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ALLDOS - A COMPUTER PROGRAM FOR CALCULATION OF RADIATION DOSES FROM AIRBORNE AND WATERBORNE RELEASES

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ABSTRACT

The computer code ALLDOS is described and instructions for its use are presented. ALLDOS generates tables of radiation doses to the maximum individual and the population in the region of the release site. Acute or chronic release of radionuclides may be considered to airborne and waterborne pathways.

The code relies heavily on data files of dose conversion factors and environmental transport factors for generating the radiation doses. A source inventory data library may also be used to generate the release terms for each pathway. Codes available for preparation of the dose conversion factors are described and a complete sample problem is provided describing preparation of data files and execution of ALLDOS.

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1.0 INTRODUCTION

The computer program ALLDOS was prepared for rapid calculation of radiation dose tables with consideration given to all significant exposure pathways.

Three release terms may be specified for each case: airborne release for external and inhalation exposure; airborne release for terrestrial pathways (ingestion/external); and waterborne releases for terrestrial and aquatic pathways (ingestion/external). Separate release source terms are defined for each release pathway to be considered for a given case. An optional procedure is provided for generation of release terms from a basic radionuclide inventory. The basic inventory is multiplied by release factors defined for each radionuclide class and each case.

ALLDOS relies heavily on use of precalculated dose conversion factors to describe terrestrial pathways and radiation dosimetry. Dose conversion factors defined for each release pathway are used to generate dose commitments to a maximum individual and the population in the region of the release site. Acute and chronic releases may be considered. Preparation of dose conversion factors is described in Section 3.0.

The dose reports indicate dose contributions by release pathway plus the total doses to selected organs. The dose contribution fraction by radionuclide for each organ is also reported as an option.

ALLDOS was developed for calculation of radiation doses from postulated releases of aged radioactive wastes. These radionuclides are long-lived with decay half-lives of several weeks or longer. Therefore, radioactive decay in transit from the release point to the location of exposure in the environment is not considered.

The version of ALLDOS described in this document is operable on the UNIVAC 1100/44 operated by Boeing Computing Services for the Department of Energy in Richland, Washington. The structured program was compiled using an ASCII FORTRAN compiler available on the UNIVAC 1100 (FTN processor). Approximately 45K (decimal) words of storage are required to execute the program.

2.0 DESCRIPTION OF CALCULATIONS

The primary function of ALLDOS is to calculate maximum individual and population dose tables generated from release inventories and dose conversion factors. As such, ALLDOS contains no models of its own but is merely a report generator. The equations used to generate the result tables are presented in the following section.

2.1 RESULT GENERATION

The code ALLDOS considers contributions to dose from three release pathways:

- airborne releases resulting in inhalation and external exposure (referred to as "airborne pathways"),
- airborne releases resulting in exposure through terrestrial pathways (referred to as "terrestrial pathway"),
- waterborne releases resulting in exposure through terrestrial pathways and aquatic pathways (referred to as "waterborne pathway").

Dose results are generated using radionuclