, indicated by a black dot in the radio button.

Select by Description

This option is only active if the white circle on the left has a black dot in it. Click the down-arrow to open the drop-down list of constituent descriptions. Select the desired constituent for the given layer.

Select by CAS

This option is only active if the white circle on the left has a black dot in it. Click the down-arrow to open the drop-down list of constituent CAS identifiers. Select the desired constituent for the given layer.

Quick Search

Click in this field and type in a letter or number to search the "Description" list.

Edit List

This button is typically for use when the user has logged in with **Allow Edit of Database**; i.e., for the code custodian. Selection of this option allows the user to enter new constituents into the constituent database. See Section 4.3.2.1 for an example.

A screenshot of a software window titled 'Enter Layer Content and Source'. It contains two input fields: 'Content' and 'Waste Source Description'. The 'Content' field has the text 'kg/BULK' to its right. There are also two small buttons on the right side of the window.

Content

Click in this field and then enter the content of the selected constituent for the selected layer. The units for this value are given to the right of the field. These units are a result of the selection made in the window, **Select Tank Waste Source**.

Waste Source Description:

Click in this field and then enter a description or a comment.

This area allows the user to move through the records one at a time by pressing the arrow (or) buttons. The user may also jump to the last record or the first record from anywhere in the list by pressing the (first record) or (last record) buttons. This portion of the window also allows the user to know which record is currently being viewed. In the example shown; "1 of 3" indicates that record one is being viewed out of 3 records. When a new record is being defined, the "1 of 3" is replaced with "New Record." Note that this section shows the records-per-layer, per selected waste-type. In other words, for a new layer, there are two sets of records, one for the Chemical and another for the Radiochemical contents.

- Edit** This button is only active when the user is not in the Add New mode, reached by selecting the **Add New** button when it is active, and when there are records available to be edited. When the button is active, the user is allowed to edit the current record. Only the Layer Thickness, Specific Gravity, and Content can be changed, all other selection are inactive.
- Save** Click on this button to save the current record. This button is not active when the current record has already been saved. Usually, the user will use this to save a new record or an edited record.
- Add New** This creates a new blank record to be filled in. This button is not active while editing or filling in a new blank record.
- Delete** Use this button to delete the current record.
- Done** Use this button when all the layers have been adequately defined. It will return the user to the **LLCE Data Selection and Edit** window, showing that STEP TWO has been completed; i.e., highlighted in green.
- Cancel** Click this button to return to the **Select Tank Waste Source** window.

To define the constituents for a layer, proceed as follows:

1. Select the layer to define. Specify the Specific Gravity and Layer Thickness. The user may also change units if needed.
2. Select Chemical or Radiochemical in the Type field.
3. Select the Constituent either by its description or its CAS number.
4. Define the content of the layer in the Content field and add a description if desired.
5. Click on the **Save** button and, if all of the constituents are not defined for the current layer, select **Add New**. When the current layer for both Chemical and Radiochemical is completely defined, change layers and repeat steps 1 through 5 until all the layers are defined. When each layer is completely defined, click on the **Done** button.

NOTE: Each layer must have Cs137 defined or the program will not proceed.

This process is time consuming, the user is advised to contact the code custodian if needed.

4.3.2.1 Add Constituent to Database. When the **Edit List** option is selected in the Select Constituent section of the **Waste Characterization Data For Tank XXX-XX-XXX** window, the following **Edit Chemical List** window will appear. This particular example shows the Chemical list. There is an equivalent Radiochemical list that the user may access by changing the Type field to Radiochemical.

Edit Chemical List					
Description	CAS	Type	Name	Formula	
1,1,1-Trichloroethane	71-55-6	CHEMICAL	1,1,1-Trichloroethane	C2H3Cl3	
1,1,2,2-Tetrachloroethane	79-34-5	CHEMICAL	1,1,2,2-Tetrachloroethane	C2H2Cl4	
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	CHEMICAL	1,1,2-Trichloro-1,2,2-trifluoroethane	C2Cl3F3	
1,1,2-Trichloroethane	79-00-5	CHEMICAL	1,1,2-Trichloroethane	C2H3Cl3	
1,1-Dichloroethane	75-34-3	CHEMICAL	1,1-Dichloroethane	C2H4Cl2	
1,1-Dichloroethene	75-35-4	CHEMICAL	1,1-Dichloroethene	C2H2Cl2	
1,2,3,5-Tetrachloro-4,6-di	877-09-8	CHEMICAL	Methyl-Benzene	C6H6Cl4	
1,2,3-Trimethylbenzene	526-73-8	CHEMICAL	1,2,3-Trimethylbenzene	[CH3]3C6H3	
1,2,4-Trichlorobenzene	120-82-1	CHEMICAL	1,2,4-Trichlorobenzene	C6H3Cl3	
1,2,4-Trimethylbenzene	95-63-6	CHEMICAL	1,2,4-Trimethylbenzene	C9H12	
1,2-Dichlorobenzene	95-50-1	CHEMICAL	1,2-Dichlorobenzene	C6H4Cl2	
1,2-Dichlorobenzene-d4	2199-69-1	CHEMICAL	1,2-Dichlorobenzene-d		
1,2-Dichloroethane	107-06-2	CHEMICAL	1,2-Dichloroethane	C1CH2CH2Cl	
1,2-Dichloroethane-d4	120CLRE7ND4	CHEMICAL	1,2-Dichloroethane-d4		
1,2-Dichloroethylene	540-59-0	CHEMICAL	1,2-Dichloroethylene	C1CHCHCl	
1,2-Dichloropropane	78-67-5	CHEMICAL	1,2-Dichloropropane	CH3CHClCH2Cl	
1,3,5-Trimethylbenzene	108-67-8	CHEMICAL	1,3,5-Trimethylbenzene	C9H12	
1,3-Cyclopentadiene	77-47-4	CHEMICAL	1,3-Cyclopentadiene	C5Cl6	
1,3-Dichlorobenzene	541-73-1	CHEMICAL	1,3-Dichlorobenzene	C6H4Cl2	
1,3-Isobenzofurandione	85-44-9	CHEMICAL	1,3-Isobenzofurandione	C8H4O3	
1,4-Dichlorobenzene	106-46-7	CHEMICAL	1,4-Dichlorobenzene	C6H4Cl2	

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- Return** Click this button to return to the **Waste Characterization Data For Tank XXX-X-XXX** window.
- Delete** Removes the selected Chemical or Radiochemical entry from the list.
- Edit** Click this button to edit the selected Chemical or Radiochemical entry. The selected item in the list is distinguished by the right pointing arrow along the left side of the window. In this example the 1,2-Dichlorobenzene-d4, CAS 2199-69-1 item is selected. The following **Edit Chemical** window is an example of the window that opens when editing a Chemical.

To make changes to the data in the **Edit Chemical List** window, simply click in the field and make the change. The "CAS #" is the Chemical Abstracts Service number that uniquely identifies the chemical. If needed, the code custodian may be consulted to identify correct CAS numbers for chemicals. **Cancel** returns to the previous window without making any changes, while **Return** will save the changes and return the user to the **Edit Chemical List** window.

The following **Edit Radiochemical** window is an example of the window that opens when editing a Radiochemical.

To make changes to the data in the **Edit Radiochemical** window, simply click in the field and make the change. **Cancel** returns to the **Edit Chemical List** window without making any changes while **Return** saves the changes, and returns to the **Edit Chemical List** window.

Add New

Click this button to add a new constituent to the list. The following **Define New Chemical** window will appear when adding to the Chemical list:

Define New Chemical

Description:

CAS#:

Name:

Formula:

Type: **CHEMICAL**

Return **Cancel**

To Define a new Chemical simply click in the fields and add the indicated information. **Cancel** returns without adding a chemical while **Return** saves the new Chemical. Both return the user to the **Edit Chemical List** window.

The following **Define New Radiochemical** window appears when adding to the Radiochemical list.

Define New Radiochemical

Description:

CAS#:

Name:

AW(1) Element(1) ☐ Metastable(1)

/

AW(2) Element(2) ☐ Metastable(2)

Formula:

Type: **RADIOCHEMICAL**

Return **Cancel**

To define a new Radiochemical, click in the fields and enter the indicated information. **Cancel** returns to the previous window without adding a Radiochemical while **Return** saves the new Radiochemical and returns to the **Edit Radiochemical** window.

4.3.3 Select/Edit LLCE Geometry Factors

The complete explanation of this option is found in Section 4.2.3.

4.3.4 Finish Data File

The complete explanation of this option is found in Section 4.2.4.

4.3.5 Review/Edit Waste Container Data

The user should select option 5, **Review/Edit Waste Container Data**, to open the **View/Edit LLCE Waste Container Data** window, shown below. Use this window to make any modifications to the available, SARP-approved (McCormick 1997) containers.

Container ID	Cont. Depth (m)	Cont. Dia. (m)	Cont. Length (m)	Cont. Volume (kg)	Max. Gross Wt. (kg)	Mass LLCE (kg/m³)	Mass LLCE (kg/m³)	Mass LLCE (kg/m³)
1 LLCE-1	6.16E-01	6.60E-01	1.71E+01	7.33E+02	5.12E+03	2.92E-01	1.43	1.43
2 LLCE-2	6.16E-01	6.60E-01	2.23E+01	9.37E+02	6.62E+03	2.92E-01	1.98	1.98
3 LLCE-3	8.52E-01	9.14E-01	1.73E+01	1.43E+03	9.24E+03	5.94E-01	1.43	1.43
4 LLCE-4	8.52E-01	9.14E-01	2.23E+01	1.82E+03	1.26E+04	5.94E-01	1.98	1.98
5 LLCE-5	1.28E+00	1.38E+00	2.24E+01	4.20E+03	2.73E+04	1.04E+00	1.98	1.98
6 LLCE-6	1.50E+00	1.61E+00	1.74E+01	4.42E+03	2.87E+04	1.27E+00	1.43	1.43
7 LLCE-7	1.50E+00	1.61E+00	2.24E+01	5.58E+03	4.31E+04	1.27E+00	1.98	1.98
9 LLCE-9	1.28E+00	1.38E+00	1.74E+01	3.31E+03	2.09E+04	1.04E+00	1.43	1.43

Return Click this button to return to the **LLCE Data Selection and Edit** window. Activate this option when the user is done making changes to the Waste Container Database.

Delete Click this button to delete the currently selected waste container. This option is not available to the user.

Edit Click this button to open the **LLCE Waste Container-XX** window and edit the data of the currently selected waste container.

Add New Click this button to open the **LLCE Waste Container-XX** window and add a new waste container entry to the database.

The **LLCE Waste Container-XX** window follows, obtained by selected the **Add New** option, with an explanation of each of its buttons:

The following options are available in this window:

Parameter Fields

Edit/enter the appropriate number or phrases in these fields to describe the waste container. The user may advance to the next field by simply using the TAB key. It is not necessary to manually enter values for every field (see the description for the **Done** button below).

Click the down-arrow at the right of these fields to open a drop-down list to select the desired length and mass/weight units.

Done

Click this button to finish editing/creating the data record and return to the **View/Edit LLCE Waste Container Data** window. If there is any missing or invalid information, the program prompts the user to enter this information before continuing. LLCEDATA will also calculate certain parameters, e.g. volumes, from entered information and will prompt the user choose the calculated values or the previously entered values.

Cancel

Click this button to cancel editing/creating a data record and return to the **View/Edit LLCE Waste Container Data** window.

4.3.6 Review/Edit Radionuclide Constants

Select option 6, **Review/Edit Radionuclide Constants**, which will open, for editing, the following **Radionuclide Physical Constants** window:

Radionuclide Physical Constants									
Radionuclide	Spec. Activity (Ci/g)	Half Life (Years)	Decay Constant (1/yr)	Alpha	Beta	Gamma	Time	Date	User
225AC	5.80E+04	2.74E-02	3.46E-02	0	0	12:33 PM	6/08/98		AC
227AC	7.23E+01	2.18E+01	4.72E-04	0	0	12:34 PM	6/08/98		AC
228AC	2.24E+06	7.00E-04	8.04E-03	0	0	08:10 AM	6/08/98		AC
241AM	3.43E+00	4.32E-02	3.28E-02	1	1	12:53 PM	6/08/98		AM
242AM	8.09E+05	1.83E-03	1.14E-03	0	0	12:53 PM	6/08/98		AM
242mAM	9.72E+00	1.52E-02	3.89E-04	1	1	12:34 PM	6/08/98		AM
243AM	1.59E-01	7.38E+03	3.17E-02	1	1	12:54 PM	6/08/98		AM
217AT	1.61E+12	1.00E-09	4.19E-02	0	0	12:55 PM	6/08/98		AT
136BA	2.56E+02	1.05E-01	2.62E-03	0	0	12:55 PM	6/08/98		BA
137mBA	5.39E+06	4.85E-06	3.93E-03	0	0	12:56 PM	6/08/98		BA
108E	2.23E-02	1.60E+06	1.20E-03	0	0	08:14 AM	6/08/98		BE
210BI	1.24E+05	1.37E-02	2.31E-03	0	0	12:56 PM	6/08/98		BI
211BI	4.18E+08	4.05E-06	3.92E-02	0	0	12:57 PM	6/08/98		BI
212BI	1.46E+07	1.15E-04	1.68E-02	0	0	12:57 PM	6/08/98		BI
213BI	1.53E+07	8.63E-05	4.18E-03	0	0	12:58 PM	6/08/98		BI
214BI	4.41E+07	7.79E-05	1.28E-02	0	0	12:59 PM	6/08/98		BI
247BK	1.05E+00	1.38E+03	3.49E-02	1	1	11:21 AM	6/15/98		BK
14C	4.45E+00	5.73E+03	2.93E-04	0	0	12:58 PM	6/08/98		C
113mCD	2.31E+02	1.37E+01	1.10E-03	0	0	12:59 PM	6/08/98		CD
144CE	3.19E+03	7.78E-01	6.63E-04	0	0	01:00 PM	6/08/98		CE
245CF	4.05E+00	3.51E-02	3.73E-02	1	1	11:21 AM	6/15/98		CF
250CF	1.03E+02	1.31E+01	3.63E-02	1	0	11:21 AM	6/15/98		CF

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- Return** Click this button to return to the **LLCE Data Selection and Edit** window. Activate this option when the user is done making changes to the Radionuclide physical constants database.
- Delete** Click this button to delete the currently selected Radionuclide. The changes will only be saved to the local EDF.
- Edit** Click this button to open the **Edit Radionuclide Physical Data** window. The user may then edit the data of the currently selected radionuclide.
- Add New** Click this button to open the **Edit Radionuclide Physical Data** window to add a new radionuclide isotope to the database.

The **Edit Radionuclide Physical Data** window is shown below, followed by an explanation of each of the buttons shown on that window. This window appears when either an **Edit** selection or an **Add New** selection is made. The **Add New** selection brings up the **Edit Radionuclide Physical Data** window with all the fields initially blank. The **Edit** option brings up the isotope data of the selected item in the **Radionuclide Physical Constants** window.

There are three sections and two buttons in the above window. An explanation of each section and button follows:

Isotope

Click on the down-arrow to open the drop-down list for selection. Select from this list the Radionuclide for which the physical constants will be defined.

Edit List

This button is only active when **Allow Edit of Database** is selected in Section 4.1. For an explanation of this option, see Section 4.3.2.1. The **Edit List** button will only take the user to the Radiochemical database.

Specific Activity: Click in the field and enter the appropriate value.

Half Life: Click in the field and enter the appropriate value that corresponds to the units shown on the right. To change the units click on the down-arrow to open the drop-down list. This allows the user to enter the half life in the most convenient units.

Heat Generation Rate: Click in the field and enter the appropriate value.

Alpha: To change the value in the field simply double click on it. It will toggle between "0" and "1."

TRU Isotope: To change the value in the field simply double click on it. It will toggle between "0" and "1."

Return Click this button to complete creation or edit of a Radionuclide physical constant entry. The user will be returned to the **Radionuclide Physical Constants** window after the changes are made and the **Radionuclide Physical Constants** window will be updated.

Cancel Click this button to return to the **Radionuclide Physical Constants** window without making any changes.

4.3.7 Review/Edit Radionuclide Limits

Select option 7, **Review/Edit Radionuclide Limits**, to make changes to the regulatory limits for any particular isotope. An example of the **Radionuclide Limits** window is shown below:

Isotope	CAT-1 LLW (Ci/m³)	CAT-2 LLW (Ci/m³)	NRC Class C (Ci/m³)
225AC	0.00E+00	0.00E+00	0.00E+00
227AC	4.20E-03	3.00E+05	0.00E+00
228AC	0.00E+00	0.00E+00	0.00E+00
235AM	0.00E+00	0.00E+00	3.40E+01
241AM	2.10E-03	0.50E+01	1.00E+02
242AM	0.00E+00	0.00E+00	0.00E+00
242mAM	1.90E-03	1.60E+00	1.00E+02
243AM	1.00E-03	2.30E-01	1.00E+02
133BA	7.10E-01	0.00E+00	0.00E+00
137mBA	0.00E+00	0.00E+00	0.00E+00
106E	1.10E+00	2.40E+02	0.00E+00
210BI	0.00E+00	0.00E+00	0.00E+00
212BI	0.00E+00	0.00E+00	0.00E+00
247BK	0.00E+00	0.00E+00	1.00E+02
14C	0.10E+02	0.10E+01	0.00E+00

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Buttons: [Home] [Back] [F6] [F7] [F8] [F9] [F10] [F11] [F12] [Print] [Exit]

Note that the units are not all the same in the U.S. Nuclear Regulatory Commission (NRC) Class C column. There is a "*" symbol that refers to the note at the bottom of the above window. The note reads "NRC Class C Limits are in nCi/g where sNRC field is TRUE." The sNRC field is not shown, but appears in the **Radionuclide Limits** window on the far right.

- Return** Click this button to return to the **LLCE Data Selection and Edit** window.
- Delete** Click this button to delete the currently selected isotope. The changes will only be saved to the EDF.
- Edit** Click this button to open the **Edit Radionuclide Limits** window and edit the data of the currently selected radionuclide.
- Add New** Click this button to open the **Edit Radionuclide Limits** window and add a new radionuclide entry into the database.

The **Edit Radionuclide Limits** window follows, with an explanation of each of its buttons and parameter fields. This window appears when either an **Edit** selection or an **Add New** selection is made. The **Add New** selection brings up the window with all the fields initially blank. The **Edit** option brings up the isotope data of the selected item in the **Radionuclide Limits** window.

- Isotope** Click on the down-arrow to open the drop-down list for selection. Select the Radionuclide for which the limits will be defined.
- Edit List** This button is only active when **Allow Edit of Database** is selected in Section 4.1. For explanation of this option, see Section 4.3.2.1. The **Edit List** button will go only to the Radiochemical database.
- Parameter** Click in each field and enter the required values. The cursor can be advanced to the next field by using the TAB key. Note that there is an option available for the units for the NRC Class C Limit field.
- Return** Click this option to complete creation or editing of a Radionuclide physical constants record. This returns the user to the **Radionuclide Limits** window after the changes are made and the **Radionuclide Limits** window is updated.
- Cancel** Click this option to return to the **Radionuclide Limits** window without making any changes.

4.3.8 Review/Edit Chemical Limits

Select option 8, **Review/Edit Chemical Limits**, in order to make changes to the regulatory limits of heavy metals. This selection will open the **Regulatory Limits For Heavy Metals** window, which is shown below, followed by an explanation of this window:

Constituent Name	CAS	D Code	D Code Limit (mg/kg)	Time	Date
Arsenic	7440-38-2	D004	5.00E+00	01:11 PM	6/5/98
Barium	7440-39-3	D005	1.00E+02	01:12 PM	6/5/98
Cadmium	7440-43-9	D006	1.00E+00	07:18 AM	7/31/98
Chromium	7440-47-3	D007	5.00E+00	01:13 PM	6/5/98
Lead	7439-92-1	D008	5.00E+00	01:13 PM	6/5/98
Mercury	7439-97-6	D009	2.00E-01	01:13 PM	6/5/98
Selenium	7782-49-2	D010	1.00E+00	01:13 PM	6/5/98
Silver	7440-22-4	D011	5.00E+00	01:13 PM	6/5/98

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Return Edit Add New Delete

- Return** Click this button to return to the **LLCE Data Selection and Edit** window.
- Delete** Click this button to delete the currently selected constituent name. The changes will only be saved to the EDF.
- Edit** Click this button to open the **Chemical Regulatory Limits Edit** window and edit the data of the currently selected chemical or metal.
- Add New** Click this button to open the **Chemical Regulatory Limits Edit** window and enter a new chemical data record to the database.

The **Chemical Regulatory Limits Edit** window follows with an explanation of each of its buttons and parameter fields. This window appears when either an **Edit** selection or an **Add New** selection is made. The **Add New** selection brings up the window with all the fields initially blank. The **Edit** option brings up the Chemical data of the selected item from the **Regulatory Limits For Heavy Metals** window.

- Parameter** Click in each field and enter the required value. The cursor can be advanced to the next field by using the TAB key.
- Return** Click this option to complete the creation or the editing of a Chemical Regulatory limit record. The user will be returned to the **Regulatory Limits For Heavy Metals** window after the changes are made and the **Regulatory Limits For Heavy Metals** window is updated.
- Cancel** Click this option to return to the **Regulatory Limits For Heavy Metals** window without making any changes.

4.3.9 Review/Edit Valid Gamma List

The user should select option 9, **Review/Edit Valid Gamma List**, when the user needs to edit or add gamma isotopes. This selection will display the following **Valid Measured Gamma** window. The following is an example and explanation of this window:

Gamma Isotope	Time	Date
137CS	08:34 PM	03/25/98

Add to List
 AW: Element:
☐ Metastable

Return Click this button to return to the **LLCE Data Selection and Edit** window.

Delete Click this button to delete the current gamma isotope. The changes will only be saved to the EDF.

Cancel Click this button to return to the **LLCE Data Selection and Edit** window without making changes to the gamma isotope database.

Add to List

Add to List
 AW: Element:
☐ Metastable

Click this button to add a new gamma isotope data record to the database. Specify the atomic weight, element, and if it is metastable, check the appropriate field. When the user is done, click on the **Add to List** button of the window, shown to the left.

5.0 LLCECALC PROGRAM OPERATION

The user interface of LLCECALC for Windows is a sequence of prompting windows that walks the user through an LLCE analysis starting with appropriate file selection and ending in LLCE waste characterization. This section provides a detailed step-by-step description of a typical LLCE analysis. It is to serve as a guide to analyzing LLCE data using the LLCECALC program. There are four main sections that follow. Section 5.1 begins the LLCECALC process. Section 5.2 selects the appropriate equipment data file and the corresponding gamma assay file. Section 5.3 discusses the processing of the AV2 file. Section 5.4 outlines the actual LLCE characterization.

5.1 STARTING THE LLCECALC PROGRAM

The first step in analyzing LLCE data using the LLCECALC program is to get the program running on the computer. The default installation location is *c:\Program Files\llcedata*; go to this location or the specific location where LLCEDATA as installed. Using Explorer, or Start/Run, initialize the program by selecting the *llcedata.exe* file or the installation directory (see Section 2.2).

5.2 SELECTING THE EDF AND AV2 FILES

When the LLCECALC program starts up, the **Select Files** window will be open. It is shown below and has the following options:

Open Select Select either a **New** or **Existing** analysis by clicking in the appropriate circle.

Name of LLCE Data File: Enter the *drive\path\filename.EDF* of the LLCE data file to use in the analysis or click the **Browse** button to utilize the **Select Files** dialogue box.

Name of Gamma Assay Data File: This frame is only present if **New** is selected in the above option **Open Select**. Enter the *drive\path\filename.AV2* of the gamma assay data file to use in the analysis, or click the **Browse** button to utilize the **Select Files** dialogue box.

Start Program Once the data file(s) are selected as specified above, click this button to begin the analysis.

Exit Program Click this button to exit the LLCECALC program.

Select either a **New** or **Existing** LLCE analysis by clicking in the appropriate circle. Click the **Browse** button(s) to select the necessary files. The **Select LLCE Equipment Data File** dialogue box will open. It is shown below and has the following options available to specify which file to open:

Look in: Click the down arrow at the right of this field and then select the drive to look in.

File name: Type the filename to open in this field or click on the filename in the large central field.

Files of type: Click the down arrow at the right of this field and then select the file type to view. Default file types are EDF or AV2.

Click this button to view the contents of the parent folder of the current folder.

Click this button to create a new folder in the current folder.

Open Click this button to open the file specified in the **File name:** field. This button will do nothing if this field is empty.

Cancel Click this button to cancel file selection and close the **Select LLCE Equipment Data File** dialogue box.

Select the file(s) to open and click the **Open** button. If the user clicks the cancel button, a **Nothing Selected** window appears. Click the **Ok** button, and the program returns to the **Select Files** window.

Once the necessary files are selected, click the **Start Program** button. The program will prompt the user to double check that the user selected the correct file(s) with the following window(s):

Click the **Yes** button to continue if the user selected the correct LLCE equipment data file or click the **No** button to go back to the **Select Files** window and change the EDF.

The window shown above only appears if a **New** LLCE analysis was selected in the **Select Files** window. Click the **Yes** button to continue if it is the correct gamma assay data (AV2) file, or click the **No** button to go back to the **Select Files** window and change the AV2 file.

The window shown above only appears if a **New** LLCE analysis was selected in the **Select Files** window and the selected EDF already contains gamma assay data. This means that the EDF file was previously processed with the AV2 file specified in the window above, in this case, TEST.AV2.

Click the **Yes** button to read and process the AV2 file selected in the **Select Files** window. This may be a different file than the one specified in the above window. Click the **No** button to use the previously processed gamma assay data file for waste characterization. If the user clicks the **No** button, skip to Section 5.4.

5.3 PROCESSING THE GAMMA ASSAY DATA FILE

Once the LLCECALC program has double checked that the user has selected the correct file(s), it is ready to start processing the gamma assay data (AV2) file.

5.3.1 Reading Gamma Assay Data File

The **Analyze Gamma Assay Data** window will be open, indicating that the program is ready to read the AV2 file. It is shown below and has the following options available:

<u>P</u>rocess Gamma	Click this button to start processing the currently selected AV2 file.
<u>S</u>top Process	This button replaces the <u>P</u>rocess Gamma button once processing has begun. It can be clicked to stop processing at the end of the current step. Once it has been clicked, it is again replaced by the <u>P</u>rocess Gamma button.
<u>C</u>s-137 Curie Content	Click on the down arrow button at the right of this field to view the ¹³⁷ Cs curie content of each of the waste layers. This option is only available after step 9, Calculating Measured Curie Content For LLCE , is complete.
<u>C</u>haracterization	Click this button to open the LLCE Waste Characterization Calculations window, discussed in Section 5.4, and initiate the

characterization of the LLCE waste. This button can only be clicked after step 9 of 9, **Calculating Measured Curie Content For LLCE**, is complete.

Cancel

Click this button to close the **Analyze Gamma Assay Data** window. This button cannot be clicked when the **Stop Process** button is visible.

Click the **Process Gamma** button to begin processing the AV2 file. As the file is being processed, a number of windows requiring user-input will appear. The following sections discuss the required input.

5.3.2 Entering Missing Crane Positions

At step 2, the following window will appear if there are missing, or zero, crane positions:

There are several variations to the text in this window depending on how many consecutive records have zero crane positions and how close to a 1 foot increment the program estimates the missing crane position to be.

The program prompts the user to enter the missing crane position. The program estimation of the crane position is pre-entered in the window above, 6.952 in this case. Click the **OK** button to accept the estimated value or edit the estimated value to the desired value and then click the **OK** button to accept the edited value. If the user clicks the **Cancel** button, the following window appears:

Click the **No** button to return to the previous window. If the user clicks the **Yes** button, AV2 file processing is stopped, and the user is returned to the **Analyze Gamma Assay Data** window. To re-start AV2 file processing, click the **Stop Process** button, then the **Process Gamma** button in the window.

The **Enter Missing Crane Position** windows will repeat as many times as necessary to correct all of the missing crane positions.

5.3.3 Relating Crane Position to LLCE

At step 5, the following window will appear:

Decision Point - Relate Crane Position to LLCE

Crane Readings Start	-0.29317	ft	Flange-to-Tip Dimension for this LLCE is	55.64600	ft
Crane Readings End	60.08500	ft			
Difference in Crane Readings	60.37817	ft			

Distance covered by the gamma assay system is 60.37817 ft.
This is 4.73217 ft longer than the LLCE Flange-to-Tip length.

Select Option

(1) ☒ Tip of LLCE corresponds to the End Crane Position

(2) ☐ Mounting Flange is at crane position: 0 ft

(3) ☐ Flange-to-tip measurement of LLCE is incorrect.

Note: Program will Exit if this option is selected. Please correct the Flange-to-Tip dimension using the LLCE DATA program.

Continue

The center portion of the window, here showing **Distance covered . . .**, will be replaced with a warning message as shown below if the range of the AV2 file is more or less than the flange-to-tip dimension of the LLCE, shown in the window above as **55.64600 ft** in this case. The following are two possible examples, one more and one less than the flange-to-tip dimension:

Distance covered by the gamma assay system is 60.37817 ft.
This is 4.73217 ft longer than the LLCE Flange-to-Tip length.

WARNING!!

The distance covered by the gamma assay system is 1.58145 ft less than the flange to tip LLCE dimension. Select Option (3) if the Flange to Tip dimension is incorrect for this LLCE.

The program prompts the user to relate the crane position to the LLCE. Option (1) is the default and specifies that the end crane position corresponds to the bottom tip of the LLCE. If this is desired, click the **Continue** button and the program continues to process the AV2 file.

If option (1) is not the case, then specify either the mounting flange position or the bottom tip position by clicking in the appropriate circle in option (2) and then entering the appropriate value in the - **is at crane position:** field. Once this is done, click the **Continue** button and the program continues to process the AV2 file.

If the flange to tip value in the window shown above (**55.64600 ft** in this case) is incorrect, click the circle in option (3) and then click the **Continue** button. This will exit the LLCECALC program. The user can edit the LLCE flange-to-tip dimension using the LLCEDATA program as specified in Section 4.2 or 4.3 and then restart the LLCECALC program.

If a value was entered in option (2) that relates the crane position to the LLCE so that there is no gamma assay data in the AV2 file corresponding to the LLCE tip, the program will prompt the user to double check that the user has related the crane position to the LLCE correctly with the following window:

Click the **Yes** button to continue if the crane position is in fact correctly related to the LLCE. Click the **No** button to return to the previous window and relate the crane position to the LLCE correctly.

5.3.4 Correcting ¹³⁷Cs Measurement Gaps

At step 7, the following window will appear if there are gap(s) in the ¹³⁷Cs measurements:

The program prompts the user to correct the gap in the ¹³⁷Cs measurements. Option (1) is the default and specifies that the program will estimate the ¹³⁷Cs content based on adjacent data. If this is desired, click the **Continue** button and the program continues to process the AV2 file.

If the ¹³⁷Cs content is available, click the circle in option (2) and then click the **Continue** button.

If option (2) was selected in the window above, the following window will appear:

The program estimation of the ^{137}Cs content is entered in the **Estimated Cs-137 (Ci)** field in the window above, **6.97990e-04** in this case. Click the **Return** button to accept the estimated value or edit the estimated value to the correct value, and then click the **Return** button to accept the edited value. If the user clicks the **Cancel** button, the following window appears:

Click the **Yes** button to accept the program estimated value displayed in the window above, **6.97990e-04 Ci** in this case. If the user clicks the **No** button, the AV2 file processing is stopped. To restart the AV2 processing, click the **Ok** button in the LLCECALC window that appears, then click the **Stop Process** button in the **Analyze Gamma Assay Data** window, and then restart the processing of the AV2 file.

The **Gap in Gamma Assay Data Found** windows will repeat as many times as necessary to correct all of the ^{137}Cs measurement gaps.

5.3.5 ^{137}Cs Curie Content of Layers

After all of the ^{137}Cs measurement gaps are corrected, the program completes processing the AV2 file. The total ^{137}Cs curie content is available for each waste layer and can be viewed as specified in Section 5.3.1. Click the **Characterization** button to start LLCE waste characterization.

5.4 CHARACTERIZING LLCE WASTE

The **LLCE Waste Characterization Calculations** window will be open, indicating that the program is ready to characterize the LLCE waste specified by the processed AV2 file. It is shown below and has the following options available:

- Calculate** Click this button to start the calculations necessary to characterize the waste of the processed AV2 file.
- Stop** This button replaces the **Calculate** button once calculation has begun. It can be clicked to stop calculation at the end of the current step. Once it has been clicked it is again replaced by the **Calculate** button.
- Reports** Click this button to open the **Print Results** window, discussed in Section 5.5, and to initiate report output. This button can only be clicked after step 11, **Calculate for Hazardous Waste Codes**, is complete.
- Cancel** Click this button to close the **LLCE Waste Characterization Calculations** window. This button cannot be clicked when the **Stop** button is visible.

Click the **Calculate** button to begin calculations necessary to characterize the LLCE waste. Before calculations actually begin, the following window will appear:

The program prompts the user to add additional unaccounted-for mass to the defined LLCE mass from the LLCEDATA program. Click the **Ok** button to accept the default value of just the LLCE mass displayed in the window above (**133.81200** in this case), or edit the value to include additional mass and then click the **Ok** button to accept this new value.

If the user clicks the **Cancel** button, the program assumes a zero mass and the following window appears:

Click the **No** button to return to the previous window and specify an appropriate mass. If the user clicks the **Yes** button, the characterization process is stopped. To re-start the characterization process, return to the beginning of Section 5.4.

After the LLCE mass has been specified, the program proceeds with necessary calculations. After step 11 is complete, click the **Reports** button to start report output.

5.5 REPORT OUTPUT

The **Print Results** window will be open, indicating that the program is ready to output reports. It is shown below and has the following options available:

Select either the **Waste Characterization** or **Status** report by clicking in the appropriate circle.

Preview	Once the desired report is selected as specified above, click this button to preview the report on screen. There are several options available at the bottom of this window in the form of icon buttons. Clicking the printer button opens a Windows print dialogue box. Clicking the briefcase or envelope button initiates a series of windows in which the user can specify the format and destination of exporting the data.
Print	Once the desired report is selected as specified above, click this button to print the report on the currently selected printer. Once this button is clicked, the print job is sent to the printer. There is no option to cancel after this point.
Setup	Click this button to open a Windows printer setup dialogue box.
Cancel	Click this button to close the Print Results window.

Select the desired report by clicking the appropriate circle. Click the **Print** button to print the specified report on the currently selected printer. Click the **Cancel** button to close the **Print Results** window.

Congratulations, the user has now successfully used the LLCECALC program to analyze and characterize LLCE waste. Please refer to Section 7.0 for instructions on using the LLCECALC menu commands to navigate through LLCECALC.

6.0 LLCEDATA MENU COMMANDS

LLCEDATA for Windows provides the user with menu driven commands allowing the user to conveniently activate the various functions of the program. This section provides a detailed description of each of these menu driven commands to serve as an in-depth guide to the operation of the program. These menu commands are located in the upper left hand corner of the background window of LLCEDATA.

6.1 FILE MENU COMMANDS

The File menu offers the following commands:

<u>New</u>	Opens a Windows file selection dialogue box. Initiates the creation of a new LLCE data (EDF) file.
<u>Open</u>	Opens a Windows file selection dialogue box. Initiates the editing of an existing LLCE data (EDF) file.
<u>Setup Printer</u>	Opens a Windows printer setup dialogue box. Initiates the specification of printing parameters.
<u>Print</u>	Opens the View / Print Data For Selected LLCE window. Initiates the specification of reports to print.
<u>Exit</u>	Exits LLCEDATA.
Shortcuts	Keys: ALT+F+X

6.1.1 New

Use this command to create a new EDF. To open an existing file use the Open command.

Shortcuts Keys: CTRL+N or ALT+F+N

6.1.2 Open

Use this command to open and edit an existing EDF. To create a new file use the **New** command.

Shortcuts Keys: CTRL+O or ALT+F+O

Open New LLCE Equipment Data File dialog box

The following options are available in this dialogue box to specify which file to open:

- Look in:** Click the down arrow at the right of this field and then select the drive to look in.
- File name:** Type the filename to open in this field or click on the filename in the large central field.
- Files of type:** Click the down arrow at the right of this field and then select the file type to view. Default file type is EDF.

Click this button to view the contents of the parent folder of the current folder.

Click this button to create a new folder in the current folder.

Open Click this button to open the file specified in the **File name:** field. This button will do nothing if this field is empty.

Cancel Click this button to cancel file selection and close the **Open New LLCE Equipment Data File** dialogue box.

6.1.3 Set Up Printer

Use this command to specify printing parameters. Selecting this command opens a Windows printer setup dialogue box. Click the down arrow at the right of the **Name:** field to select a properly installed printer. Click the **Properties** button to open another dialog box where other printing properties can be set. This option will not allow printing. To print, select the Print command.

Shortcuts Keys: ALT+F+S

6.1.4 Print

Use this command to preview and print the available data reports that LLCEDATA accesses and creates.

Shortcuts Keys: CTRL+P or ALT+F+P

View / Print Data For Selected LLCE Window

The following options are available in this window:

Data Selection Select the data to preview/print by clicking in the appropriate circle. Only one of the nine possible reports can be selected at a time.

Preview Once the desired data is selected as specified above, click this button to preview the report in a window on screen. There are several options available at the bottom of this window in the form of icon buttons. Clicking the printer button opens a Windows print dialogue box. Clicking the briefcase or envelope button initiates a series of windows in which the user can specify the format and destination of exporting the data.

Print Once the desired data is selected as specified above, click this button to print the data on the currently selected printer. Once this button is clicked, the print job is sent to the printer. There is no option to cancel after this point.

Setup Click this button to open a Windows printer setup dialogue box.

Cancel Click this button to cancel the **Print** command selection and close the **View / Print Data For Selected LLCE** window.

6.2 EDIT MENU COMMANDS

The Edit menu offers the following commands:

Cut Cuts highlighted data from the display and places it on the clipboard. Placing data on the clipboard replaces the contents previously stored there.

Shortcuts Keys: CTRL+X

Warning: Do not attempt to use ALT+E+T, as hitting ALT-E will exit the program without warning.

Copy Copies highlighted data from the display to the clipboard. Copying data to the clipboard replaces the contents previously stored there.

Shortcuts Keys: CTRL+C

Warning: Do not attempt to use ALT+E+C, as hitting ALT-E will exit the program without warning.

Paste Pastes the contents of the clipboard to the position of the cursor in the display. Pasting does not remove the contents of the clipboard (specific data can be pasted more than once).

Shortcuts Keys: CTRL+V

Warning: Do not attempt to use ALT+E+P, as hitting ALT-E will exit the program without warning.

6.3 DATA MENU COMMANDS

The Data menu offers the following commands:

Select Data Edit Option Opens the **LLCE Data Selection and Edit** window when another window is open. Initiates the specification of the LLCE.

View/Print/Export Main Databases Opens a sub-menu of main databases for viewing/printing/exporting.

6.3.1 Select Data Edit Option

Use this command to allow the user to select various options for specifying the data used to create the EDF.

Shortcuts Keys: ALT+D+L

LLCE Data Selection and Edit Window

The following options are available in this window:

Required Steps Select one of the available steps by clicking in the appropriate circle.

Optional Steps Select one of the steps by clicking in the appropriate circle.

Go To Selected Step Click this button to go to the currently selected step.

Exit Program Click this button to exit the LLCEDATA program.

6.3.2 View/Print/Export Main Databases

Use this command to open a sub-menu of main databases for viewing/printing/exporting.

Shortcuts Keys: ALT+D+V

6.3.2.1 LLCE Physical Data. Use this command to view/print/export the **LLCE Physical Data** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.3.2.2 Tank Waste Characterization Data. Use this command to view/print/export the **Tank Waste Characterization Data** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.3.2.3 LLCE Geometry Factors Data. Use this command to view/print/export the **LLCE Geometry Factors Data** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.3.2.4 Radionuclide Regulatory Data. Use this command to view/print/export the **Radionuclide Regulatory Data** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.3.2.5 Radionuclide Physical Constants. Use this command to view/print/export the **Radionuclide Physical Constants** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.3.2.6 List Of Valid Measured Gamma Isotopes. Use this command to view/print/export the **List Of Valid Measured Gamma Isotopes** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.3.2.7 LLCE Waste Containers. Use this command to view/print/export the **LLCE Waste Containers** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.3.2.8 Chemical Regulatory Data. Use this command to view/print/export the **Chemical Regulatory Data** in a window on screen. Uses the same format as **Preview** button, in Section 6.1.4.

6.4 WINDOWS MENU COMMAND

The **Windows** menu gives the user the opportunity to select from the various displayed windows allowing the window to become the active window and brought to the foreground. Currently, LLCEDATA only has one active window at a time.

6.5 STATUS MENU COMMANDS

The **Status** menu offers the following commands:

<u>Current Status</u>	Opens the Status Log window which displays a detailed record of exactly what the program has done in creating the LLCE data (EDF) file. Click the Return button at the bottom of this window to close the Status Log window and continue with the program.
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Shortcuts	Keys: CTRL+S or ALT+S+C
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6.6 HELP MENU COMMANDS

The **Help** menu offers the following commands:

<u>About</u>	Displays a picture window that includes the title of the program, the version number, the operating system, etc. It gives information A bout the program. Click the Ok button to close the picture window and continue with the program.
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Shortcuts	Keys: CTRL+A or ALT+H+A
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7.0 LLCECALC MENU COMMANDS

LLCECALC for Windows provides the user with menu driven commands allowing the user to conveniently activate the various functions of the program. This section provides a detailed description of each of these menu driven commands to serve as an in-depth guide to the operation of the program.

When the LLCECALC program first starts, the only menu command available is **Startup**. This brings up the Select Files menu, shown in Section 7.1.1. Once the EDF and AV2 file have been selected, the following menu items become available.

7.1 FILE MENU COMMANDS

The File menu offers the following commands:

Open Files Opens the **Select Files** window. Initiates the specification of files to analyze.

Printer Setup Opens a Windows printer setup dialogue box. Initiates the specification of printing parameters.

Print Opens the **Print Results** window. Initiates the specification of reports to print.

Export Opens a sub-menu of data reports to export.

Exit Exits LLCECALC.

Shortcuts Keys: ALT+F+X

7.1.1 Open Files

Use this command to create a new or edit an existing LLCECALC analysis.

Shortcuts Keys: CTRL+O or ALT+F+O

Select Files Window

The following options are available in this window:

Open Select Select either a **New** or **Existing** analysis by clicking in the appropriate circle.

Name of LLCE Data File: Enter the *drive\path\filename.EDF* of the LLCE data file to use in the analysis or click the **Browse** button to utilize the **Select LLCE Equipment Data File** dialogue box.

Name of Gamma Assay Data File: This frame is only present if **New** is selected in the above option **Open Select**. Enter the *drive\path\filename.AV2* of the gamma assay data file to use in the analysis or click the **Browse** button to utilize the **Select LLCE Equipment Data File** dialogue box.

Start Program Once the data file(s) are selected as specified above, click this button to begin the analysis.

Exit Program Click this button to exit the LLCECALC program.

When the Browse button is selected, the **Select LLCE Equipment Data File** window will appear.

The following options are available in this dialogue box to specify which file to open:

Look in: Click the down arrow at the right of this field and then select the drive to look in.

File name: Type the filename to open in this field or click on the filename in the large central field.

Files of type: Click the down arrow at the right of this field and then select the file type to view. Default file types are EDF or AV2.

Click this button to view the contents of the parent folder of the current folder.

Click this button to create a new folder in the current folder.

- Open** Click this button to open the file specified in the **File name:** field. This button will do nothing if this field is empty.
- Cancel** Click this button to cancel file selection and close the **Select LLCE Equipment Data File** dialogue box.

7.1.2 Printer Setup

Use this command to specify printer properties and print options. Selecting this command opens a Windows printer setup dialogue box.

Shortcuts Keys: CTRL+W or ALT+F+S

7.1.3 Print

Use this command to preview and print the available reports that LLCECALC creates.

Shortcuts Keys: CTRL+P or ALT+F+P

Print Results Window

The following options are available in this window:

- Report Selection** Select either the **Waste Characterization** or **Status** report by clicking in the appropriate circle.
- Preview** Once the desired report is selected as specified above, click this button to preview the report in a window on screen. There are several options available at the bottom of this window in the form of icon buttons. Clicking the printer button opens a Windows print dialogue box. Clicking the briefcase or envelope button initiates a series of windows in which the user can specify the format and destination of exporting the data.
- Print** Once the desired report is selected as specified above, click this button to print the report on the currently selected printer. Once this button is clicked, the print job is sent to the printer. There is no option to cancel after this point.
- Setup** Click this button to open a Windows printer setup dialogue box, discussed in Section 7.1.2.
- Cancel** Click this button to cancel the **Print** command selection and close the **Print Results** window.

7.1.4 Export

Use this command to open a submenu of data reports to export.

Shortcuts Keys: ALT+F+E

7.1.4.1 As Read Gamma Assay Data. Use this command to preview/export the **As Read Gamma Assay Data** in a window on screen. Uses the same format as **Preview** button, in Section 7.1.3.

7.1.4.2 Processed Gamma Assay Data. Use this command to preview/export the **Processed Gamma Assay Data** in a window on screen. Uses the same format as **Preview** button, in Section 7.1.3.

7.1.4.3 Chemical/Radionuclide Content of Waste. Use this command to preview/export the **Chemical/Radionuclide Content of Waste** in a window on screen. Uses the same format as **Preview** button, in Section 7.1.3.

This selectable submenu item will be grayed out if the LLCECALC program has not analyzed the EDF or AV2 file.

7.2 EDIT MENU COMMANDS

The Edit menu offers the following commands:

Cut Cuts highlighted data from the display and places it on the clipboard. Placing data on the clipboard replaces the contents previously stored there.

Shortcuts Keys: CTRL+X or ALT+E+T

Copy Copies highlighted data from the display to the clipboard. Copying data to the clipboard replaces the contents previously stored there.

Shortcuts Keys: CTRL+C or ALT+E+C

Paste Pastes the contents of the clipboard to the position of the cursor in the display. Pasting does not remove the contents of the clipboard. Specific data can be pasted more than once.

Shortcuts Keys: CTRL+V

7.3 DATA MENU COMMANDS

The Data menu offers the following commands:

Analyze Gamma File Opens the **Analyze Gamma Assay Data** window. Initiates the analysis of selected data files.

Characterize Waste Opens the **LLCE Waste Characterization Calculations** window. Initiates the characterization of the waste of processed data files.

This selectable submenu item will be grayed out if the LLCECALC program has not analyzed the EDF or AV2 file.

7.3.1 Analyze Gamma File

Use this command to initiate the analysis of the currently specified AV2 file. This command is only available once the user has specified the appropriate filenames as outlined in Section 7.1.1.

Shortcuts Keys: ALT+D+A

Analyze Gamma Assay Data Window

Analyze Gamma Assay Data

Processing Gamma Assay File: T101AZ13D.AV2

- ☐ Read Gamma Assay Data File
- ☐ Check and Correct Positions in Gamma Assay Records
- ☐ Find Gamma Assay Start Points
- ☐ Check and Correct for Superseded Records
- ☐ Apply Geometry Correction Factors for Cs-137
- ☐ Apply Detector Shielding Correction Factors for Cs-137
- ☐ Check and Correct Gaps in Cs-137 Measurements
- ☐ Assign Assay Records to Tank Waste Layer
- ☐ Calculate Measured Curie Content for LLCE

Gamma File Measurement Statistics:

Crane Start: ft Measured Length: ft

Crane End: ft Tip of LLCE from Crane End: ft

Cs-137 Curie Content

Ci Total all Layers: Ci

☐ Indicates Processing
☐ Indicates OK
☐ Indicates Problem

Process Gamma **Characterization** **Cancel**

The following options are available in this window:

Process Gamma

Click this button to start processing the currently selected AV2 file.

Stop Process

This button replaces the **Process Gamma** button once processing has begun. It can be clicked to stop processing at the end of the current step. Once it has been clicked, it is again replaced by the **Process Gamma** button.

Cs-137 Curie Content Click on the down arrow button at the right of this field to view the ^{137}Cs curie content of each of the waste layers. This option is only available after step 9, **Calculating Measured Curie Content For LLCE**, is complete.

Characterization Click this button to open the **LLCE Waste Characterization Calculations** window, discussed in Section 7.3.2, and initiate the characterization of the LLCE waste of the data files. This button can only be clicked after step 9, **Calculating Measured Curie Content For LLCE**, is complete.

Cancel Click this button to cancel the **Analyze Gamma File** command selection and close the **Analyze Gamma Assay Data** window. This button cannot be clicked when the **Stop Process** button is visible.

7.3.2 Characterize Waste

Use this command to initiate the characterization of the LLCE waste of the processed data files. This command is only available after step 9 has been completed in the **Analyze Gamma Assay Data** window from Section 7.3.1.

Shortcuts Keys: ALT+D+C

LLCE Waste Characterization Calculations Window

The following options are available in this window:

- Calculate** Click this button to start the calculations necessary to characterize the waste of the processed AV2 file.
- Stop** This button replaces the **Calculate** button once calculation has begun. It can be clicked to stop calculation at the end of the current step. Once it has been clicked, it is again replaced by the **Calculate** button.
- Reports** Click this button to open the **Print Results** window, from Section 7.1.3, and initiate report output. This button can only be clicked after step 11, **Calculate for Hazardous Waste Codes**, is complete.
- Cancel** Click this button to cancel the **Characterize Waste** command selection and close the **LLCE Waste Characterization Calculations** window. This button cannot be clicked when the **Stop** button is visible.

7.4 STATUS MENU COMMANDS

The Status menu offers the following commands:

Current Status Opens the **Status Log** window which displays a detailed record of exactly what the program has done in the LLCE analysis. Click the **Return** button at the bottom of this window to close the **Status Log** window and continue with the program.

Shortcuts Keys: CTRL+S or ALT+S+U

7.5 HELP MENU COMMANDS

The Help menu offers the following commands:

About Displays a picture window that includes the title of the program, the version number, the operating system, etc. It gives information **A**bout the program. Click the **Ok** button to close the picture window and continue with the program.

Shortcuts Keys: CTRL+A or ALT+H+A

8.0 SOFTWARE VERIFICATION

LLCEDATA and LLCECALC for windows are accompanied with verification examples for benchmark problems to be run on a computer system following installation. This section provides three verification cases which, when completed, will verify the correct operation of LLCEDATA and LLCECALC. One EDF will be created by the user while the remaining two EDFs and three AV2 files are provided on the installation CD and are copied into the *Verify* directory, located under the directory where LLCECALC was installed. The default *Verify* directory is *c:\Program Files\LLCECALC\Verify*.

Each one of these three test cases will check different features of the LLCEDATA and LLCECALC program. The three verification cases are summarized as follows:

- A synthetic one-layer EDF with an AV2 file containing gaps, zero data and backwards motion. This test case contains the simplest LLCE with a relatively complex AV2 file.
- A synthetic five-layer EDF with an AV2 file of the simplest form. This test case confirms the multi-layer algorithm, with additional complexities of mid-layer start points and mid-layer geometry correction factors. To facilitate the understanding of a multi-layer tank, this test case contains the simplest AV2 file, with no gaps, zero data, or backwards motion.
- A real LLCE case, based on historical data, and a real AV2 file. In this test case, the user creates the EDF by selecting an LLCE and tank that were manually analyzed in 1996. The AV2 file used for this test case was generated by the GAS and has not been modified.

The following sections will minimize instructions that relate to the operation of the software and will emphasize which selections to make at each step described in detail in Sections 4.2 and 5.2 through 5.5.

8.1 SYNTHETIC SINGLE-LAYER CASE: ONE-LAYER EDF, WITH A COMPLEX AV2 FILE

The first test case will use a synthetic gamma assay file, AV2 file, with a synthetic LLCE that was created specifically to test the ability of LLCECALC to work correctly with AV2 files that contain backward motion, gaps in the gamma records, and zero entries. The EDF for this test case had tank constituents that cause the LLCECALC characterization to be at the upper limit for most of the characterization decisions that are made. The LLCE will be TRU and Type B.

LLCEDATA will be used to open, in edit-mode, the *c1_1layer.edf* file, for the purpose of generating two LLCEDATA reports. The synthetic *c1_1layer.av2* file was specifically constructed to confirm the advanced algorithms used by LLCECALC to correct the anomalies that are sometimes present in AV2 files.

The specific characteristics for this synthetic test case were specified as follows.

- One tank layer: The layer thickness was specified to be 20 ft.
- Content: The single layer has three chemicals and six radionuclides, including ¹³⁷Cs.
- LLCE: The LLCE was chosen to be positioned 5 ft from the bottom of layer 1. This is the "Tip to Bottom" dimension; however, for single layer tanks this dimension is not needed. The LLCE flange-to-tip length is 20 ft, and the entire LLCE is 25 ft long.
- Geometry factors: There is only one set of geometry factors for this LLCE. The applicable range for this single set of factors is from 0 to 20 ft.

8.1.1 LLCEDATA Verification for Case 1; Equipment Data File

- Step 1** Start LLCEDATA. When the LLCEDATA program starts, activate the button in the first window for **Edit Existing LLCE Data File**. Open the *ct_1layer.edf* file.
- Step 2** When the **LLCE Data Selection and Edit** window is displayed, the first four required steps will already be hi-lighted in green. Select **Finish Data File** to display the **Complete LLCE Data File** window. Compare this window to the one shown below:

The information in the **Complete LLCE Data File** window shown above should match the window that appears on the computer's monitor. The only exception will be the first line, because the user will have installed the software to a different location.

- Step 3** Select **Print** from the **Complete LLCE Data File** window; then print the following two reports:
1. **Physical Data for Selected LLCE** will print the **LLCE Physical Data** report.
 2. **Geometry Factors for Selected LLCE** will print the **LLCE Geometry Factors** report.

The remaining two reports, **LLCE Status Report** and the **Tank Characterization Database** report, will not be needed for this validation.

- Step 4** Appendix A, Section A1.0, contains a listing of these two reports. The user must now take the printouts received from the above steps and compare them to the reports in the appendix to verify the following information.

- Report 1:** In the **LLCE Physical Data** report verify each column of information. The reports should match exactly, except for the date in the upper left corner which will display the date the user printed the report.
- Report 2:** In the **LLCE Geometry Factors** report, verify each column of information. The report should match exactly, except for the date in the upper left corner. The specific information unique to this report is the start and end locations for the set of geometry correction factors.

Now that the reports generated by the *c1_1layer.edf* file have been verified to be correct, the user is ready to move to the verification of LLCECALC for this test case, Section 8.1.2.

8.1.2 LLCECALC Verification for Case 1; Synthetic Single-Layer With Complex AV2 File

- Step 1** Start LLCECALC; the default of **New LLCE Waste Characterization Analysis** will be selected. Use the **Browse** feature and select the *c1_1layer.edf* data file and the *c1_1layer.av2* gamma assay file. If needed, refer to Section 5.2 for details.
- Step 2** Verify that the next two windows that appear, as LLCECALC reads the two files, are the same as the following two windows. The only exception is the location of the data and gamma files.

Select Yes for each of these two windows.

Step 3

The **Analyze Gamma Assay Data** window will be displayed. Select **Process Gamma**, as described in Section 5.3.1. Due to the specifications that were used to create this synthetic AV2 file, there will be several windows that appear as the AV2 file is being read.

The first window to display, **Enter Missing Crane Position**, correctly indicates that there is a zero position for record ID 1000060. The previous position recorded was 5, and the next non-zero position recorded is 8, with the indication that there are two consecutive records with zero position. Accept the default of 6 ft for the missing crane position. The window appears again, indicating that there is a zero position for the record ID 1000070. The previous position recorded is now 6, and the next non-zero position recorded is still 8. Accept the default of 7 ft for this missing crane position.

A **Decision Point - Relate Crane Position to LLCE** window will appear. This window notifies the user that the gamma assay file contains 2.67 ft of data more than the length of the LLCE. The user should accept the default option of "Tip of LLCE Corresponds to the End Crane Position."

Two **Gap In Gamma Assay Data Found** windows will appear. These windows correctly identify that the AV2 file has a gap in the readings for the gamma assay records. A gap would indicate that a portion of the LLCE does not have gamma records associated with it, implying that it would not be possible to characterize the gap portion of the LLCE. Accept the default in the windows and let LLCECALC estimate the ^{137}Cs content.

Step 4

When the gamma file processing is complete, the **Analyze Gamma Assay Data** window, still being displayed, will be updated. Verify that the following three items, from the window displayed below, match the window on the computer monitor.

Step 5

- Item 1: The top frame of the windows should read: "Processing Gamma Assay File: C:_1LAYER.AV2"
- Item 2: Next to the first green box should read: "Read Gamma Assay Data File - (81 Records Read)". The "81 Records Read" is the number to verify.
- Item 3: Verify that the fields near the bottom of the window read exactly as the window shows. The user will verify the four entries in **Gamma File Measurement Statistics**: and the two entries in **Cs-137 Curie Content**.
- Select the **Characterization** button to begin the **LLCE Waste Characterization Calculations**. Select **Calculate** to begin the characterization process, documented in Section 5.4. The following window, **LLCE Waste Mass**, will appear. Verify the information in the field is the same as shown below. Accept this default value.

Step 6

When the characterization process is completed, the following window, LLCE Waste Characterization Calculations, is present. Verify, from the window below, that each parenthetical statement, to the right of the green-box labels, matches with the computer's window. The 9 constituents displayed on the first line were judiciously chosen to make the characterization of this LLCE exceed the limits of McCormick (1997); be greater than Cat 3; be greater than NRC class C, TRU; be greater than 0.1 W/t², Type B; and have some D codes.

Step 7

The final step is to print the waste characterization report. Select **Reports** from the LLCE Waste Characterization Calculations window. Select the **Waste Characterization Report**, which will print or preview the LLCE Characterization Report.

8.1.3 LLCECALC Verification for Case 1; Characterization Report

Now that the characterization process is completed, the information in the characterization report will be verified. The following subsections will provide a step-by-step confirmation of the LLCE characterization report and the items to be verified on each. The section numbers will refer directly to the section (or step) numbers in the LLCE characterization report. A copy of this report is located in Appendix A, Section A1.0.

8.1.3.1 Information for This LLCE Retrieval. Confirm each entry in this section. The "UserName" would ordinarily be the user's user-name when creating the EDF in LLCEDATA. In this case, because the EDF was supplied, the user-name will be the original creator. The path for the *c1_1layer.edf* and *c1_1layer.av2* files will be different because the files would have been installed in a different location.

8.1.3.2 Radionuclide and Chemical Content of the LLCE Waste. Section "2.1 Chemicals" lists three chemicals, and section "2.2 Radionuclides" lists six nuclides. Both the name and content of these two sections should match exactly.

8.1.3.3 Check To See If SARP Limits Have Been Exceeded. The user should see a warning here that the SARP (McCormick 1997) limit has been exceeded for ^{241}Pu . Compare both the SARP limit and the LLCE content.

8.1.3.4 Calculate for CAT 1 and CAT 3 LLW. Compare the four sum-of-fractions values reported for Cat 1, Cat 3, NRC class C, and the interim safety basis (ISB) noncombustible limit. The LLCE should be greater than category 3, and greater than NRC class C. The ISB noncombustible limit was not exceeded.

8.1.3.5 TRU Waste Calculation. Confirm that the TRU fraction is greater than one because this LLCE is TRU. As a means to help identify when an LLCE is close to the TRU limit, a suspect TRU indicator is used. The user is allowed to define the suspect TRU limit. The limit used for suspect TRU is located in an *llcecalc.ini* file found where the user installed LLCECALC. The *llcecalc.ini* file is discussed in companion Volume II: Technical Manual, Appendix A3.1.0. If the user has not changed the *llcecalc.ini* file, the default value of 85 nCi/g will be shown.

8.1.3.6 Calculate PE-Ci for TRU Waste. Confirm the PE-Ci content. It should be lower than the 35 PE-Ci limit.

8.1.3.7 Calculate ^{239}Pu FGE for TRU Waste. Confirm the ^{239}Pu FGE curie content.

8.1.3.8 Calculate Alpha Curie Content for TRU Waste. Confirm the alpha content.

8.1.3.9 Heat Generation From the LLCE Waste Package. Compare all the values listed; each should match.

8.1.3.10 Calculate Transportation Category. Confirm the A_2 sum is over 1. The LLCE is Type B.

8.1.3.11 Calculate DE-Ci. Since the LLCE is Type B, confirm the DE-Ci curie value.

8.1.3.12 Calculate Hazardous Waste Codes. The hazardous waste codes D006, D008, and D009 apply in addition to the mandatory F001-F005 waste codes. The D006 waste code is needed because the concentration of cadmium is 25.49 mg/kg. The D code limit for cadmium is 20 mg/kg. The D008 waste code is needed because the concentration of lead is 101.98 mg/kg. The D code limit for lead is 100 mg/kg. The D009 waste code is needed because the concentration of mercury is 5.099 mg/kg. The D code limit for mercury is 4 mg/kg. These concentrations do not appear in the characterization report. If desired, the user may compare these values by previewing or printing the status report.

8.2 SYNTHETIC MULTI-LAYER CASE: FIVE-LAYER EDF WITH SIMPLE AV2 FILE

The second test case will use a synthetic gamma assay file, AV2 file, with a synthetic LLCE that was created specifically to test the multi-layer functionality of LLCEDATA and LLCCEALC.

LLCEDATA will be used to open, in edit-mode, the *c2_5layer.edf* file, to generate the LLCEDATA reports. The synthetic *c2_5layer.av2* file was constructed as simple as possible for this test- case to facilitate the ease of comparing just the data needed to confirm multi-layer functionality.

The configuration of the synthetic five-layer tank is shown in Figure 8.1.

The specific characteristics for this test case were specified as follows.

- Five layers:** The layer thicknesses, starting with layer one, are 10, 5, 2.5, 1, and 0.5 ft thick. The layer thicknesses shown in Figure 8-1 are not drawn to scale.
- Content:** Each of the five layers has one chemical and one radionuclide, in addition to the required ^{137}Cs . Other than for ^{137}Cs , the content is unique for each layer.
- LLCE:** The LLCE was chosen to be positioned 5 ft from the bottom of layer one, this is the "Tip to Bottom" dimension. The "Flange to Tip" dimension was specified as 19 ft.
- Geometry factors:** There are three geometry factors for this LLCE: the applicable range for each set of factors is from 0 to 7.5, 7.5 to 12.75, and 12.75 to 19 ft from the tip of the LLCE. Each of these three ranges end in the middle of one of the layers.

Figure 8-1. LLCE and Multi-Layer Tank Configuration for Verification Case No. 2.

8.2.1 LLCEDATA Verification for Case 2; Equipment Data File

- Step 1** Start LLCEDATA. When the LLCEDATA program starts, activate the button in the first window for **Edit Existing LLCE Data File**. Open the *c2_5layer.edf* file.
- Step 2** When the **LLCE Data Selection and Edit** window is displayed, the first four required steps will already be hi-lighted in green. Select **Finish Data File** to display the **Complete LLCE Data File** window. Compare this window to the one shown below:

The information in the **Complete LLCE Data File** window, shown here, should match the window that appears on the computer's monitor. The only exception will be the first line, since the user would have installed the software to a different location.

- Step 3** Select **Print** from the **Complete LLCE Data File** window; then print the following two reports:
1. **Physical Data for Selected LLCE** will print the **LLCE Physical Data** report.
 2. **Geometry Factors for Selected LLCE** will print the **LLCE Geometry Factors** report.

The remaining two reports, **LLCE Status Report** and the **Tank Characterization Database** report, will not be needed for this validation.

- Step 4** Appendix A, Section A2.0, contains a listing of these two reports. The user must now take the printouts received from the above steps and compare them to the ones in Appendix A, Section A2.0, to verify the following information.

Report 1: In the **LLCE Physical Data** report, verify each column of information. The reports should match exactly, except for date in the upper left corner which will display the date the user printed the report.

Report 2: In the **LLCE Geometry Factors** report, verify each column of information. The report should match exactly, except for the date in the upper left corner, which will display the date the user printed the report. The specific information unique to this report is the start and end locations for the geometry correction factors. These were chosen to occur midway between a tank layer.

Now that the two reports from the *c2_5layer.edf* file has been verified to be correct, the user is ready to move to the verification of LLCECALC for this test case, Section 8.2.2.

8.2.2 LLCECALC Verification for Case 2; Synthetic Multi-Layer With Simple AV2 File

- Step 1** Start LLCECALC, the default of **New LLCE Waste Characterization Analysis** will be selected. Use the **Browse** feature and select the *c2_5layer.edf* data file and the *c2_5layer.av2* gamma assay file. If needed, refer to Section 5.2 for details.
- Step 2** Verify that the next two windows that appear, as LLCECALC reads the two files, are the same as the following two windows:

The user should select Yes for each of these two windows.

Step 3

The **Analyze Gamma Assay Data** window will be displayed. Select **Process Gamma**, as described in Section 5.3.1. A **Decision Point - Relate Crane Position to LLCE** window will appear. This window notifies the user that the gamma assay file contains 3 ft of data more than the length of the LLCE; the user should accept the default. The synthetic AV2 file for this case was specified to be the simplest possible, so there will be no gaps or backwards motion.

Step 4

When the analysis is complete, the **Analyze Gamma Assay Data** window, still being displayed, will be updated. Verify that the following three items, from this window, match the window on the computer.

Analyze Gamma Assay Data

Processing Gamma Assay File: C2_5LAYER.AV2

☐ Read Gamma Assay Data File - (66 Records Read)

☐ Check and Correct Positions in Gamma Assay Records

☐ Find Gamma Assay Start Points

☐ Check and Correct for Superceded Records - (Backward motion not detected)

☐ Apply Geometry Correction Factors for Cs-137

☐ Apply Detector Shielding Correction Factors for Cs-137

☐ Check and Correct Gaps in Cs-137 Measurements

☐ Assign Assay Records to Tank Waste Layer

☐ Calculate Measured Curie Content for LLCE

Gamma File Measurement Statistics:

Crane Start: ft. Measured Length: ft.

Crane End: ft. Tip of LLCE from Crane End: ft.

Cs-137 Curie Content:

Ci Total of Layers: Ci

☐ Indicates Processing

☐ Indicates OK

☐ Indicates Problem

Item 1: The top frame of the windows should read: "Processing Gamma Assay File: C2_5LAYER.AV2".

Item 2: Next to the first green box should read: "Read Gamma Assay Data File - (66 Records Read)". The "66 Records Read" is the number to verify.

Item 3: Verify that the fields near the bottom of the window read exactly as the window shows. Verify the four entries in **Gamma File Measurement Statistics** and the two entries in **Cs-137 Curie Content**.

Step 5

Select the **Characterization** button to begin the **LLCE Waste Characterization Calculations**. Select **Calculate** to begin the characterization process documented in Section 5.4. The following window, **LLCE Waste Mass**, will appear. Verify the information in the field is the same as shown below. Accept the default value.

Step 6

When the characterization process is completed, the following window, LLCE Waste Characterization Calculations, is present. Verify, from the window below, that each parenthetical statement, to the right of green-box labels, matches with the window on the computer. The 11 constituents represents the 2 unique constituents per layer plus the mandatory ¹³⁷Cs. The quantity of the constituents selected was judiciously chosen to make the characterization of this LLCE be TRU and Type B, requiring the additional calculations shown.

Step 7

The final step is to print the waste characterization report. Select Waste Characterization Report, which will print the LLCE Characterization Report.

8.2.3 LLCECALC Verification for Case 2; Characterization Report

Now that the characterization process is complete, the information contained in the characterization report will be verified. The following subsections will provide a step-by-step confirmation of the LLCE characterization report and the items to be verified on each. The section numbers will refer directly to the section (or step) numbers in the report. A copy of this report is located in Appendix A, Section A2.0.

8.2.3.1 Information for This LLCE Retrieval. Confirm each entry in this section. The "UserName" would ordinarily be the user's user name when creating the EDF in LLCEDATA. In this case, because the EDF was supplied, the user name will be the original creator. The path for the *c2_5layer.edf* and *c2_5layer.av2* files will be different depending on where the files were installed.

8.2.3.2 Radionuclide and Chemical Content of the LLCE Waste. Section "2.1 Chemicals" lists five chemicals, and Section "2.2 Radionuclides" lists six nuclides. Both the name and content of these two sections should match exactly.

8.2.3.3 Check To See If SARP Limits Have Been Exceeded. A warning will appear that the SARP (McCormick 1997) limit has been exceeded for ²³⁷Np and ²³³U. Compare both the SARP limit and the LLCE content.

8.2.3.4 Calculate for CAT 1 and CAT 3 LLW. Compare the four sum-of-fractions values reported for Cat 1, Cat 3, NRC class C, and ISB noncombustible limit. The LLCE should be Category 1 and greater than NRC class C.

8.2.3.5 TRU Waste Calculation. Confirm that the TRU fraction is greater than one because this LLCE is TRU. As a means to help identify when an LLCE is close to the TRU limit, a suspect TRU indicator is used. The user is allowed to define the suspect TRU limit. The limit used for suspect TRU is located in an *llcecalc.ini* file found where the user installed LLCECALC. The *llcecalc.ini* file is discussed in companion Volume II: Technical Manual, Appendix A3.1.0. If the user has not changed the *llcecalc.ini* file, the default value of 85 nCi/g will be shown.

8.2.3.6 Calculate PE-Ci for TRU Waste. Confirm the PE-Ci content.

8.2.3.7 Calculate ²³⁹Pu FGE for TRU Waste. Confirm the ²³⁹Pu FGE curie content.

8.2.3.8 Calculate Alpha Curie Content for TRU Waste. Confirm the alpha content.

8.2.3.9 Heat Generation From the LLCE Waste Package. Compare all the values listed; each should match.

8.2.3.10 Calculate Transportation Category. Confirm the A₂ sum is over 1. The LLCE is Type B.

8.2.3.11 Calculate DE-Ci. Since the LLCE is Type B, confirm the DE-Ci curie value.

8.2.3.12 Calculate Hazardous Waste Codes. The hazardous waste code D009 applies in addition to the mandatory F001-F005 waste codes. Waste code D009 applies because the concentration of mercury is 4.56 mg/kg. The D code limit for mercury is 4 mg/kg. These concentrations do not appear in the characterization report. If desired, the user may compare these values by previewing or printing the status report.

8.3 HISTORICAL DATA CASE: THERMOCOUPLE PROFILE FROM TANK 241-AZ-101

This third test case will use an actual LLCE with its real AV2 file, created by the FRDRS in 1996. This case represents the historical data test case and uses no synthetic data. LLCEDATA will be used to select the LLCE and the tank contents.

To maintain verification conformity, the 241-AZ-101 tank characterization database has been "frozen" in time and renamed. That is, the most current tank characterization database, in LLCEDATA, has had the 241-AZ-101 tank data extracted and placed in a "special" tank farm database within LLCEDATA. This special tank farm database is called farm "XX." This will enable the verification to be confirmed for a "real" LLCE that will not change with each revision of the LLCEDATA program. Revisions are anticipated due to updates in the tank characterization database in LLCEDATA. This database is obtained from the Tank Waste Information Network System.

8.3.1 LLCEDATA EDF Creation Verification

- Step 1** Start LLCEDATA, create a new EDF, name it *T101AZ13D.edf*. This is discussed in detail in Sections 4.12 and 4.13.
- Step 2** At the first required step, **Select/Edit LLCE Physical Data**, discussed in Section 4.2.1 as STEP ONE, select the LLCE from the database identified as follows: "Description: Thermocouple Profile," "H-2 Drawing # 68339," "Part #: 3."
- Step 3** At the second required step, **Select Tank Waste Source**, select tank farm XX and tank 101. Indicate in the "Riser" field, the identifier 13D. This selection is referred to as STEP TWO in Section 4.2.2.
- Step 4** For this particular LLCE, the third required step, **Select/Edit LLCE Geometry Factors**, is not necessary because the factors have previously been defined for this LLCE. When the user accepts the predetermined geometry factors, the user should still see the **Define LLCE Geometry Correction Factors** window. Confirm that the factors listed are as follows: detector #1: 1.481; #2: 1.934; and #3: 1.957.
- Step 5** Now select **Finish Data File**, discussed in Section 4.2.4 as STEP FOUR. The user will first verify that the following **Complete LLCE Data File** window appears. The information on this window should match the window that appears on the computer's monitor. The only exception will be the first line, because the user will have installed the software to a different location. Select **Print**; then print the following four reports from the **Complete LLCE Data File** window:
1. **Physical Data for Selected LLCE** will print the **LLCE Physical Data** report.
 2. **Tank Waste Characterization Data for Selected Tank** will print the **Tank Characterization Database** report.
 3. **Geometry Factors for Selected LLCE** will print the **LLCE Geometry Factors** report.
 4. **Running Status Report for This EDF file**, will print the **LLCE Status Report**.

Step 6

Contained in Appendix A, Section A3.0, is a copy of these four reports for comparison. Take the printouts received from the above steps and compare them to the ones in the appendix to verify the following information.

- Report 1: In the **LLCE Physical Data** report, verify each column of information. The reports should match exactly, except for date in the upper left corner which will display the date the user printed the report.
- Report 2: From the **Tank Characterization Database** report, verify that the following random sampling of constituent data matches:

Constituent:	Layer Cont:
Chloride	640
Lead	455
Mercury	0.26
Uranium	2460
Cesium-137	7430000
Curium-243	4.36
Europium-155	71500
Plutonium-238	165
Radium-228	0.00
Strontium-90	6360000
Tritium	4.0
Uranium-235	0.044

- Report 3: In the **LLCE Geometry Factors** report, verify each column of information. The reports should match exactly, except for the date in the upper left corner which will display the date the user printed the report.
- Report 4: In the **LLCE Status Report** listing, verify that the representative information, specific to this LLCE and shown in bold print,

matches the user's LLCE status report. Note that the date and time on the left margin should correspond to the user's current date and time.

Now that the required EDF has been created and verified to be correct, the user is ready to move to the verification of LLCECALC, Section 8.3.2.

8.3.2 Verification of LLCECALC for Case 3; Thermocouple Profile From Tank 241-AZ-101

- Step 1** Start LLCECALC; the default of **New LLCE Waste Characterization Analysis** will be selected. Use the **Browse** feature and select the *t101az13d.edf* data file and the *t101az13d.av2* gamma assay file. If needed, refer to Section 5.2 for details.

- Step 2** Verify that the next two windows that appear, as LLCECALC reads the two files, are the same as the following two windows:

Select Yes for each of these two windows.

- Step 3** The **Analyze Gamma Assay Data** window will be displayed; select **Process Gamma**, as described in Section 5.3.1. There will be several windows that open

and prompt the user for input during this process: (1) **Enter Missing Crane Position**, (2) **Decision Point - Relate Crane Position to LLCE**, and (3) **Gap in Gamma Assay Data Found**. Accept the default options for each of these windows.

Step 4

When the analysis is complete, the **Analyze Gamma Assay Data** window will have been updated. Verify that the following three items from this window match the window on the user's monitor.

Item 1: The top frame of the windows should read: "Processing Gamma Assay File: T101AZ13D.AV2"

Item 2: Next to the first green box should read: "Read Gamma Assay Data File - (1130 Records Read)". The "1130 Records Read" is the number to note.

Item 3: Verify that the fields near the bottom of the window reads exactly as the window below shows. Verify the four entries in **Gamma File Measurement Statistics**, **Measurement Statistics**, and the two entries in **Cs-137 Curie Content**.

Analyze Gamma Assay Data

Processing Gamma Assay File: T101AZ13D.AV2

- ☐ Read Gamma Assay Data File - (1130 Records Read)
- ☐ Check and Correct Positions in Gamma Assay Records
- ☐ Find Gamma Assay Start Points
- ☐ Check and Correct for Superseded Records - (Backward motion detected)
- ☐ Apply Geometry Correction Factors for Cs-137
- ☐ Apply Detector Shielding Correction Factors for Cs-137
- ☐ Check and Correct Gaps in Cs-137 Measurements
- ☐ Assign Assay Records to Tank Waste Layer
- ☐ Calculate Measured Curie Content for LLCE

Gamma File Measurement Statistics:

Crane Start: -0.29317 ft	Measured Length: 60.37817 ft
Crane End: 60.08500 ft	Tip of LLCE from Crane End: 0 ft

Cs-137 Curie Content:

Layer 1 st = 0.26426	CI	Total all Layers: 0.26426	CI
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☐ Indicates Processing
☒ Indicates OK
☐ Indicates Problem

Process Gamma **Characterization** Cancel

Step 5

Select the **Characterization** button to begin the **LLCE Waste Characterization Calculations**. Select **Calculate** to begin the characterization process documented in Section 5.4. The following **LLCE Waste Mass** window will appear. Verify the information in the field is the same as shown below. Accept this default value.

LLCE Waste Mass

LLCE mass defined as 133.81200 kg

This does not include mass of the flexible receiver bag or the lifting linkage used. You may change the LLCE mass shown if you wish to add these additional masses.

Enter the mass of the (LLCE + Bag + Lifting Links) in kilograms:

133.81200

OK Cancel

Step 6

When the characterization process is completed, the following window, **LLCE Waste Characterization Calculations**, is present. Verify, from the window below, that each parenthetical statement, to the right of the green-box labels, matches with the window on the user's monitor.

LLCE Waste Characterization Calculations

LLCE Waste Characterization Steps

- ☐ Calculate Radiochemical and Chemical Content. (71 Constituents)
- ☐ Check LLCE Waste Against SARP Limits. (Some Limits Exceeded)
- ☐ Calculate for Category 1 and 3 LLW. (Category 3, LLMW, < NRC Class C, < ISB Cat. 3)
- ☐ Calculate for TRU Waste. (Not TRU)
- ☐ Calculate PE-Cl. N/A
- ☐ Calculate Pu-239 FGE. N/A
- ☐ Calculate Alpha Emitters Content. N/A
- ☐ Calculate Heat Generation Rate for Waste Package. (< 0.1 w/t²)
- ☐ Calculate Transportation Category. (Type A)
- ☐ Calculate DE-Cl. N/A
- ☐ Calculate for Hazardous Waste Codes. (F001-F005)

☐ Indicates Processing
☐ Indicates DK
☐ Indicates Problem

Calculate Reports Cancel

Step 7 The final step is to print the two reports available after the characterization is complete:

1. **Waste Characterization Report** which will print the **LLCE Characterization Report**.
2. **Status Report** which will print the **LLCE Status Report**.

Copies of these reports are available in Appendix A, Section A3.0.

8.3.3 LLCECALC Verification for Case 3; LLCE Characterization Report

Now that the characterization process has completed, the information in the first of the two reports generated by LLCECALC will be verified. The following section will provide a step-by-step confirmation of the LLCE characterization report and the items to be verified on each. The section numbers will refer directly to the section (or step) numbers on the report.

8.3.3.1 Information for This LLCE Retrieval. Confirm each entry in this section. The "UserName" should be the user's user name, selected when starting LLCEDATA. The path for the EDF and AV2 files will be different because of where the user installed the programs.

8.3.3.2 Radionuclide and Chemical Content of the LLCE Waste. Section "2.1 Chemicals" lists 25 chemicals, and Section "2.2 Radionuclides" lists 46 nuclides. Both the name and content of these two sections should match exactly.

8.3.3.3 Check To See If SARP Limits Have Been Exceeded. A warning will appear here that the SARP (McCormick 1997) limit has been exceeded for ²⁴²Pu. Compare both the SARP limit and the LLCE content.

8.3.3.4 Calculate for CAT 1 and CAT 3 LLW. Compare the four sum-of-fractions values reported for Cat 1, Cat 3, NRC class C, and ISB noncombustible limit. The LLCE should be Category 3 LLMW (low-level mixed waste).

8.3.3.5 TRU Waste Calculation. Confirm that the LLCE is not TRU by comparing the TRU fraction. As a means to help identify when an LLCE is close to the TRU limit, a suspect TRU indicator is used. The user is allowed to define the suspect TRU limit. The limit used for suspect TRU is located in an *llcecalc.ini* file found where the user installed LLCECALC. The *llcecalc.ini* file is discussed in companion Volume II: Technical Manual, Appendix A3.1.0. If the user has not changed the *llcecalc.ini* file, the default value of 85 nCi/g will be shown.

8.3.3.6 Calculate PE-Ci for TRU Waste. Since the LLCE is not TRU, this step is not performed.

8.3.3.7 Calculate ²³⁹Pu FGE for TRU Waste. Since the LLCE is not TRU, this step is not performed.

8.3.3.8 Calculate Alpha Curie Content for TRU Waste. Since the LLCE is not TRU, this step is not performed.

8.3.3.9 Heat Generation From the LLCE Waste Package. Compare all the values listed; each should match.

8.3.3.10 Calculate Transportation Category. The LLCE is Type A, note the A₂ fraction sum.

8.3.3.11 Calculate DE-Ci. Since the LLCE is Type A, this step is not performed.

8.3.3.12 Calculate Hazardous Waste Codes. The hazardous waste codes F001-F005 should be the only waste codes that apply.

8.3.4 LLCECALC Verification for Case 3; LLCE Status Report

The LLCE status report, printed by LLCECALC, will be a complete listing of all activity performed by both LLCEDATA and LLCECALC. Section 8.3.1 discusses the verification of the status report generated by LLCEDATA. Since LLCECALC is being confirmed in this section, the user should advance to the portion of the status report, generated by LLCECALC, that indicates: "START OF LLCECALC PROGRAM RUN." This start position in the status report is easy to identify due to a row of stars "*****" between the LLCEDATA and LLCECALC entries. The verification for the LLCECALC portion of this status report is divided between the following two sections that independently verify gamma assay file reading and the actual characterization.

8.3.4.1 Verification of "Analyze Gamma Assay Data". LLCECALC performs two major functions. The first function is to read the AV2 file and fix any anomalies that are present. This is performed by **Analyze Gamma Assay Data**, and consists of the following nine specific steps.

8.3.4.1.1 Read Gamma Assay Data File - Gamma File Analysis Step 1. Confirm the file name and the number of records read.

8.3.4.1.2 Check and Correct Positions in Gamma Assay Records - Gamma File Analysis Step 2. Confirm conversion from raw crane position measurements to the new "Max Crane Position." The user should see a number of nonuniform crane positions and zero crane positions that are fixed.

8.3.4.1.3 Find Gamma Assay Start Points - Gamma File Analysis Step 3. Confirm several non-motion entries that are deleted due to the LLCE not moving. Confirm several backward motion entries "Crane motion reversed."

8.3.4.1.4 Check and Correct for Superseded Records - Gamma File Analysis Step 4. Confirm several superseded records that are deleted and several records that are created in the middle of other records.

8.3.4.1.5 Applying Geometry Correction Factors - Gamma File Analysis Step 5. Confirm the beginning and ending crane position, also the total crane travel. Crane measurements are then calibrated to the default of zero crane position representing the tip of the LLCE. Confirm that several records are discarded because they occur above the mounting flange. Confirm that the data record at the mounting flange is adjusted to truncate the length of the record to be from the last record to the mounting flange. Confirm that the geometry correction factors are read properly.

8.3.4.1.6 Applying Detector Shielding Correction Factors for ¹³⁷Cs - Gamma File Analysis Step 6. Confirm that the default correction values are replaced with the values from the llcecalc.ini file. Confirm the estimate of what the correction values should be.

8.3.4.1.7 Check and Correct Gaps in ¹³⁷Cs Measurements - Gamma File Analysis Step 7. Confirm negative ¹³⁷Cs measurement values are set to zero. Confirm that the gaps found have new records created and confirm the ¹³⁷Cs estimated content.

8.3.4.1.8 Assigning Assay Records to Tank Waste Layer - Gamma File Analysis Step 8. Confirm all data records are in layer one.

8.3.4.1.9 Calculating Measured Curie Content for LLCE - Gamma File Analysis Step 9. Confirm the ¹³⁷CS content for layer one.

8.3.4.2 Verification of "LLCE Waste Characterization Calculations". This is the second major function of LLCECALC. The first function is to read the AV2 file and fix any anomalies that are present. The second function is performed by **LLCE Waste Characterization Calculations**, and consists of 11 specific steps.

8.3.4.2.1 Calculate Radiochemical/Chemical Content of LLCE Waste - Step 1. This portion of the status file displays the LLCE mass and any additional mass the user entered for the bag or lifting hardware.

8.3.4.2.2 Calculate To See If SARP Limits Are Exceeded - Step 2. Confirm that the SARP (McCormick 1997) limit is exceeded for ^{242}Pu .

8.3.4.2.3 Calculate for Cat 1, Cat 3 LLW - Step 3. Confirm the entries for Cat 1, Cat 3, NRC Class C, and the ISB noncombustible limit.

8.3.4.2.4 Calculate for TRU - Step 4. Confirm that the LLCE is not TRU.

8.3.4.2.5 Calculate PE-Ci for TRU Waste - Step 5. Since the LLCE is not TRU, this step is not performed.

8.3.4.2.6 Calculate ^{239}Pu FGE for TRU Waste - Step 6. Since the LLCE is not TRU, this step is not performed.

8.3.4.2.7 Calculate Alpha Curie Content for TRU Waste - Step 7. Since the LLCE is not TRU, this step is not performed.

8.3.4.2.8 Calculate Heat Generation Rate of LLCE Waste Package - Step 8. Confirm the heat generation rate and the volume of the selected container.

8.3.4.2.9 Calculate Transportation Category - Step 9. Compare the A_2 value; the DE-Ci calculation is not required.

8.3.4.2.10 Calculate DE-Ci - Step 10. Since the LLCE is not Type B, this step is not performed.

8.3.4.2.11 Calculate Hazardous Waste Codes - Step 11. Compare the concentrations of chromium, lead, and mercury.

This completes the verification of LLCEDATA and LLCECALC.

9.0 LLCEDATA AND LLCECALC ERROR AND WARNING MESSAGES

9.1 GENERAL RUN-TIME ERROR MESSAGES

Appendix B contains Table B-1 with a listing of all possible warning and error messages for LLCEDATA. Appendix C contains Table C-1 with a listing of all possible warning and error messages for LLCECALC.

If a critical program error is observed, please immediately contact the code custodian and describe, in detail, the events that caused the error.

10.0 SUMMARY

LLCEDATA and LLCECALC generate characterization information by integrating both the acquisition of current tank waste data with the output from the LLCE GEA System. LLCEDATA and LLCECALC allows for the quick, accurate, and efficient characterization of an LLCE.

Three manuals document LLCEDATA and LLCECALC for Windows. Volume I is a user's manual, which is intended for quick reference. It is to be used as an aid for learning to use LLCEDATA and LLCECALC for Windows and as a guide to the program's uses. The user's manual contains a discussion of all the options available to the user for each menu found in both LLCEDATA and LLCECALC. The user's manual also contains three test cases that allow the user to verify the correct installation and setup of the software.

Volume II is a technical manual, which contains in-depth information on both programs. It gives information on the history of LLCEDATA and LLCECALC for Windows, as well as the theoretical background, calculational methodology, and quality assurance for the software program. Volume III is a software verification and validation document for LLCEDATA and LLCECALC. This document shows that each step performed by LLCECALC has been independently calculated for a variety of test cases, confirming that the methodology, algorithms, and data used in LLCECALC are correct.

An important result provided by the two LLCE programs is the generation of the status report. The status report can serve as a historical guide, showing exactly what took place during an LLCE characterization. The report documents every step in both LLCEDATA and LLCECALC and records every action the user performs with either of these programs.

11.0 REFERENCES

- HNF-3169, 1998, *LLCEDATA and LLCECALC for Windows Version 1.0, Volume II: Technical Manual*, Rev. 0, prepared by Waste Management Federal Services, Inc., Northwest Operations for Fluor Daniel Hanford, Inc., Richland, Washington.
- HNF-3169, 1998, *LLCEDATA and LLCECALC for Windows Version 1.0, Volume III: Software Verification and Validation*, Rev. 0, prepared by Waste Management Federal Services, Inc., Northwest Operations for Fluor Daniel Hanford, Inc., Richland, Washington.
- McCormick, W. A., 1997, *Safety Analysis Report for Packaging (Onsite) Long-Length Contaminated Equipment Transport System*, HNF-SD-TP-SARP-013, Rev. 0, prepared by Waste Management Federal Services, Inc., Northwest Operations for Fluor Daniel Hanford, Inc., Richland, Washington.
- Nelson, J. V., 1998, "Requirement for New Geometry Correction Factors That Take Self-Absorption of Equipment into Account" (personal communication to R. D. Wilson, Waste Management Federal Services, Inc., Northwest Operations, April 9), Fluor Daniel Northwest, Inc., Richland, Washington.

APPENDIX A

LLCEDATA AND LLCECALC INSTALLATION VERIFICATION TEST CASES

There are three LLCEDATA and LLCECALC for Windows¹ test cases that were developed to test proper installation of LLCEDATA and LLCECALC for Windows. Presented in this appendix is a printout of the reports used to confirm these three cases. Users should run the three test cases after installation of LLCEDATA and LLCECALC for Windows. The test cases are located in the *Verify* subdirectory at the load point for where LLCEDATA and LLCECALC are installed. Identical results indicate proper installation of LLCEDATA and LLCECALC for Windows.

¹Windows is a trademark of Microsoft Corporation.

**A1.0 CASE NO.1: SYNTHETIC SINGLE-LAYER CASE:
ONE-LAYER EDF, WITH A COMPLEX AV2 FILE**

A1.1 LLCEDATA-GENERATED REPORTS

Today's Date: 8/ 5/98

LLCE PHYSICAL DATA

Length in Meters
Weight in kg

ID	LLCE Description	Max Diameter	Max Tip to Tip Length	Flange to Tip Length	LLCE Weight	Drawing Number	Part Number	Drawing List	Farms	Waste Container Size	Comment	Time	Date
1	LLCE for Case 1 V&V (1 Tank)	0.08	7.62	6.10	50.00	1	1	Case 1	XX	3	This LLCE is for V&V purposes only.	10:56 AM	7/29/98

Today's Date: 8/ 5/98

LLCE GEOMETRY FACTORS

Length in Meters
Weight in kg

ID	LLCE Description	Max Diameter	Flange to Tip	Drawing Number	Part Number	Start Location	End Location	Isotope	Correction Factor #1	Correction Factor #2	Correction Factor #3	Time	Date
0	LLCE for Case 1 V&V (1 Layer Tank)	0.08	6.10	1	1	0.00	6.10	137CS	1.00	2.00	3.00	11:03 AM	7/29/98

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A1.2 LLCECALC-GENERATED REPORTS

Todays Date: 8/21/1998 LLCE CHARACTERIZATION REPORT

Checked by: _____

=====

1.0 INFORMATION FOR THIS LLCE RETRIEVAL

=====

UserName from LLCEDATA: kandle
 Description of LLCE being retrieved : LLCE for Case 1 V & V (1 Layer Tank)
 Drawing number (H-2) of LLCE : 1
 Part number of LLCE : 1
 Waste tank LLCE is retrieved from: 241-XX-103
 Tank riser LLCE is retrieved from : 3
 Waste container number for this LLCE : 3
 Equipment Data File Name (EDF) : E:\Program Files\llcecalc\Verify\c1_1layer.edf

Gamma Assay Data File Name : E:\Program Files\llcecalc\Verify\c1_1layer.av2

LLCE mass is 50 kg.
 User did not add any additional mass for the flexible receiver bag or lifting linkage

=====

2.0 RADIONUCLIDE AND CHEMICAL CONTENT OF THE LLCE WASTE:

=====

2.1 Chemicals:

=====

Lead = 5.09881 grams
 Cadmium = 1.27470 grams
 Mercury = 0.25494 grams

=====

2.2 Radionuclides:

=====

Polonium-212 = 1019.76252 curies
 Thorium-232 = 0.25494 curies
 Plutonium-241 = 0.25494 curies
 Curium-250 = 0.00612 curies
 Actinium-227 = 5.09881e-04 curies
 Cesium-137 = 5.09881e-05 curies (Measured by Gamma Assay System)

=====

3.0 CHECK TO SEE IF SARP LIMITS HAVE BEEN EXCEEDED

=====

Warning - The SARP limit has been exceeded for radionuclide: 241PU
 SARP limit is: 0.17900 Ci
 LLCE waste content is: 0.25494 Ci
 SEP is required for this waste package

=====

4.0 CALCULATE FOR CAT 1 AND CAT 3 LLW

=====

For NRC Calcs: Estimate of Volume based on Mass of LLCE is 0.00638 m³.

Volume for LLCE waste container: 3 is 9.57100 m³
 Cat 1 sum of fractions is : 242.60287

Cat 3 sum of fractions is : 1.15919
 NRC Class C sum of fractions is : 2.68052
 Cat 3 non-combustible limit sum of fractions is : 0.03126
 LLCE waste is Greater than Category 3, LLMW
 LLCE is NOT suitable for near surface disposal (NRC C Fraction >1)
 Additional safety analysis is not required for near surface disposal. (NonComb Fraction <1)

5.0 TRU WASTE CALCULATION

Read from file E:\Program Files\lcecalc\lcecalc.ini Suspect TRU limit = 85 nCi/g
 LLCE waste is TRU-Mixed (TRUM) since TRU fraction > 1 (1.22372)

6.0 CALCULATE PE-Ci FOR TRU WASTE

LLCE Pu Curie Content: 0.25494
 LLCE Pu Gram Content: 0.00248
 LLCE PE-Ci Content: 0.12871
 LLCE Does not exceed the 35 PE-Ci limit

7.0 CALCULATE Pu-239 FGE FOR TRU WASTE

LLCE Pu-239 Fissile Gram Equivalent (FGE) Curie content: 0.00557

8.0 CALCULATE ALPHA CURIE CONTENT FOR TRU WASTE

LLCE Alpha curie content: 0.26106

9.0 HEAT GENERATION FROM THE LLCE WASTE PACKAGE

Total heat generated by LLCE waste is: 53.13570 watts.
 Internal volume of container LLCE-3 = 337.99987 ft³
 Heat generation rate for the LLCE waste is 0.15721 watts/ft³
 Heat generation rate exceeds 0.1 watts/ft³

10.0 CALCULATE TRANSPORTATION CATEGORY

A2 fraction sum = 1.88671
 LLCE waste package is Type B Quantity.
 DE-Ci calculation is required.

11.0 CALCULATE DE-Ci

DE-Ci total for LLCE waste package is: 1.02231 Ci

12.0 CALCULATE HAZARDOUS WASTE CODES

Hazardous waste codes F001-F005 apply to all LLCE.

Waste Code D006 apply to this LLCE waste.

Waste Code D008 apply to this LLCE waste.

Waste Code D009 apply to this LLCE waste.

No other Waste codes Apply.

=====

END OF REPORT

=====

**A2.0 CASE No. 2: SYNTHETIC MULTI-LAYER CASE:
5-LAYER EDF WITH SIMPLE AV2 FILE**

A2.1 LLCEDATA-GENERATED REPORTS

Today's Date: 8/ 5/98

LLCE PHYSICAL DATA

Length in Meters
Weight in kg

ID	LLCE Description	Max Diameter	Max Tip to Tip Length	Flange to Tip Length	LLCE Weight	Drawing Number	Part Number	Drawing List	Farms	Waste Container Size	Comment	Time	Date
1	LLCE for Case 2 V&V (5 Tank)	0.08	7.32	5.79	50.00	2	2	Case 2	XX	2	This LLCE is for V&V purposes only.	05:14 PM	8/05/98

Today's Date: 8/ 5/98

LLCE GEOMETRY FACTORS

Length in Meters
Weight in kg

ID	LLCE Description	Max Diameter	Flange to Tip	Drawing Number	Part Number	Start Location	End Location	Isotope	Correction Factor #1	Correction Factor #2	Correction Factor #3	Time	Date
0	LLCE for Case 2 V&V (5 Layer Tank)	0.08	5.79	2	2	0.00	2.29	137CS	1.00	2.00	3.00	04:24 PM	7/28/98
0	LLCE for Case 2 V&V (5 Layer Tank)	0.08	5.79	2	2	2.29	3.89	137CS	3.00	1.00	2.00	05:03 PM	7/28/98
0	LLCE for Case 2 V&V (5 Layer Tank)	0.08	5.79	2	2	3.89	5.79	137CS	2.00	3.00	1.00	05:04 PM	7/28/98

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A2.2 LLCECALC-GENERATED REPORTS

Todays Date: 8/10/98 LLCE CHARACTERIZATION REPORT

Checked by: _____

=====

1.0 INFORMATION FOR THIS LLCE RETRIEVAL

=====

UserName from LLCEDATA: kandle
 Description of LLCE being retrieved : LLCE for Case 2 V&V (5 Layer Tank)
 Drawing number (H-2) of LLCE : 2
 Part number of LLCE : 2
 Waste tank LLCE is retrieved from: 241-XX-102
 Tank riser LLCE is retrieved from : 2
 Waste container number for this LLCE : 2
 Equipment Data File Name (EDF) : E:\Program Files\llcecalc\Verify\c2_5layer.edf
 Gamma Assay Data File Name : E:\Program Files\llcecalc\Verify\c2_5layer.av2
 LLCE mass is 50 kg.
 User did not add any additional mass for the flexible receiver bag or lifting linkage

=====

2.0 RADIONUCLIDE AND CHEMICAL CONTENT OF THE LLCE WASTE:

=====

2.1 Chemicals:

Cyanide = 1.26551 grams
 Lead = 1.17593 grams
 Tungsten = 1.14005 grams
 Silicon = 0.55208 grams
 Mercury = 0.22778 grams

2.2 Radionuclides:

Uranium-233 = 0.00633 curies
 Plutonium-240 = 0.00588 curies
 Thallium-209 = 0.00570 curies
 Radon-222 = 0.00276 curies
 Neptunium-237 = 0.00114 curies
 Cesium-137 = 4.36134e-04 curies (Measured by Gamma Assay System)

=====

3.0 CHECK TO SEE IF SARP LIMITS HAVE BEEN EXCEEDED

=====

Warning - The SARP limit has been exceeded for radionuclide: 237NP
 SARP limit is: 2.96000e-04 Ci
 LLCE waste content is: 0.00114 Ci
 Warning - The SARP limit has been exceeded for radionuclide: 233U
 SARP limit is: 2.58000e-04 Ci
 LLCE waste content is: 0.00633 Ci
 SEP is required for this waste package

=====

4.0 CALCULATE FOR CAT 1 AND CAT 3 LLW

=====

For NRC Calcs: Estimate of Volume based on Mass of LLCE is 0.00638 m³.
 Volume for LLCE waste container: 2 is 6.48500 m³
 Cat 1 sum of fractions is : 0.87953
 Cat 3 sum of fractions is : 0.00429
 NRC Class C sum of fractions is : 1.40372
 Cat 3 non-combustible limit sum of fractions is : 3.00782e-04
 LLCE waste is Category 1, LLMW
 LLCE is NOT suitable for near surface disposal (NRC C Fraction >1)
 Additional safety analysis is not required for near surface disposal. (NonComb Fraction <1)

=====

5.0 TRU WASTE CALCULATION

=====

Read from file C:\LLCE\lcecalc81098\lcecalc.ini Suspect TRU limit = 85 nCi/g
 LLCE waste is TRU-Mixed (TRUM) since TRU fraction >1 (1.40370)

=====

6.0 CALCULATE PE-Ci FOR TRU WASTE

=====

LLCE Pu Curie Content: 0.01335
 LLCE Pu Gram Content: 2.29763
 LLCE PE-Ci Content: 4.20114
 LLCE Does not exceed the 35 PE-Ci limit

=====

7.0 CALCULATE Pu-239 FGE FOR TRU WASTE

=====

LLCE Pu-239 Fissile Gram Equivalent (FGE) Curie content: 0.68120

=====

8.0 CALCULATE ALPHA CURIE CONTENT FOR TRU WASTE

=====

LLCE Alpha curie content: 0.01335

=====

9.0 HEAT GENERATION FROM THE LLCE WASTE PACKAGE

=====

Total heat generated by LLCE waste is: 5.78462e-04 watts.
 Internal volume of container LLCE-2 = 229.01778 ft³
 Heat generation rate for the LLCE waste is 2.52584e-06 watts/ft³
 Heat generation rate doesn't exceed 0.1 watts/ft³

=====

10.0 CALCULATE TRANSPORTATION CATEGORY

=====

A2 fraction sum = 1.55967
LLCE waste package is Type B Quantity.
DE-Ci calculation is required.

=====

11.0 CALCULATE DE-Ci

=====

DE-Ci total for LLCE waste package is: 0.00930 Ci

=====

12.0 CALCULATE HAZARDOUS WASTE CODES

=====

Hazardous waste codes F001-F005 apply to all LLCE.

Waste Code D009 apply to this LLCE waste.
No other Waste codes Apply.

=====

END OF REPORT

=====

**A3.0 CASE NO.3: HISTORICAL DATA CASE: THERMOCOUPLE
PROFILE FROM TANK 241-AZ-101**

A3.1 LLCEDATA-GENERATED REPORTS

Today's Date: 8/ 5/98

LLCE PHYSICAL DATA

Length in Meters
Weight in kg

ID	LLCE Description	Max Diameter	Max Tip to Tip Length	Flange to Tip Length	LLCE Weight	Drawing Number	Part Number	Drawing List	Farms	Waste	Comment	Time	Date
169	Thermocouple, profile	0.28	17.42	16.96	133.81	68339	3	H-2-	AZ	2	Last Retrieved From	06:59 PM	5/07/98
											Risers 13A, 13B,		
											and 13D		

Note: The numbers in the **Layer Cont** column are truncated, where possible, to two decimal places to conserve space. In the printout there are six decimal places. Also, there are slight differences in the text wrap around in the **Data Source** column. This is insignificant.

8/ 5/98

TANK CHARACTERIZATION DATABASE

Tank	Constituent	CAS	Unit Mass	Unit Vol	Layer Cont	Layer Num	Layer Thick m	SpG	Data Source	Time	Date	Type
241-XX-101	Aluminum	7429-90-5	kg	BULK	49000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	08:49 AM	4/29/98	CHEMICAL
241-XX-101	Bismuth	7440-69-9	kg	BULK	35.00	1	0.00	0.00	From Tank 241-AZ-101 - HANFORD DEFINED WASTE MODEL-BASED, Effective Date: 1/31/97 0:00, Expected to be a minor component, , Date	1:02:25 PM	2/5/98	CHEMICAL
241-XX-101	Calcium	7440-70-2	kg	BULK	570.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Carbonate	189	kg	BULK	107000.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Concentration will increase as CO3 is absorbed from the air.	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Chloride	16887-00-6	kg	BULK	640.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Chromium	7440-47-3	kg	BULK	2640.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Fluoride	16984-48-8	kg	BULK	6060.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Hydroxide	HYDROXIDE	kg	BULK	210000.00	1	0.00	0.00	From Tank 241-AZ-101 - CALCULATED BY CHARGE BALANCE, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Iron	7439-89-6	kg	BULK	23400.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Lanthanum	7439-91-0	kg	BULK	890.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Lead	7439-92-1	kg	BULK	455.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Tank heel had high lead concentration, , Date	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Manganese	7439-96-5	kg	BULK	5220.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL

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241-XX-101	Mercury	7439-97-6	kg	BULK	0.26	1	0.00	0.00	From Tank 241-AZ-101 - HANFORD DEFINED WASTE MODEL-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Nickel	7440-02-0	kg	BULK	1360.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Nitrate	14797-55-8	kg	BULK	241500.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Converted to NO2 by ionizing radiation, , Date Released: 8/30	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Nitrite	14797-65-0	kg	BULK	208900.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Phosphate	14265-44-2	kg	BULK	4720.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Not P as PO4, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Potassium	7440-09-7	kg	BULK	15700.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Silicon	7440-21-3	kg	BULK	1380.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Sodium	7440-23-5	kg	BULK	351500.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Strontium	7440-24-6	kg	BULK	117.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Sulfate	14808-79-8	kg	BULK	57500.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Essential material usage was 33 percent higher. Not S as SO	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Total organic carbon	TOC	kg	BULK	6060.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Uranium	7440-61-1	kg	BULK	2460.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Zirconium	7440-67-7	kg	BULK	8240.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	CHEMICAL
241-XX-101	Actinium-227	227AC	CI	BULK	0.001	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Americium- 241	241AM	CI	BULK	22600.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Americium- 243	243AM	CI	BULK	9.98	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL

241-XX-101	Antimony-125	125SB	Cl	BULK	131000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Barium-137 metastable	137mBA	Cl	BULK	6930000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Cadmium-113 metastable	113mCD	Cl	BULK	2120.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Carbon-14	14C	Cl	BULK	0.43	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Sludge layer only., Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Cesium-134	134CS	Cl	BULK	43400.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Cesium-137	137CS	Cl	BULK	7430000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Cobalt-60	60CO	Cl	BULK	4610.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Curium-242	242CM	Cl	BULK	25.40	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Curium-243	243CM	Cl	BULK	4.36	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Curium-244	244CM	Cl	BULK	102.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Europium-152	152EU	Cl	BULK	273.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Europium-154	154EU	Cl	BULK	57600.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Europium-155	155EU	Cl	BULK	71500.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Iodine-129	129I	Cl	BULK	7.10	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Should be considered an upper bound., Date Released: 8/30/97	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Neptunium-237	237NP	Cl	BULK	19.60	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Nickel-59	59NI	Cl	BULK	19.90	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL

241-XX-101	Nickel-63	63Ni	Ci	BULK	2300.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Niobium-93 metastable	93mNB	Ci	BULK	87.40	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Plutonium-238	238PU	Ci	BULK	165.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Plutonium-239	239PU	Ci	BULK	958.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Plutonium-240	240PU	Ci	BULK	272.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Plutonium-241	241PU	Ci	BULK	9990.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Plutonium-242	242PU	Ci	BULK	0.074	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:26 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Protactinium-231	231PA	Ci	BULK	0.0031	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Radium-226	226RA	Ci	BULK	0.00018	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Radium-228	228RA	Ci	BULK	0.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Ruthenium-106	106RU	Ci	BULK	106000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Samarium-151	151SM	Ci	BULK	142000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Selenium-79	79SE	Ci	BULK	41.30	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Strontium-90	90SR	Ci	BULK	6360000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Technetium-99	99TC	Ci	BULK	1100.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Should be considered an upper bound., Date R	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Thorium-229	229TH	Ci	BULK	0.000001	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL

241-XX-101	Thorium-232	232TH	Ci	BULK	0.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Tin-126	126SN	Ci	BULK	65.70	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Tritium	3H	Ci	BULK	4.00	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE-BASED, Effective Date: 1/31/97 0:00, Sludge layer only, , Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Uranium-232	232U	Ci	BULK	0.00046	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE/ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Uranium-233	233U	Ci	BULK	0.00027	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE/ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Uranium-234	234U	Ci	BULK	1.20	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE/ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Uranium-235	235U	Ci	BULK	0.044	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE/ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Uranium-236	236U	Ci	BULK	0.099	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE/ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Uranium-238	238U	Ci	BULK	0.82	1	0.00	0.00	From Tank 241-AZ-101 - SAMPLE/ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:34 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Yttrium-90	90Y	Ci	BULK	6360000.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL
241-XX-101	Zirconium-93	93ZR	Ci	BULK	199.00	1	0.00	0.00	From Tank 241-AZ-101 - ENGINEERING ASSESSMENT-BASED, Effective Date: 1/31/97 0:00, , Date Released: 8/30/97 0:00	1:02:33 PM	2/5/98	RADIOCHEMICAL

Today's Date: 8/ 5/98

LLCE GEOMETRY FACTORSLength in Meters
Weight in Kg

ID	LLCE Description	Max	Flange to	Drawing	Part	Start	End Location	Isotope	Correctio	Correctio	Correctio	Time	Date
169	Thermocouple, profile	0.28	16.96	68339	3	0.00	16.96	137CS	1.48	1.93	1.96	1:18:12 PM	5/21/96

Today's Date: 8/ 5/98

LLCE Status Report

8/5/98 - 05:42 PM:

=====

8/5/98 - 05:42 PM: START OF LLCEDATA PROGRAM RUN

8/5/98 - 05:42 PM:

=====

8/5/98 - 05:42 PM: New Program Run Initiated

8/5/98 - 05:42 PM: Current Program User is: riledo

8/5/98 - 05:42 PM: Main database file LLCEINFO.MDB open

8/5/98 - 05:42 PM: Data changes will NOT be recorded in DBCHANGE.MDB

8/5/98 - 05:42 PM: Data changes to LLCEINFO.MDB will NOT be made

8/5/98 - 05:42 PM: Data changes will be made to (EDF): E:\Program Files\llcecalc\Verify\101az13D.edf

8/5/98 - 05:42 PM: New LLCE Data File E:\Program Files\llcecalc\Verify\101az13D.edf has been created and opened.

8/5/98 - 05:42 PM:

=====

8/5/98 - 05:44 PM: START - Select LLCE for Retrieval and Edit LLCE Physical Data

8/5/98 - 05:44 PM: Thermocouple, profile , H-2-68339, Part No: 3, has been selected for retrieval.

8/5/98 - 05:44 PM: Note all units are in meters and kg.

8/5/98 - 05:44 PM: END - Select LLCE for Retrieval

8/5/98 - 05:44 PM:

=====

8/5/98 - 05:45 PM: START - Select Waste Tank for LLCE Retrieval and Edit Tank Waste Data

8/5/98 - 05:45 PM: Tank 241-XX-101 was selected for Thermocouple, profile retrieval.

8/5/98 - 05:45 PM: Units for tank waste data are consistent

8/5/98 - 05:45 PM: LLCE will be retrieved from riser #13D

8/5/98 - 05:45 PM: END - Tank Waste Data Editing

8/5/98 - 05:45 PM:

=====

8/5/98 - 05:45 PM: START - Select and Edit Geometry Correction Factors for Thermocouple, profile, H-2-68339

8/5/98 - 05:45 PM: END - Select and Edit of Geometry Correction Factors

8/5/98 - 05:45 PM:

=====

8/5/98 - 05:45 PM: START - Complete Equipment Data File (EDF)

8/5/98 - 05:45 PM: Container # 2 data saved to EDF file

8/5/98 - 05:45 PM: Chemical regulatory limits saved to EDF file

8/5/98 - 05:45 PM: Valid gamma isotopes saved to EDF file

8/5/98 - 05:45 PM: Radionuclide limits saved to EDF file

8/5/98 - 05:45 PM: Physical constants are defined for all radionuclides found in tank 241-XX-101

8/5/98 - 05:45 PM: Radionuclide constants written to EDF file

8/5/98 - 05:45 PM: LLCE data file (EDF) completed without errors.

8/5/98 - 05:45 PM: END - Complete Equipment Data File (EDF)

8/5/98 - 05:45 PM:

=====

A3.2 LLCECALC-GENERATED REPORTS

Todays Date: 8/10/98 LLCE CHARACTERIZATION REPORT

Checked by: _____

=====

1.0 INFORMATION FOR THIS LLCE RETRIEVAL

=====

UserName from LLCEDATA: kandle
 Description of LLCE being retrieved : Thermocouple, profile
 Drawing number (H-2) of LLCE : 68339
 Part number of LLCE : 3
 Waste tank LLCE is retrieved from: 241-XX-101
 Tank riser LLCE is retrieved from : 13D
 Waste container number for this LLCE : 2
 Equipment Data File Name (EDF) : E:\Program Files\llcecalc\Verify\T101az13D.edf
 Gamma Assay Data File Name : E:\Program Files\llcecalc\Verify\T101az13d.av2
 LLCE mass is 133.81200 kg.
 User entered additional mass of 6.53174e-07 kg for the flexible receiver bag and lifting linkage.

=====

2.0 RADIONUCLIDE AND CHEMICAL CONTENT OF THE LLCE WASTE:

=====

2.1 Chemicals:

Sodium = 12.50144 grams
 Nitrate = 8.58918 grams
 Hydroxide = 7.46886 grams
 Nitrite = 7.42973 grams
 Carbonate = 3.80556 grams
 Sulfate = 2.04504 grams
 Aluminum = 1.74273 grams
 Iron = 0.83224 grams
 Potassium = 0.55839 grams
 Zirconium = 0.29306 grams
 Total organic carbon = 0.21553 grams
 Fluoride = 0.21553 grams
 Manganese = 0.18565 grams
 Phosphate = 0.16787 grams
 Chromium = 0.09389 grams
 Uranium = 0.08749 grams
 Silicon = 0.04908 grams
 Nickel = 0.04837 grams
 Lanthanum = 0.03165 grams
 Chloride = 0.02276 grams
 Calcium = 0.02027 grams
 Lead = 0.01618 grams
 Strontium = 0.00416 grams
 Bismuth = 0.00124 grams
 Mercury = 9.24716e-06 grams

2.2 Radionuclides:

Cesium-137 = 0.26426 curies (Measured by Gamma Assay System)
 Barium-137 metastable = 0.24647 curies
 Yttrium-90 = 0.22620 curies

Strontium-90 = 0.22620 curies
 Samarium-151 = 0.00505 curies
 Antimony-125 = 0.00466 curies
 Ruthenium-106 = 0.00377 curies
 Europium-155 = 0.00254 curies
 Europium-154 = 0.00205 curies
 Cesium-134 = 0.00154 curies
 Americium-241 = 8.03791e-04 curies
 Plutonium-241 = 3.55304e-04 curies
 Cobalt-60 = 1.63959e-04 curies
 Nickel-63 = 8.18018e-05 curies
 Cadmium-113 metastable = 7.53999e-05 curies
 Technetium-99 = 3.91226e-05 curies
 Plutonium-239 = 3.40722e-05 curies
 Europium-152 = 9.70951e-06 curies
 Plutonium-240 = 9.67395e-06 curies
 Zirconium-93 = 7.07763e-06 curies
 Plutonium-238 = 5.86839e-06 curies
 Curium-244 = 3.62773e-06 curies
 Niobium-93 metastable = 3.10847e-06 curies
 Tin-126 = 2.33669e-06 curies
 Selenium-79 = 1.46888e-06 curies
 Curium-242 = 9.03376e-07 curies
 Nickel-59 = 7.07763e-07 curies
 Neptunium-237 = 6.97093e-07 curies
 Americium-243 = 3.54949e-07 curies
 Iodine-129 = 2.52518e-07 curies
 Curium-243 = 1.55068e-07 curies
 Tritium = 1.42264e-07 curies
 Uranium-234 = 4.26792e-08 curies
 Uranium-238 = 2.91641e-08 curies
 Carbon-14 = 1.52934e-08 curies
 Uranium-236 = 3.52103e-09 curies
 Plutonium-242 = 2.63188e-09 curies
 Uranium-235 = 1.56490e-09 curies
 Protactinium-231 = 1.10255e-10 curies
 Actinium-227 = 3.55660e-11 curies
 Uranium-232 = 1.63604e-11 curies
 Uranium-233 = 9.60282e-12 curies
 Radium-226 = 6.40188e-12 curies
 Thorium-229 = 4.26792e-14 curies
 Thorium-232 = 5.69056e-16 curies
 Radium-228 = 4.62358e-16 curies

=====

3.0 CHECK TO SEE IF SARP LIMITS HAVE BEEN EXCEEDED

=====

Warning - The SARP limit has been exceeded for radionuclide: 242PU

SARP limit is: 1.21000e-09 Ci

LLCE waste content is: 2.63188e-09 Ci

SEP is required for this waste package

=====

4.0 CALCULATE FOR CAT 1 AND CAT 3 LLW

=====

For NRC Calcs: Estimate of Volume based on Mass of LLCE is 0.01707 m³.

Volume for LLCE waste container: 2 is 6.48500 m³

Cat 1 sum of fractions is : 9.65577

Cat 3 sum of fractions is : 1.80871e-04
 NRC Class C sum of fractions is : 0.07111
 Cat 3 non-combustible limit sum of fractions is : 3.29543e-05
 LLCE waste is Category 3, LLMW
 LLCE is suitable for near surface disposal (NRC C Fraction < 0.1)
 Additional safety analysis is not required for near surface disposal. (NonComb Fraction <1)
 =====

5.0 TRU WASTE CALCULATION

=====

Read from file E:\Program Files\lcecalc\lcecalc.ini Suspect TRU limit = 85 nCi/g
 LLCE waste is Low Level Mixed Waste (LLMW) since TRU fraction <1 (0.06387)
 =====

6.0 CALCULATE PE-Ci FOR TRU WASTE

=====

Since LLCE waste is not TRU this calculation is not required.

=====

7.0 CALCULATE Pu-239 FGE FOR TRU WASTE

=====

Since LLCE waste is not TRU this calculation is not required.

=====

8.0 CALCULATE ALPHA CURIE CONTENT FOR TRU WASTE

=====

Since LLCE waste is not TRU this calculation is not required.

=====

9.0 HEAT GENERATION FROM THE LLCE WASTE PACKAGE

=====

Total heat generated by LLCE waste is: 0.00283 watts.
 Internal volume of container LLCE-2 = 229.01778 ft³
 Heat generation rate for the LLCE waste is 1.23722e-05 watts/ft³
 Heat generation rate doesn't exceed 0.1 watts/ft³
 =====

10.0 CALCULATE TRANSPORTATION CATEGORY

=====

A2 fraction sum = 0.30637
 LLCE waste package is Type A Quantity.
 DE-Ci calculation is not required.
 =====

11.0 CALCULATE DE-Ci

=====

DE-Ci calculation is not required since waste package is not a type B waste package.

=====

12.0 CALCULATE HAZARDOUS WASTE CODES

=====

Hazardous waste codes F001-F005 apply to all LLCE.

No other Waste codes Apply.

=====

END OF REPORT

=====

Today's Date: 8/10/98 **LLCE STATUS REPORT**

```

8/10/98 - 05:33 PM: =====
8/10/98 - 05:33 PM: START OF LLCE DATA PROGRAM RUN
8/10/98 - 05:33 PM: =====
8/10/98 - 05:33 PM: New Program Run Initiated
8/10/98 - 05:33 PM: Current Program User is: riledo
8/10/98 - 05:33 PM: Main database file LLCEINFO.MDB open
8/10/98 - 05:33 PM: Data changes will NOT be recorded in DBCHANGE.MDB
8/10/98 - 05:33 PM: Data changes to LLCEINFO.MDB will NOT be made
8/10/98 - 05:33 PM: Data changes will be made to (EDF): E:\Program Files\llcecalc\Verify\t101az13D.edf
8/10/98 - 05:33 PM: New LLCE Data File E:\Program Files\llcecalc\Verify\t101az13D.edf has been created and opened.
8/10/98 - 05:33 PM: =====
8/10/98 - 05:34 PM: START - Select LLCE for Retrieval and Edit LLCE Physical Data
8/10/98 - 05:34 PM: Thermocouple, profile, H-2-68339, Part No: 3, has been selected for retrieval.
8/10/98 - 05:34 PM: Note all units are in meters and kg.
8/10/98 - 05:34 PM: END - Select LLCE for Retrieval
8/10/98 - 05:34 PM: =====
8/10/98 - 05:34 PM: START - Select Waste Tank for LLCE Retrieval and Edit Tank Waste Data
8/10/98 - 05:34 PM: Tank 241-XX-101 was selected for Thermocouple, profile retrieval.
8/10/98 - 05:34 PM: Units for tank waste data are consistent
8/10/98 - 05:34 PM: LLCE will be retrieved from riser #13D
8/10/98 - 05:35 PM: END - Tank Waste Data Editing
8/10/98 - 05:35 PM: =====
8/10/98 - 05:35 PM: START - Select and Edit Geometry Correction Factors for Thermocouple, profile, H-2-68339
8/10/98 - 05:35 PM: END - Select and Edit of Geometry Correction Factors
8/10/98 - 05:35 PM: =====
8/10/98 - 05:35 PM: START - Complete Equipment Data File (EDF)
8/10/98 - 05:35 PM: Container # 2 data saved to EDF file.
8/10/98 - 05:35 PM: Chemical regulatory limits saved to EDF file.
8/10/98 - 05:35 PM: Valid gamma isotopes saved to EDF file.
8/10/98 - 05:35 PM: Radionuclide limits saved to EDF file.
8/10/98 - 05:35 PM: Physical constants are defined for all radionuclides found in tank 241-XX-101.
8/10/98 - 05:35 PM: Radionuclide constants written to EDF file
8/10/98 - 05:35 PM: LLCE data file (EDF) completed without errors
8/10/98 - 05:35 PM: END - Complete Equipment Data File (EDF)
8/10/98 - 05:35 PM: =====
8/10/98 - 05:36 PM: END OF LLCE DATA PROGRAM RUN
8/10/98 - 05:36 PM: =====
8/10/98 - 05:36 PM: =====
8/10/98 - 05:36 PM: START OF LLCE CALC PROGRAM RUN
8/10/98 - 05:36 PM: =====
8/10/98 - 05:38 PM: LLCE Data File Selected: E:\Program Files\llcecalc\Verify\t101az13D.edf
8/10/98 - 05:38 PM: Gamma Assay File Selected: E:\Program Files\llcecalc\Verify\t101az13D.av2
8/10/98 - 05:38 PM: =====
8/10/98 - 05:38 PM: START - Read Gamma Assay Data File - Gamma File Analysis Step 1
8/10/98 - 05:38 PM: =====
8/10/98 - 05:38 PM: Reading Gamma Assay Data File: T101az13d.av2
8/10/98 - 05:38 PM: Gamma File: T101az13d.av2 was successfully read
8/10/98 - 05:38 PM: 1130 data records were read into Table 'RAWDATA'.
8/10/98 - 05:38 PM: END - Read Gamma Assay Data File - Gamma File Analysis Step 1
8/10/98 - 05:38 PM: =====
8/10/98 - 05:38 PM: START - Check and Correct Positions in Gamma Assay Records - Gamma File Analysis Step 2
8/10/98 - 05:38 PM: =====
8/10/98 - 05:38 PM: Converting gamma activity from microcuries to curies in database table GammaData.
8/10/98 - 05:38 PM: Taking absolute value of crane positions in database table GammaData to make sure crane positions are positive.
8/10/98 - 05:38 PM: Max Crane Position (Last crane position during retrieval) = 60085 feet
8/10/98 - 05:38 PM: Since max crane position = 1000 it is assumed that measurements are in thousands of a feet
8/10/98 - 05:38 PM: Correcting GammaData table crane positions units to feet.
8/10/98 - 05:38 PM: Max Crane Position (now): 60.08500 feet
8/10/98 - 05:38 PM: =====
8/10/98 - 05:38 PM: Start - Checking for Zero and Inconsistent Crane Positions in GammaData Database Table.
8/10/98 - 05:38 PM: Note: Crane positions are in feet.
8/10/98 - 05:38 PM: Record: 0808410 positions not uniform. Max: 18.92600 Min: 18.87600 Avg: 18.90100 Set all to Average: 18.90100
8/10/98 - 05:38 PM: Record: 0808530 positions not uniform. Max: 31.04600 Min: 30.99800 Avg: 31.01600 Set all to Average: 31.01600
8/10/98 - 05:38 PM: Record: 0808550 positions not uniform. Max: 31.93000 Min: 31.88100 Avg: 31.90142 Set all to Average: 31.90142
8/10/98 - 05:38 PM: Record: 0808570 positions not uniform. Max: 30.87900 Min: 30.83200 Avg: 30.85550 Set all to Average: 30.85550
8/10/98 - 05:38 PM: Record: 0808580 positions not uniform. Max: 30.09100 Min: 30.03000 Avg: 30.06747 Set all to Average: 30.06747
8/10/98 - 05:38 PM: Record: 0809170 positions not uniform. Max: 44.24600 Min: 44.03800 Avg: 44.13653 Set all to Average: 44.13653
8/10/98 - 05:38 PM: Record: 0809410 positions not uniform. Max: 48.10100 Min: 0 Avg: 48.10100 Set all to Average: 48.10100
8/10/98 - 05:38 PM: Record: 0810140 positions not uniform. Max: 47.18900 Min: 47.13900 Avg: 47.16622 Set all to Average: 47.16622
8/10/98 - 05:38 PM: Record: 0810140 positions not uniform. Max: 57.55900 Min: 57.45500 Avg: 57.48273 Set all to Average: 57.48273
8/10/98 - 05:38 PM: Record: 0810150 positions not uniform. Max: 58.70400 Min: 58.54700 Avg: 58.59933 Set all to Average: 58.59933
8/10/98 - 05:39 PM: Record ID 0809000 reads zero crane position. , Prev: 6.08700, Next: 7.81700, crane position corrected to : 6.95200
8/10/98 - 05:39 PM: Record ID 0809500 reads zero crane position. , Prev: 26.62700, Next: 28.79500, crane position corrected to : 27.71100
8/10/98 - 05:39 PM: Record ID 0810010 reads zero crane position. , Prev: 52.93900, Next: 55.29400, crane position corrected to : 54.11650
8/10/98 - 05:39 PM: End - Checking for Zero and Inconsistent Crane Positions in GammaData Database Table.
8/10/98 - 05:39 PM: END - Check and Correct Positions in Gamma Assay Records - Gamma File Analysis Step 2
8/10/98 - 05:39 PM: =====

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8/10/98 - 05:39 PM: Record ID 0809190 is superseded by Record ID 809210. Deleting Superseded Record ID 0809190
 8/10/98 - 05:39 PM: Record ID 0809180 is superseded by Record ID 809210. Deleting Superseded Record ID 0809180
 8/10/98 - 05:39 PM: Record ID 0809170 is superseded by Record ID 809210. Deleting Superseded Record ID 0809170
 8/10/98 - 05:39 PM: Record ID 809210 is inserted in the middle of record ID 0809160
 8/10/98 - 05:39 PM: Record 0809160 new end position is now 42.15400. Activity in record ID 0809160 has been reduced by 78.02653%
 8/10/98 - 05:39 PM: Record ID 0808590 is superseded by Record ID 809000. Deleting Superseded Record ID 0808590
 8/10/98 - 05:39 PM: Record ID 0808580 is superseded by Record ID 809000. Deleting Superseded Record ID 0808580
 8/10/98 - 05:39 PM: Record ID 0808570 is superseded by Record ID 809000. Deleting Superseded Record ID 0808570
 8/10/98 - 05:39 PM: Record ID 0808550 is superseded by Record ID 809000. Deleting Superseded Record ID 0808550
 8/10/98 - 05:39 PM: Record ID 0808540 is superseded by Record ID 809000. Deleting Superseded Record ID 0808540
 8/10/98 - 05:39 PM: Record ID 0808530 is superseded by Record ID 809000. Deleting Superseded Record ID 0808530
 8/10/98 - 05:39 PM: Record ID 0808520 is inserted in the middle of record ID 0808520
 8/10/98 - 05:39 PM: END - Check and Correct for Superseded Records - Gamma File Analysis Step 4.
 8/10/98 - 05:39 PM: =====
 8/10/98 - 05:39 PM: START - Applying Geometry Correction Factors - Gamma File Analysis Step 5.
 8/10/98 - 05:39 PM: =====
 8/10/98 - 05:39 PM: Beginning crane position is: -0.29317 ft.
 8/10/98 - 05:39 PM: End crane position is: 60.08500 ft.
 8/10/98 - 05:39 PM: Total crane travel is: 60.37817 ft.
 8/10/98 - 05:39 PM: The program user has input that the bottom tip of the LLCE corresponds to the end crane reading
 8/10/98 - 05:39 PM: Start - Changing crane position measurements so zero (0) position represents tip of LLCE.
 8/10/98 - 05:39 PM: Record ID 0807360 (Start, End) was (-0.29317, 0.83300) Now is: (59.25200, 60.37817 ft.)
 8/10/98 - 05:39 PM: Record ID 0807370 (Start, End) was (0.83300, 1.95400) Now is: (58.13100, 59.25200)
 8/10/98 - 05:39 PM: Record ID 0807380 (Start, End) was (1.95400, 3.03100) Now is: (57.05400, 58.13100)
 8/10/98 - 05:39 PM: Record ID 0807390 (Start, End) was (3.03100, 4.05700) Now is: (56.02800, 57.05400)
 8/10/98 - 05:39 PM: Record ID 0807400 (Start, End) was (4.05700, 5.07900) Now is: (55.00800, 56.02800)
 8/10/98 - 05:39 PM: Record ID 0807450 (Start, End) was (5.07900, 6.08700) Now is: (53.99800, 55.00800)
 8/10/98 - 05:39 PM: Record ID 0808000 (Start, End) was (6.08700, 6.95200) Now is: (53.13300, 53.99800)
 8/10/98 - 05:39 PM: Record ID 0808020 (Start, End) was (6.95200, 7.81700) Now is: (52.26800, 53.13300)
 8/10/98 - 05:39 PM: Record ID 0808140 (Start, End) was (9.81383, 10.94000) Now is: (49.14500, 50.27117)
 8/10/98 - 05:39 PM: Record ID 0808260 (Start, End) was (10.94000, 11.18700) Now is: (48.89800, 49.14500)
 8/10/98 - 05:39 PM: Record ID 0808300 (Start, End) was (11.18700, 11.93000) Now is: (48.15500, 48.89800)
 8/10/98 - 05:39 PM: Record ID 0808310 (Start, End) was (11.93000, 13.01100) Now is: (47.07400, 48.15500)
 8/10/98 - 05:39 PM: Record ID 0808330 (Start, End) was (13.01100, 14.13500) Now is: (45.95000, 47.07400)
 8/10/98 - 05:39 PM: Record ID 0808340 (Start, End) was (14.13500, 15.16200) Now is: (44.92300, 45.95000)
 8/10/98 - 05:39 PM: Record ID 0808350 (Start, End) was (15.16200, 16.14100) Now is: (43.94400, 44.92300)
 8/10/98 - 05:39 PM: Record ID 0808360 (Start, End) was (16.14100, 17.50900) Now is: (42.57600, 43.94400)
 8/10/98 - 05:39 PM: Record ID 0808380 (Start, End) was (17.50900, 17.78400) Now is: (42.30100, 42.57600)
 8/10/98 - 05:39 PM: Record ID 0808410 (Start, End) was (17.78400, 18.90100) Now is: (41.18400, 42.30100)
 8/10/98 - 05:39 PM: Record ID 0808420 (Start, End) was (18.90100, 19.99800) Now is: (40.08700, 41.18400)
 8/10/98 - 05:39 PM: Record ID 0808430 (Start, End) was (19.99800, 21.08200) Now is: (39.00300, 40.08700)
 8/10/98 - 05:39 PM: Record ID 0808440 (Start, End) was (21.08200, 22.20300) Now is: (37.88200, 39.00300)
 8/10/98 - 05:39 PM: Record ID 0808450 (Start, End) was (22.20300, 23.33300) Now is: (36.75200, 37.88200)
 8/10/98 - 05:39 PM: Record ID 0808470 (Start, End) was (23.33300, 24.40500) Now is: (35.68800, 36.75200)
 8/10/98 - 05:39 PM: Record ID 0808480 (Start, End) was (24.40500, 25.48900) Now is: (34.59600, 35.68800)
 8/10/98 - 05:39 PM: Record ID 0808490 (Start, End) was (25.48900, 26.62700) Now is: (33.45800, 34.59600)
 8/10/98 - 05:39 PM: Record ID 0808500 (Start, End) was (26.62700, 27.71100) Now is: (32.37400, 33.45800)
 8/10/98 - 05:39 PM: Record ID 0808510 (Start, End) was (27.71100, 28.79500) Now is: (31.29000, 32.37400)
 8/10/98 - 05:39 PM: Record ID 0808520 (Start, End) was (28.79500, 29.47200) Now is: (30.61300, 31.29000)
 8/10/98 - 05:39 PM: Record ID 0809000 (Start, End) was (29.47200, 30.54200) Now is: (29.54300, 30.61300)
 8/10/98 - 05:39 PM: Record ID 0809010 (Start, End) was (30.54200, 31.62000) Now is: (28.46500, 29.54300)
 8/10/98 - 05:39 PM: Record ID 0809020 (Start, End) was (31.62000, 32.72900) Now is: (27.35600, 28.46500)
 8/10/98 - 05:39 PM: Record ID 0809030 (Start, End) was (32.72900, 33.86000) Now is: (26.22500, 27.35600)
 8/10/98 - 05:39 PM: Record ID 0809040 (Start, End) was (33.86000, 35.02900) Now is: (25.05600, 26.22500)
 8/10/98 - 05:39 PM: Record ID 0809080 (Start, End) was (35.02900, 35.29900) Now is: (24.78800, 25.05600)
 8/10/98 - 05:39 PM: Record ID 0809090 (Start, End) was (35.29900, 35.92400) Now is: (24.16100, 24.78800)
 8/10/98 - 05:39 PM: Record ID 0809100 (Start, End) was (35.92400, 37.16800) Now is: (22.91700, 24.16100)
 8/10/98 - 05:39 PM: Record ID 0809110 (Start, End) was (37.16800, 38.32200) Now is: (21.76300, 22.91700)
 8/10/98 - 05:39 PM: Record ID 0809120 (Start, End) was (38.32200, 39.62700) Now is: (20.58800, 21.76300)
 8/10/98 - 05:39 PM: Record ID 0809140 (Start, End) was (39.62700, 40.73700) Now is: (19.34800, 20.58800)
 8/10/98 - 05:39 PM: Record ID 0809150 (Start, End) was (40.73700, 41.88900) Now is: (18.19600, 19.34800)
 8/10/98 - 05:39 PM: Record ID 0809160 (Start, End) was (41.88900, 42.15400) Now is: (17.93100, 18.19600)
 8/10/98 - 05:39 PM: Record ID 0809210 (Start, End) was (42.15400, 42.27700) Now is: (17.80800, 17.93100)
 8/10/98 - 05:39 PM: Record ID 0809320 (Start, End) was (42.27700, 43.27400) Now is: (16.81100, 17.80800)
 8/10/98 - 05:39 PM: Record ID 0809330 (Start, End) was (43.27400, 44.37700) Now is: (15.70800, 16.81100)
 8/10/98 - 05:39 PM: Record ID 0809450 (Start, End) was (44.37700, 45.60300) Now is: (14.48200, 15.70800)
 8/10/98 - 05:39 PM: Record ID 0809460 (Start, End) was (45.60300, 48.72300) Now is: (13.36200, 14.48200)
 8/10/98 - 05:39 PM: Record ID 0809480 (Start, End) was (48.72300, 47.01800) Now is: (13.06700, 13.36200)
 8/10/98 - 05:39 PM: Record ID 0809490 (Start, End) was (47.01800, 47.88500) Now is: (12.40000, 13.06700)
 8/10/98 - 05:39 PM: Record ID 0809550 (Start, End) was (47.88500, 48.17600) Now is: (11.50600, 12.40000)
 8/10/98 - 05:39 PM: Record ID 0809560 (Start, End) was (48.17600, 49.37800) Now is: (10.70600, 11.50600)
 8/10/98 - 05:39 PM: Record ID 0809570 (Start, End) was (49.37900, 50.53500) Now is: (9.95000, 10.70600)
 8/10/98 - 05:39 PM: Record ID 0809580 (Start, End) was (50.53500, 51.73000) Now is: (8.35500, 9.95000)
 8/10/98 - 05:39 PM: Record ID 0809590 (Start, End) was (51.73000, 52.93800) Now is: (7.14600, 8.35500)
 8/10/98 - 05:39 PM: Record ID 0810010 (Start, End) was (52.93900, 54.11650) Now is: (5.98950, 7.14600)
 8/10/98 - 05:39 PM: Record ID 0810020 (Start, End) was (54.11650, 55.14700) Now is: (4.93800, 5.98950)
 8/10/98 - 05:39 PM: Record ID 0810130 (Start, End) was (55.14700, 58.34500) Now is: (3.74000, 4.93800)
 8/10/98 - 05:39 PM: Record ID 0810140 (Start, End) was (56.34500, 57.48273) Now is: (2.60227, 3.74000)

8/10/98 - 05:39 PM: Record ID 0810150 (Start, End) was (57.48273, 58.59933) Now is: (1.48567, 2.60227).

8/10/98 - 05:39 PM: Record ID 0810170 (Start, End) was (58.95883, 60.08500) Now is: (0, 1.12617).

8/10/98 - 05:39 PM: End - Changing crane position measurements so zero (0) position represents tip of LLCE.

8/10/98 - 05:39 PM:

8/10/98 - 05:39 PM: Start - Discarding any gamma assay records that are below LLCE tip or above mounting flange.

8/10/98 - 05:39 PM: Removing Record ID 0807360 because it's position is above mounting flange of LLCE

8/10/98 - 05:39 PM: Removing Record ID 0807370 because it's position is above mounting flange of LLCE

8/10/98 - 05:39 PM: Removing Record ID 0807380 because it's position is above mounting flange of LLCE

8/10/98 - 05:39 PM: Removing Record ID 0807390 because it's position is above mounting flange of LLCE

8/10/98 - 05:39 PM: Mounting flange falls within start and end position of record ID # 0807400

8/10/98 - 05:39 PM: Activity of record ID 0807400 has been reduced by 37.37769%

8/10/98 - 05:39 PM: End point of record ID 0807400 has been changed to 55.646 ft.

8/10/98 - 05:39 PM: End - Discarding any gamma assay records that are below LLCE tip or above mounting flange.

8/10/98 - 05:39 PM:

8/10/98 - 05:39 PM: Start - Add missing gamma assay records at tip or mounting flange of LLCE

8/10/98 - 05:39 PM: End - Add missing gamma assay records at tip or mounting flange of LLCE

8/10/98 - 05:39 PM:

8/10/98 - 05:39 PM: Start - Read Geometry Correction Factors for LLCE

8/10/98 - 05:39 PM: Geometry correction factors read at end location 16.96090 meters: Geom Cor1: 1.481, Geom Cor2: 1.934, Geom Cor3: 1.957

8/10/98 - 05:39 PM: End - Read Geometry Correction Factors for LLCE

8/10/98 - 05:39 PM:

8/10/98 - 05:39 PM: Start - Apply correction factors to Cs-137 data Records

8/10/98 - 05:39 PM: Correcting 137CS, record 08101070, for Detector # 2 Was: 4.71100e-05 Now: 9.1107e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101070, for Detector # 3 Was: 1.98500e-09 Now: 3.88464e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101050, for Detector # 1 Was: 7.97600e-04 Now: 0.00118 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101050, for Detector # 3 Was: 5.70600e-10 Now: 1.1666e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101040, for Detector # 1 Was: 0.00104 Now: 0.00155 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101040, for Detector # 2 Was: 2.49900e-05 Now: 4.83307e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101040, for Detector # 3 Was: 7.65600e-10 Now: 1.49828e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101030, for Detector # 1 Was: 0.00107 Now: 0.00158 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101030, for Detector # 2 Was: 2.49400e-05 Now: 4.82340e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 08101030, for Detector # 3 Was: 8.25000e-10 Now: 1.61453e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0810020, for Detector # 1 Was: 8.6785e-04 Now: 0.00129 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0810020, for Detector # 3 Was: 7.18500e-10 Now: 1.40612e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0810010, for Detector # 1 Was: 9.39100e-05 Now: 1.39081e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0810010, for Detector # 3 Was: 7.36900e-10 Now: 1.4421e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809590, for Detector # 2 Was: 1.70700e-04 Now: 3.30134e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809590, for Detector # 3 Was: 5.04800e-09 Now: 9.87894e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809580, for Detector # 2 Was: 1.27000e-04 Now: 2.45618e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809580, for Detector # 3 Was: 4.43600e-09 Now: 8.68125e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809570, for Detector # 2 Was: 4.11400e-05 Now: 7.95648e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809570, for Detector # 3 Was: 1.36400e-09 Now: 2.66935e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809560, for Detector # 2 Was: 6.02900e-04 Now: 0.00117 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809560, for Detector # 3 Was: 1.39500e-08 Now: 2.73002e-08 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809550, for Detector # 2 Was: 6.42600e-04 Now: 0.00124 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809550, for Detector # 3 Was: 2.51200e-08 Now: 4.91598e-08 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809490, for Detector # 2 Was: 4.46988e-04 Now: 8.64474e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809490, for Detector # 3 Was: 1.14696e-08 Now: 2.24461e-08 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809480, for Detector # 3 Was: 3.93500e-09 Now: 7.70080e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809460, for Detector # 2 Was: 1.76900e-04 Now: 3.42125e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809460, for Detector # 3 Was: 6.89600e-09 Now: 1.34955e-08 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809450, for Detector # 2 Was: 2.85300e-05 Now: 5.51770e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809450, for Detector # 3 Was: 1.08800e-09 Now: 2.12530e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809330, for Detector # 1 Was: 0.00118 Now: 0.00172 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809330, for Detector # 2 Was: 2.25455e-05 Now: 4.36031e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809330, for Detector # 3 Was: 9.8487e-10 Now: 1.88785e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809320, for Detector # 3 Was: 1.26800e-09 Now: 2.48148e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809210, for Detector # 1 Was: 5.14713e-04 Now: 7.62290e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809210, for Detector # 2 Was: 8.94545e-06 Now: 1.73005e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809210, for Detector # 3 Was: 4.39236e-10 Now: 8.59584e-10 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809160, for Detector # 2 Was: 5.67794e-06 Now: 1.09811e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809160, for Detector # 3 Was: 2.68735e-10 Now: 5.25915e-10 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809150, for Detector # 1 Was: 0.00161 Now: 0.00238 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809150, for Detector # 2 Was: 3.24400e-05 Now: 6.27390e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809150, for Detector # 3 Was: 1.25200e-09 Now: 2.45016e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809140, for Detector # 1 Was: 0.00171 Now: 0.00253 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809140, for Detector # 2 Was: 4.09200e-05 Now: 7.91593e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809120, for Detector # 3 Was: 1.45600e-09 Now: 2.84939e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809120, for Detector # 1 Was: 0.00135 Now: 0.00200 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809120, for Detector # 2 Was: 2.88800e-05 Now: 5.58539e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809120, for Detector # 3 Was: 1.11700e-09 Now: 2.18597e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809110, for Detector # 1 Was: 0.00167 Now: 0.00248 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809110, for Detector # 2 Was: 3.95800e-05 Now: 7.65090e-05 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809110, for Detector # 3 Was: 1.39800e-09 Now: 2.73589e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809100, for Detector # 3 Was: 1.12800e-09 Now: 2.20750e-09 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809090, for Detector # 2 Was: 1.53100e-04 Now: 2.96095e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809090, for Detector # 3 Was: 6.89100e-09 Now: 1.30948e-08 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809080, for Detector # 2 Was: 2.24800e-04 Now: 4.34375e-04 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809080, for Detector # 3 Was: 3.95500e-08 Now: 2.06464e-08 curies

8/10/98 - 05:39 PM: Correcting 137CS, record 0809040, for Detector # 2 Was: 2.36800e-04 Now: 4.57971e-04 curies

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8/10/98 - 05:39 PM: Correcting 137CS, record 0809040, for Detector # 3 Was: 9.81400e-09 Now: 1.92060e-08 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809030, for Detector # 2 Was: 5.11500e-04 Now: 8.98241e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809030, for Detector # 3 Was: 1.48100e-08 Now: 2.89832e-08 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809020, for Detector # 2 Was: 1.88800e-04 Now: 3.26459e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809020, for Detector # 3 Was: 5.81500e-09 Now: 1.13800e-08 curies
8/12/98 - 05:39 PM: Correcting 137CS, record 0809010, for Detector # 2 Was: 8.14800e-05 Now: 1.57582e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809010, for Detector # 3 Was: 3.89600e-09 Now: 7.23307e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809000, for Detector # 1 Was: 0.00170 Now: 0.00252 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809000, for Detector # 2 Was: 3.97600e-05 Now: 7.68959e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0809000, for Detector # 3 Was: 1.52900e-09 Now: 2.99225e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808520, for Detector # 1 Was: 8.64689e-04 Now: 0.00128 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808520, for Detector # 2 Was: 1.90880e-05 Now: 3.67830e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808520, for Detector # 3 Was: 7.90333e-10 Now: 1.54689e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808510, for Detector # 1 Was: 0.00119 Now: 0.00178 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808510, for Detector # 2 Was: 2.05100e-05 Now: 3.96683e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808510, for Detector # 3 Was: 1.12900e-09 Now: 2.20945e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808500, for Detector # 1 Was: 0.00206 Now: 0.00305 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808500, for Detector # 2 Was: 4.83800e-05 Now: 9.35659e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808500, for Detector # 3 Was: 1.87500e-09 Now: 3.66937e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808490, for Detector # 2 Was: 5.99900e-05 Now: 1.16021e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808490, for Detector # 3 Was: 2.22800e-09 Now: 4.35628e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808480, for Detector # 1 Was: 0.00182 Now: 0.00270 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808480, for Detector # 2 Was: 3.24300e-05 Now: 6.27196e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808490, for Detector # 3 Was: 1.52500e-09 Now: 2.98443e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808470, for Detector # 1 Was: 7.84700e-04 Now: 0.00116 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808470, for Detector # 2 Was: 1.84700e-05 Now: 3.57210e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808470, for Detector # 3 Was: 8.93700e-10 Now: 1.74897e-09 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808450, for Detector # 1 Was: 2.09200e-04 Now: 3.09825e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808450, for Detector # 2 Was: 3.65800e-06 Now: 7.07457e-06 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808450, for Detector # 3 Was: 1.54200e-10 Now: 3.01769e-10 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808440, for Detector # 1 Was: 9.69200e-05 Now: 1.43539e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808440, for Detector # 3 Was: 7.37200e-11 Now: 1.44270e-10 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808430, for Detector # 1 Was: 6.82000e-05 Now: 1.01004e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808430, for Detector # 3 Was: 5.04400e-11 Now: 9.87111e-11 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808420, for Detector # 1 Was: 4.92800e-05 Now: 7.29873e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808410, for Detector # 3 Was: 4.59200e-11 Now: 8.86544e-11 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808410, for Detector # 1 Was: 4.97300e-05 Now: 7.36501e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808400, for Detector # 3 Was: 3.67400e-11 Now: 7.19002e-11 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808380, for Detector # 1 Was: 5.39800e-05 Now: 7.99444e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808380, for Detector # 3 Was: 7.38800e-11 Now: 1.44583e-10 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808360, for Detector # 1 Was: 3.52900e-05 Now: 5.22645e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808360, for Detector # 3 Was: 2.84300e-11 Now: 5.56375e-11 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808350, for Detector # 1 Was: 9.17200e-06 Now: 1.35837e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808340, for Detector # 1 Was: 1.55800e-05 Now: 2.30740e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808330, for Detector # 1 Was: 3.72400e-05 Now: 5.51524e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808310, for Detector # 1 Was: 4.47100e-05 Now: 6.62155e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808310, for Detector # 3 Was: 5.82700e-11 Now: 1.10120e-10 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808300, for Detector # 1 Was: 2.59300e-05 Now: 3.84023e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808260, for Detector # 3 Was: 3.73300e-11 Now: 7.30548e-11 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808260, for Detector # 1 Was: 2.19800e-05 Now: 3.25524e-05 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808140, for Detector # 1 Was: 2.24200e-11 Now: 4.38759e-11 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808140, for Detector # 3 Was: 1.14800e-04 Now: 1.70019e-04 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808140, for Detector # 1 Was: 1.75300e-10 Now: 3.43062e-10 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808020, for Detector # 1 Was: -1.11500e-07 Now: -1.65132e-07 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0808000, for Detector # 1 Was: -1.07000e-07 Now: -1.58467e-07 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0807450, for Detector # 1 Was: -8.66700e-08 Now: -1.28358e-07 curies
8/10/98 - 05:39 PM: Correcting 137CS, record 0807400, for Detector # 1 Was: -7.29550e-08 Now: -1.08046e-07 curies
8/10/98 - 05:39 PM: End - Apply correction factors to Cs-137 Data Records
8/10/98 - 05:39 PM: END - Applying Geometry Correction Factors - Gamma File Analysis Step 5.
=====
8/10/98 - 05:39 PM: START - Applying Detector Shielding Correction Factors for Cs-137 - Gamma File Analysis Step 6.
=====
8/10/98 - 05:39 PM: Program default correction factors are: Det 1 = 1.0, Det 2 = 1.165, Det 3 = 2.491+E07
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: Start - Estimate Shielding Correction Factors for Detectors 2 and 3
8/10/98 - 05:39 PM: Data records where found for: Detector 1, Detector 2, Detector 3
8/10/98 - 05:39 PM: Detector 2 shielding correction factor estimated to be 36.68767
8/10/98 - 05:39 PM: Detector 3 shielding correction factor estimated to be 8.27246e+05
8/10/98 - 05:39 PM: End - Estimate Shielding Correction Factors for Detectors 2 and 3
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: The following correction factors were read from E:\Program Files\lccalc\lccalc.ini.
8/10/98 - 05:39 PM: - No Factors were read from INI file
8/10/98 - 05:39 PM: Corrections factors read from the INI file will supersede program defaults and program estimates for correction factors.
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: Shielding correction factor will be 1 For Detector #1
8/10/98 - 05:39 PM: Shielding correction factor will be 36.68767 For Detector #2
8/10/98 - 05:39 PM: Shielding correction factor will be 8.27246e+05 For Detector #3
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: Start - Applying Shielding Correction Factors to Cs-137 Data Records
8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0808450, Was: 7.07457e-06 Now: 2.59505e-04

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8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0808470, Was: 3.57210e-05 Now: 0.00131
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0808480, Was: 6.27196e-05 Now: 0.00230
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0808490, Was: 1.16021e-04 Now: 0.00426
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0808500, Was: 9.35689e-05 Now: 0.00343
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0808510, Was: 3.96653e-05 Now: 0.00146
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0808520, Was: 3.67630e-05 Now: 0.00135
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809000, Was: 7.68958e-05 Now: 0.00282
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809010, Was: 1.57582e-04 Now: 0.00578
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809020, Was: 3.26459e-04 Now: 0.01198
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809030, Was: 9.89241e-04 Now: 0.03629
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809040, Was: 4.57971e-04 Now: 0.01680
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809080, Was: 4.34376e-04 Now: 0.01594
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809090, Was: 2.96095e-04 Now: 0.01098
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809110, Was: 7.65090e-05 Now: 0.00281
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809120, Was: 5.58539e-05 Now: 0.00205
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809140, Was: 7.91393e-05 Now: 0.00290
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809150, Was: 6.27390e-05 Now: 0.00230
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809160, Was: 1.09811e-05 Now: 4.02873e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809210, Was: 1.73005e-05 Now: 6.34715e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809330, Was: 4.36031e-05 Now: 0.00160
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809450, Was: 5.51770e-05 Now: 0.00202
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809460, Was: 3.42125e-04 Now: 0.01255
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809490, Was: 8.64474e-04 Now: 0.03172
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809550, Was: 0.00124 Now: 0.04560
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809560, Was: 0.00117 Now: 0.04278
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809570, Was: 7.95648e-05 Now: 0.00292
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809580, Was: 2.45618e-04 Now: 0.00901
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0809590, Was: 3.30134e-04 Now: 0.01211
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0810130, Was: 4.62340e-05 Now: 0.00177
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0810140, Was: 4.83307e-05 Now: 0.00177
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #2, Record ID: 0810170, Was: 9.11107e-05 Now: 0.00334
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808140, Was: 3.43062e-10 Now: 2.83797e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808260, Was: 4.38759e-11 Now: 3.62962e-05
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808300, Was: 7.30548e-11 Now: 6.04343e-05
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808310, Was: 1.10120e-10 Now: 9.10968e-05
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808360, Was: 5.56375e-11 Now: 4.60259e-05
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808380, Was: 1.44583e-10 Now: 1.19608e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808410, Was: 7.19002e-11 Now: 5.94791e-05
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808420, Was: 8.98654e-11 Now: 7.44308e-05
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808430, Was: 9.87111e-11 Now: 8.16583e-05
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808440, Was: 1.44270e-10 Now: 1.19347e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808450, Was: 3.01769e-10 Now: 2.49638e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808470, Was: 1.74897e-09 Now: 0.00145
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808480, Was: 2.98443e-09 Now: 0.00247
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808490, Was: 4.35628e-09 Now: 0.00360
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808500, Was: 3.66837e-09 Now: 0.00304
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808510, Was: 2.20945e-09 Now: 0.00183
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0808520, Was: 1.54666e-09 Now: 0.00128
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809000, Was: 2.99225e-09 Now: 0.00248
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809010, Was: 7.23307e-09 Now: 0.00598
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809020, Was: 1.13800e-08 Now: 0.00941
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809030, Was: 2.89832e-08 Now: 0.02398
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809040, Was: 1.92060e-08 Now: 0.01589
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809080, Was: 2.06446e-08 Now: 0.01708
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809090, Was: 1.30943e-08 Now: 0.01083
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809160, Was: 2.20750e-09 Now: 0.00183
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809110, Was: 2.73589e-09 Now: 0.00226
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809120, Was: 2.18597e-09 Now: 0.00181
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809140, Was: 2.84939e-09 Now: 0.00236
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809150, Was: 2.45016e-09 Now: 0.00203
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809160, Was: 5.25915e-10 Now: 4.35061e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809210, Was: 8.59584e-10 Now: 7.11088e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809320, Was: 2.48148e-09 Now: 0.00205
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809330, Was: 1.88785e-09 Now: 0.00158
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809450, Was: 2.12530e-09 Now: 0.00176
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809460, Was: 1.34855e-08 Now: 0.01116
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809480, Was: 7.70080e-09 Now: 0.00637
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809490, Was: 2.24461e-08 Now: 0.01857
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809550, Was: 4.91598e-08 Now: 0.04067
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809560, Was: 2.73002e-08 Now: 0.02258
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809570, Was: 2.66935e-09 Now: 0.00221
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809580, Was: 8.68125e-09 Now: 0.00718
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0809590, Was: 9.87894e-09 Now: 0.00817
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0810010, Was: 1.44211e-09 Now: 0.00119
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0810020, Was: 1.40612e-09 Now: 0.00116
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0810130, Was: 1.61453e-09 Now: 0.00134
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0810140, Was: 1.49828e-09 Now: 0.00124
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0810150, Was: 1.11658e-09 Now: 9.23756e-04
 8/10/98 - 05:39 PM: Correcting 137Cs for Detector #3, Record ID: 0810170, Was: 3.88464e-09 Now: 0.00321
 8/10/98 - 05:39 PM: END - Applying Detector Shielding Correction Factors for Cs-137 - Gamma File Analysis Step 6.

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8/10/98 - 05:39 PM: =====
8/10/98 - 05:39 PM: START - Check and Correct Gaps in Cs-137 Measurements - Gamma File Analysis Step 7.
8/10/98 - 05:39 PM: =====
8/10/98 - 05:39 PM: Reading Cs-137 Data from GammaData database table and storing activity per unit length in Positions database table (Ci/ft).
8/10/98 - 05:39 PM: Converting < 0 value to 0 for Record 0808020 Detector #1
8/10/98 - 05:39 PM: Converting < 0 value to 0 for Record 0808000 Detector #1
8/10/98 - 05:39 PM: Converting < 0 value to 0 for Record 0807450 Detector #1
8/10/98 - 05:39 PM: Converting < 0 value to 0 for Record 0807400 Detector #1
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: Start - Create new blank records where there are gaps in measurements
8/10/98 - 05:39 PM: Gap found, creating new record: 0810153 Start: 1.12617 End: 1.48567
8/10/98 - 05:39 PM: Gap found, creating new record: 0808023 Start: 50.27117 End: 52.26800
8/10/98 - 05:39 PM: End - Create new blank records where there are gaps in measurements
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: Start - Identify all Gaps in Cs-137 activity, and combine all adjacent data records that have no Cs-137 Activity
8/10/98 - 05:39 PM: Gap found at Record 0810153 Start: 1.12617 End: 1.48567
8/10/98 - 05:39 PM: Gap found at Record 0808023 Start: 50.27117 End: 52.26800
8/10/98 - 05:39 PM: Gap found at Record 0808020 Start: 52.26800 End: 53.13300
8/10/98 - 05:39 PM: Gap found at Record 0808000 Start: 53.13300 End: 53.98800
8/10/98 - 05:39 PM: Gap found at Record 0807450 Start: 53.98800 End: 55.00600
8/10/98 - 05:39 PM: Gap found at Record 0807400 Start: 55.00600 End: 55.64600
8/10/98 - 05:39 PM: Record ID 0808020 to be combined with record 0808023 deleting record ID0808020
8/10/98 - 05:39 PM: Record ID 0809000 to be combined with record 0808023 deleting record ID0809000
8/10/98 - 05:39 PM: Record ID 0807450 to be combined with record 0808023 deleting record ID0807450
8/10/98 - 05:39 PM: Record ID 0807400 to be combined with record 0808023 deleting record ID0807400
8/10/98 - 05:39 PM: End - Identify all Gaps in Cs-137 activity, and combine all adjacent data records that have no Cs-137 Activity
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: Start - Enter missing gamma assay data for gaps
8/10/98 - 05:39 PM: Program user selected to let program estimate Cs-137 activity for record ID 0810153 (start, end) = (1.12617, 1.48567).
8/10/98 - 05:39 PM: Program estimates Cs-137 activity for record ID 0810153 to be 0.00194 Ci/ft.
8/10/98 - 05:39 PM: Program user selected to let program estimate Cs-137 activity for record ID 0808023 (start, end) = (50.27117, 55.64600).
8/10/98 - 05:39 PM: Program estimates Cs-137 activity for record ID 0808023 to be 2.52002e-04 Ci/ft.
8/10/98 - 05:39 PM: End - Enter missing gamma assay data for gaps
8/10/98 - 05:39 PM:
8/10/98 - 05:39 PM: END - Check and Correct Gaps in Cs-137 Measurements - Gamma File Analysis Step 7.
8/10/98 - 05:39 PM: =====
8/10/98 - 05:39 PM: START - Assigning Assay Records To Tank Waste Layer - Gamma File Analysis Step 8.
8/10/98 - 05:39 PM: =====
8/10/98 - 05:39 PM: All data records are in tank waste layer 1.
8/10/98 - 05:39 PM: END - Assigning Assay Records To Tank Waste Layer - Gamma File Analysis Step 8.
8/10/98 - 05:39 PM: =====
8/10/98 - 05:39 PM: START - Calculating Measured Curie Content For LLCE - Gamma File Analysis Step 9.
8/10/98 - 05:39 PM: =====
8/10/98 - 05:39 PM: 137CS content Layer 1 = 0.26426 curies.
8/10/98 - 05:39 PM: Cs-137 content for all tank waste layers = 0.26426 Ci.
8/10/98 - 05:39 PM: END - Calculating Measured Curie Content For LLCE - Gamma File Analysis Step 9.
8/10/98 - 05:39 PM: =====
8/10/98 - 05:41 PM: START - Analysis of LLCE Waste Characterization - Step 1
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Get total LLCE mass
8/10/98 - 05:41 PM: LLCE mass is 133.81200 kg.
8/10/98 - 05:41 PM: User entered additional mass of 6.53174e-07 kg for the flexible receiver bag and lifting linkage.
8/10/98 - 05:41 PM: END - Get total LLCE mass
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate Radiochemical/Chemical Content of LLCE Waste - Step 2
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: Converting mass units to grams and curies
8/10/98 - 05:41 PM: Estimating the content of each radiochemical/chemical in LLCE waste
8/10/98 - 05:41 PM: END - Calculate Radiochemical/Chemical Content of LLCE Waste
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate to see if SARP Limits are exceeded. - Step 3
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: SARP Limit exceeded for: 242PU SARP Limit: 1.21000e-09 LLCE Waste Content: 2.63188e-09 Ci.
8/10/98 - 05:41 PM: SEP is required for this waste package
8/10/98 - 05:41 PM: END - Calculate to see if SARP Limits are exceeded.
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate for Cat 1 and Cat 3 LLW - Step 4
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: For NRC Calcs: Estimate of Volume based on Mass of LLCE is 0.01707 m^3.
8/10/98 - 05:41 PM: Volume for LLCE waste container: 2 is 6.48500 m^3
8/10/98 - 05:41 PM: Cat 1 sum of fractions is : 9.85577
8/10/98 - 05:41 PM: Cat 3 sum of fractions is : 1.80871e-04
8/10/98 - 05:41 PM: NRC Class C sum of fractions is : 0.07111
8/10/98 - 05:41 PM: Cat 3 non-combustible limit sum of fractions is : 3.29543e-05
8/10/98 - 05:41 PM: LLCE waste is Category 3, LLW
8/10/98 - 05:41 PM: LLCE is suitable for near surface disposal (NRC C Fraction < 0.1)
8/10/98 - 05:41 PM: Additional safety analysis is not required for near surface disposal. (NonComb Fraction <1)
8/10/98 - 05:41 PM: END - Calculate for Cat 1 and Cat 3 LLW
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate for TRU - Step 5

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8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: Read from file C:\LLCE\llcecalc\81098\llcecalc.ini Suspect TRU limit = 85 nCi/g
8/10/98 - 05:41 PM: LLCE waste is Low Level Mixed Waste (LLMW) since TRU fraction <1 (0.06387)
8/10/98 - 05:41 PM: END - Calculate for TRU
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate PE-Ci for TRU waste - Step 6
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: Since LLCE waste is not TRU this calculation is not required.
8/10/98 - 05:41 PM: END - Calculate PE-Ci for TRU waste
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate Pu-239 FGE for TRU waste - Step 7
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: Since LLCE waste is not TRU this calculation is not required.
8/10/98 - 05:41 PM: END - Calculate Pu-239 FGE for TRU waste
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate Alpha Curie Content for TRU waste - Step 8
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: Since LLCE waste is not TRU this calculation is not required.
8/10/98 - 05:41 PM: END - Calculate Alpha Curie Content for TRU waste
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate heat generation rate of LLCE waste package - Step 9
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: Total heat generated by LLCE waste is: 0.00283 watts.
8/10/98 - 05:41 PM: Internal volume of container LLCE-2 = 229.01778 ft^3
8/10/98 - 05:41 PM: Heat generation rate for the LLCE waste is 1.23722e-05 watts/ft^3
8/10/98 - 05:41 PM: Heat generation rate doesn't exceed 0.1 watts/ft^3
8/10/98 - 05:41 PM: END - Calculate heat generation rate of LLCE waste package
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate Transportation Category - Step 10
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: A2 fraction sum = 0.30637
8/10/98 - 05:41 PM: LLCE waste package is Type A Quantity.
8/10/98 - 05:41 PM: DE-Ci calculation is not required.
8/10/98 - 05:41 PM: END - Calculate Transportation Category
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate DE-Ci - Step 11
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: DE-Ci calculation is not required since waste package is not a type B waste package.
8/10/98 - 05:41 PM: END - Calculate DE-Ci
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: START - Calculate Hazardous Waste Codes - Step 12
8/10/98 - 05:41 PM: =====
8/10/98 - 05:41 PM: Hazardous waste codes F001-F005 apply to all LLCE.
8/10/98 - 05:41 PM:
8/10/98 - 05:41 PM: Concentration of Chromium, D007 is: 0.70169 mg/kg.
8/10/98 - 05:41 PM: 20 * TCLP limit for Chromium is: 100 mg/kg.
8/10/98 - 05:41 PM: Waste Code D007 does not apply to this LLCE waste.
8/10/98 - 05:41 PM:
8/10/98 - 05:41 PM: Concentration of Lead, D008 is: 0.12093 mg/kg.
8/10/98 - 05:41 PM: 20 * TCLP limit for Lead is: 100 mg/kg.
8/10/98 - 05:41 PM: Waste Code D008 does not apply to this LLCE waste.
8/10/98 - 05:41 PM:
8/10/98 - 05:41 PM: Concentration of Mercury, D009 is: 6.91056e-05 mg/kg.
8/10/98 - 05:41 PM: 20 * TCLP limit for Mercury is: 4 mg/kg.
8/10/98 - 05:41 PM: Waste Code D009 does not apply to this LLCE waste.
8/10/98 - 05:41 PM:
8/10/98 - 05:41 PM: No other Waste codes Apply.
8/10/98 - 05:41 PM: END - Calculate Hazardous Waste Codes
8/10/98 - 05:41 PM: =====

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APPENDIX B
ERROR AND WARNING MESSAGES FOR LLCEDATA

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
MDIForm:QueryUnload	Error occurred when trying to clean up and compact the main database file LLCEINFO.MDB. Changes to data can be saved if the user manually re-compresses LLCEINFO.MDB to LLCEINFO.BIN.	When LLCEDATA exits, and the program user has administrative privileges, i.e., the code custodian, the main database is compacted to remove deleted records. If error occurs during compaction, this message is displayed.
modFiles:OpenFiles modMain:CheckFileSize	File Was Not Selected.	Occurs when program user exits file dialog box with-out making selection or when cancel is selected in file dialog box.
modFiles:OpenFiles	[FileName] This file already exists. Overwrite existing file?	Where [Filename] is the EDF file selected or entered in a file dialog box. Warns user if 'NEW' file option selects an existing file.
modFiles:OpenFiles	[FileName] is not an existing file.	Where [Filename] is the EDF file selected or entered in a file dialog box. This message is displayed if user-entered path and name does not exist.
modFiles:OpenFiles	LLCE Data File: [FileName] is corrupt or not a valid LLCE Data File.	Where [Filename] is the EDF file selected or entered in a file dialog box. This message is displayed if file is not recognized as a EDF file.
modMain:StartWaste	Tank [Tank] is currently selected in LLCE data file: [FileName]. WARNING — Current tank data will be lost if you select yes! Do you wish to select another waste tank?	Where [Tank] is the name of the waste tank that is currently defined in the EDF file and [Filename] is the name of the EDF file. This warning is displayed if user selects to edit tank waste data where a tank is currently defined in the EDF file.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
modMain:StartPhysical	LLCE currently selected in this file: Description: [LLCE Description] Drawing Number: [Draw List] Part Number: [Part Num] Do you wish to select another LLCE?	Where [LLCE Description] is the descriptive name of the currently selected LLCE, [Draw List] is the list of drawings for the LLCE, and [Part Num] is the part number for the LLCE. This is displayed if the program user chooses to select a LLCE when a LLCE is currently is currently defined in the EDF.
modMain:GetUser	User Data Not Found!	This error occurs when the program calls the routine to get user data, but user data doesn't exist.
modMain:GetUser	User Data Not Found: [FileName] is corrupt or not a valid LLCE Data File.	Where [Filename] is the filename of the EDF file. This error occurs if the currently selected EDF file is corrupt or an invalid EDF file.
modMain:CheckFileSize	Change File, which records changes made to the main LLCE Database is getting large ([File Size]) bytes. Do you want to save this file to a backup file?	Where [File Size] is the file size of the dbchange.mdb file. This message is displayed at program startup if the dbchange.mdb file is larger than 5,000,000 bytes (5 MB).
modMain:CheckFileSize	[Filename] This file already exists. Overwrite existing file?	Where [filename] is the name selected by the program user to save the dbchange.mdb file. This message is displayed if the filename entered for the file to be used to save dbchange.mdb is an existing file.
FrmStartUp:cmdStart	Database change option was not selected. Changes will be made to the LLCE data file (EDF) you select. Changes will not be made to the main database. Is this what you want?	Displayed during program startup if the program user does not select the "Allow Edit of Databases" option on the startup form.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
frmVPhysical:cmdDelete	Delete LLCE from Database Description: [LLCE Description] Drawing Number: [Drawing List] Part Number: [Part Number] Do you Wish to proceed?	Where [LLCE Description] is the descriptive name of the currently selected LLCE, [Draw List] is the list of drawings for the LLCE, and [Part Num] is the part number for the LLCE. This message is displayed if the program user selects a LLCE for deletion.
frmMWaste:CheckOut	Please complete selection of units.	Displayed when user selection of units for tank waste characterization is incomplete.
frmMWaste:CheckOut	Do you wish to enter a riser number?	Displayed when exiting the "Select Tank Waste Source" form if the program user had not entered a tank riser number.
frmMWaste:CheckOut	The user cannot use existing tank waste data unless the user changes the number of tank waste layers back to [Num Layers]. Change number of layers to [NumLayers] or select change existing units option to replace all existing tank waste data.	Where [Num Layers] is the number of tank waste layers defined in the main database for the current tank waste data. This message is displayed when number of tank waste layers entered on the "Select Tank Waste Source" form doesn't match number of layers in the current database for the selected tank.
frmEPhysical:cmdSelect	The program has determined that no existing container will fit this LLCE. A new container must be defined for this LLCE before it can be selected for retrieval.	This message is displayed when the dimensions entered for the LLCE are too large to fit in any existing LLCE waste container.
frmEPhysical:cmdSelect	The program calculates that container number [ContNum] is the best fit. Do you want to use the best fit container?	Where [ContNum] is a number of an existing LLCE waste container. This message occurs after the LLCE overall length and max diameter have been entered. It displays the best fit waste container for the entered dimensions.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
frmEPhysical:cmdSelect	<p>The following problems must be corrected for this LLCE:</p> <p><i>[One or more of the following lines will be displayed if there is a problem]</i></p> <ul style="list-style-type: none"> - Max dia cannot be zero. - Max tip to tip length cannot be zero. - Max flange to tip length cannot be zero. - Tip to tip length must be larger than flange to tip length. - A new container is required to fit the LLCE dimensions. 	This message displays errors that must be corrected before the current LLCE physical data definition can be saved.
frmEPhysical:cmdSelect	Is there a drawing number for this LLCE?	This message is displayed if no drawing number was entered by the program user for the current LLCE physical data.
frmEPhysical:cmdSelect	Is there a part number for this LLCE?	This message is displayed if no part number was entered by the program user for the current LLCE physical data.
frmEPhysical:cmdSelect	LLCE [LLCE Description] already exists in the Database.	Where [LLCE Description] is the descriptive name given to a LLCE. This message is displayed if a new LLCE being defined already exists in the main database.
frmGamma:CmdAdd	<p>The following errors were found:</p> <p><i>[One or both of the following lines will be displayed if there is a problem]</i></p> <ul style="list-style-type: none"> - Atomic weight not entered - Element name not entered 	Displayed when required data is missing when entering data for a new gamma isotope as a valid measured gamma radionuclide.
frmGamma:CmdAdd	Isotope [Gamma Isotope] already exists in list.	Where [Gamma Isotope] is the new gamma isotope being entered. This message is displayed if the current gamma isotope is already in the list of valid measured gamma isotopes.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
frmGamma:cmdDelete	Delete <i>[Isotope]</i> from database?	Where <i>[Isotope]</i> is a currently defined valid measured gamma isotope. This message is displayed if program user selects to delete an existing valid gamma radionuclide.
frmGamma:cmdDelete	Cs-137 can not be deleted!	This message is displayed if program user tries to delete Cs-137 as an valid measured gamma radionuclide.
frmGamma:FormLoad	Changing valid gamma list will require that geometry factors to be re-edited.	This message is displayed to warn the program user that geometry factors will have to be re-edited if the list of valid measured gamma isotopes is changed.
frmMcont:cmdDelete	Delete LLCE waste container: Description: LLCE Waste Container # <i>[Container Number]</i> Drawing Number: <i>[Container Drawing Number]</i> Is this what you want to do?	Where <i>[Container Number]</i> and <i>[Container Drawing Number]</i> is the container ID number and drawing number of the currently selected LLCE waste container. This message is displayed when the program selects to delete an existing LLCE waste container.
frmConEdit:CheckVolumes	Program calculated external volume is <i>[Volume]</i> . Entered value is <i>[Current Volume]</i> . Use program calculated value?	Where <i>[Volume]</i> and <i>[Current Volume]</i> is the external calculated volume and the entered volume for the currently selected waste container. This message is displayed when the container OD and length is defined and the calculated and entered volumes do not match.
frmConEdit:CheckVolumes	Program calculated internal volume is <i>[Volume]</i> . Entered value is <i>[Current Volume]</i> . Use program calculated value?	Where <i>[Volume]</i> and <i>[Current Volume]</i> is the internal calculated volume and the entered volume for the currently selected waste container. This message is displayed when the container ID and length is defined and the calculated and entered volumes do not match.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
frmContEdit:cmdDone	<p>The following problems must be corrected:</p> <p><i>[One or more of the following lines will be displayed if there is a problem]</i></p> <ul style="list-style-type: none"> - Container OD Is Required - Container ID is Required - Container Length is Required - Max Allowable LLCE Diameter is Required - Max Allowable LLCE Length is Required - Max LLCE diameter exceeds container ID - Max allowable LLCE length exceeds container length - Container + skid weight exceeds max allowable gross weight for container 	This message is displayed if problems are found with the data entry for a waste container.
frmContEdit:cmdDone	Duplicate Container Number Not Allowed!	This message is displayed if the container number selected for a new LLCE waste container matches an existing LLCE waste container number.
frmEGeom:cmdDelete	<p>This will delete all geometry factors for:</p> <p><i>[LLCE Description]</i> Isotope: <i>[Isotope]</i></p> <p>Between <i>[Start]</i> and <i>[End]</i></p> <p>OK to Delete?</p>	Where <i>[LLCE Description]</i> is the descriptive name of the selected LLCE. <i>[Isotope]</i> is the gamma isotope that geometry factors are being defined for. <i>[Start]</i> and <i>[End]</i> define the start and end location for which the current geometry factors apply (measured from the tip of the LLCE). This message is display when the program user selects to delete one of the geometry factor records defined for the current gamma isotope.
FrmEGeom:cmdAddNew	<p>Geometry factors are completely defined for <i>[Isotope]</i>. You cannot add new records.</p> <p>Edit or delete are still valid options.</p>	Where <i>[Isotope]</i> is the gamma isotope that geometry factors are being defined for. This message is displayed if the program user tries to enter new data for a gamma isotope which already has geometry factors fully defined.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
frmEGeom:cmdSave	Data record already exists for this isotope. Start and end points data will not be saved.	This message is displayed if the program user tries to save a geometry factor that duplicates information already defined.
frmEGeom:CheckForComplete	The geometry factors are completely defined for this LLCE.	This message is displayed during editing of geometry factors when geometry factors have been completely defined for the current selected LLCE.
frmEGeom:EntryComplete	<p>The following problems must be corrected:</p> <p><i>[One or more of the following lines will be displayed if there is a problem]</i></p> <ul style="list-style-type: none"> - End Point must be larger than Start point - End Point must not be zero - End Point cannot exceed Bottom tip to Flange - Correction Factor for Detector 1 must be larger than zero - Correction Factor for Detector 2 must be larger than zero - Correction Factor for Detector 3 must be larger than zero 	This message displays any errors found when trying to save data for geometry factors.
frmEGeom:CheckEditMode	Save changes to record?	This message is displayed when the program user tries to move to another geometry factors data record without saving the current data.
frmEWaste:cbocAS	Please enter thickness for this layer.	This message is displayed when the program user starts to edit the tank waste data, there is more than one tank waste layer, and layer thickness is not defined for the current tank waste layer.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
frmEWaste:CmdCancel	All changes and edits of tank waste data will be discarded. Is this what you want?	This message is displayed if the program user cancels from the tank waste edit form. It is a warning that all edited data will be lost.
frmEWaste:cmdDelete	Delete [Description] , [CAS] In Layer # [Layer] OK to Delete?	Where [Description] and [CAS] are the current constituent name and CAS. [Layer] is the current tank waste layer. This message is displayed when the program user selects to delete a defined constituent in the tank waste data.
frmEWaste:cmdDone	The following critical problems were found: - There are no chemical records defined for layer [I]. - There are no radionuclide records defined for layer [I]. - 137Cs is not defined for layer [I]. Please correct these problems.	Where [I] is the number of the current tank waste layer. This message is displayed when errors are encountered when the tank waste data editing has been completed.
frmEWaste:CheckEditMode	Save changes to record?	This message is displayed when the program user tries to move to another data record without saving the current data.
frmEWaste:CmdUpdate	Data record already exists for [Type] : [Description] Data will not be saved.	Where [Type] is either chemical or radiochemical. [Description] is the name for the chemical or radiochemical. This message is displayed if the program user tries to enter duplicate tank waste data.

Table B-1. LLCEDATA. (9 sheets total)

Where Generated	Program Message	Description
frmEWaste:EntryComplete	<p>The following problems must be corrected:</p> <p><i>[One or more of the following lines will be displayed if there is a problem]</i></p> <ul style="list-style-type: none"> - Type needs to be defined - Layer needs to be defined - Description needs to be defined - CAS needs to be defined - Specific gravity field must be filled in or set to zero - Layer thickness must be entered - Content must be entered 	<p>This message is displayed when errors are encountered when editing of tank waste data is complete and the program user exits the windows.</p>
frmMChemReg:cmdDelete	<p>Delete chemical <i>[Constituent Name]</i> <i>[D Code]</i>.</p>	<p>Where <i>[Constituent Name]</i> is the name of the current chemical constituent and <i>[D Code]</i> is the D code associated with the constituent. This message is displayed when the program user selects to delete a constituent in the Chemreg database table.</p>
frmElement:cmdDelete	<p>Delete <i>[Description]</i> CAS # <i>[cas]</i>?</p>	<p>Where <i>[Description]</i> and <i>[CAS]</i> are the name and associated CAS for an element that the program user has chosen to delete.</p>

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APPENDIX C
ERROR AND WARNING MESSAGES FOR LLCECALC

TABLE C-1. LLCECALC. (5 sheets total)

Where Generated	Program Message	Description
frmMain:mnuGammaRead	Gamma assay file not selected.	Message is displayed if gamma assay file is not selected when 'Analyze Gamma File' menu option is selected.
frmMain:mnuProcessed	Equipment Data File (EDF) not selected.	Message is displayed if the menu option selected to view, print and export Processed gamma assay data when EDF file is not selected.
frmMain:mnuRaw	Equipment Data File (EDF) not selected.	Message is displayed if the menu option selected to view, print and export raw (as-read) gamma assay data when EDF file is not selected.
frmMain:mnuResults	Equipment Data File (EDF) not selected.	Message is displayed if the menu option selected to view, print and export calculated chemical/radionuclide content of the LLCE waste when EDF file is not selected.
modMain:CompactDB	Failed to compact EDF: [EDF File]	Where [EDF File] is the name of the selected EDF file. Message is displayed during program startup if EDF can not be compacted.
frmStartup:cmdBrowse	No File Was Selected.	Message is displayed when filename was not entered in file dialog box or cancel was selected in file dialog box.
frmStartup:cmdStart	File: [EDF File] doesn't exist.	Where [EDF File] is the name of the EDF file selected. This message is displayed when filename is entered for EDF file and filename doesn't exist.

TABLE C-1. LLCECALC. (5 sheets total)

Where Generated	Program Message	Description
frmStartup:cmdStart	LLCE data file: <i>[EDF File]</i> is not complete. Please go back to LLCEDATA program to complete input to file.	Where <i>[EDF File]</i> is the name of the EDF file selected. This message is displayed when the selected EDF file was not completed in LLCEDATA.
frmStartup:cmdStart	LLCE Data File: <i>[EDF File]</i> does not contain gamma assay data. Please open this file as a new analysis and read in a gamma assay file.	Where <i>[EDF File]</i> is the name of the EDF file selected. This message is displayed if program user selects 'Existing LLCE Waste Characterization Analysis' during program startup and gamma assay data does not exist in the EDF file.
frmStartup:cmdStart	LLCE data file: <i>[EDF File]</i> LLCE description: <i>[Description]</i> LLCE drawing number: <i>[DrawList]</i> LLCE part number: <i>[PartNum]</i> Waste container #: <i>[ContNum]</i> Retrieved from waste tank: <i>[Tank]</i> Riser #: <i>[Riser]</i> Number of layers in tank waste: <i>[NumLayers]</i> GAMMA assay data has been entered. File Name: <i>[Gamma File]</i> or GAMMA assay data has NOT been entered.	Where <i>[EDF File]</i> is the name of the selected EDF file. <i>[Description]</i> , <i>[DrawList]</i> , and <i>[PartNum]</i> is the name, drawing number and part number for the selected LLCE. <i>[ContNum]</i> is the LLCE waste container selected for this LLCE. <i>[Tank]</i> and <i>[Riser]</i> is the waste tank and the tank riser from which the LLCE is retrieved. <i>[NumLayers]</i> is the number of tank waste layers defined for <i>[Tank]</i> . <i>[Gamma File]</i> is the name of the gamma file that was previously read for a EDF file that has gamma assay data. This message is displayed during program startup after EDF file and Gamma assay file has been selected.

TABLE C-1. LLCECALC. (5 sheets total)

Where Generated	Program Message	Description
frmStartup:cmdStart	Gamma assay file: [Gamma File] Acquisition date: [Gamma Date] First spectrum ID: [Gamma Spectrum] Is this the correct gamma file for this LLCE?	Where [Gamma File] is the name of the gamma assay data file (AV2) that was selected. [Gamma Date] and [Gamma Spectrum] are the acquisition data and gamma record ID number for the first data record in the [Gamma File]. This message is displayed during program startup to allow the program user to verify that this is the correct gamma assay file.
frmStartup:cmdStart	Error Reading Gamma Assay File [Gamma File].	Where [Gamma File] is the name of the gamma assay file selected. This message is displayed during program startup if selected file is not recognized or corrupt.
frmStartup:cmdStart	File: [Gamma File] doesn't exist.	Where [Gamma File] is the name of the gamma assay file selected. This message is displayed when filename is entered for gamma assay file and filename doesn't exist.
frmStartup:cmdStart	End of [Gamma File] reached without reading a valid gamma assay record. Please make sure you have the correct file.	Where [Gamma File] is the name of the gamma assay file selected. This message is displayed when the entire [Gamma File] was read without recognizing any valid gamma assay records.
frmStartup:cmdStart	Gamma assay data is currently in the EDF file from gamma assay data file: [Gamma File Name] Do you want to read new gamma data?	Where [Gamma File Name] is the name of the gamma assay file that was previously read into the EDF file. This message is displayed during program startup if user selects a gamma assay file and gamma assay data already exists in the EDF file.
frmStartup:cmdStart	EDF file : [EDF File] is not recognized as a valid EDF file.	Where [EDF File] is the name of the EDF file selected. This message is displayed when the selected EDF file is not a valid EDF file or is corrupt.

TABLE C-1. LLCECALC. (5 sheets total)

Where Generated	Program Message	Description
frmGamma:cmdProcess	Process stopped at this step!	This message is displayed when a error occurs in a gamma assay analysis process step.
frmPosition:cmdReturn	You will not have any valid gamma records with the current settings. Please change your selection	This message is displayed if the selected crane position that corresponds to the tip of the LLCE will result in no valid gamma assay data records.
frmPosition:cmdReturn	With your current selection the gamma assay records stop [From End] feet from the tip of the LLCE. Is this correct?	Where [From End] is the distance in feet from the end crane position to the tip of the LLCE. This message is displayed after program user selects crane position for tip of LLCE to verify user input.
frmPosition:OptOption	Exit LLCECALC to correct flange to tip dimension for this LLCE. Use LLCEDATA to change the flange to tip dimension. Is this what you want?	This message is displayed if program user selected to exit the program to correct the flange-to-tip dimension of the LLCE. This might be selected if the gamma assay system measured length is less than the length of the LLCE.
frmEnter:cmdCancel	Do you want to use the program calculated content of [Content] Ci?	Where [Content] is the curie content of Cs-137. This message is displayed if program user selected to enter missing Cs-137 data then selected to cancel from the input form.
frmEnter:cmdReturn	You have entered 0.00 (zero) 137CS content for record ID: [Gamma ID] Is this what you want?	Where [Gamma ID] is the ID number of a gamma assay record with missing Cs-137 data. This message is displayed when the program user selected to enter missing Cs-137 data then entered zero content on the input form.
frmPrint:myPrint	Equipment Data File (EDF) not selected	This message is displayed if user selects to print data when the EDF file is not selected.

TABLE C-1. LLCECALC. (5 sheets total)

Where Generated	Program Message	Description
modGamma:CheckPosition	A position of zero is not possible. Do you want to exit?	This message is displayed when the program user enters zero for a missing crane position.
modGamma:CheckPosition	Could not update zero crane position in Record ID: [Record]	Where [Record] is the ID number for a gamma assay record that is missing crane position information. This message is displayed when the program user inputs a number for the missing crane position that could not be saved.
modGamma:Combine	Record [Record] could not be found.	Where [Record] is the ID of a gamma assay record. This message is displayed if gamma assay record [Record] could not be found.
modCalc:CalcContent	Error — Cs-137 Content record not found in layer table for tank waste layer [I].	Where [I] is the current tank waste layer.
modCalc:Cleanup	Error — No records found in the tank characterization database	This message is displayed if no data records are found in the tank waste characterization data table.
modCalc:GetLLCEWgt	Program cannot characterize LLCE waste with mass = 0	This message is displayed if the program user enters a mass of zero for the LLCE waste.
modCalc:CalcPE	Specific activity not defined for [CAS].	Where [CAS] is the chemical abstract number for a radionuclide defined in the tank waste. This message occurs if the specific activity is not defined for a radionuclide defined in the tank waste.

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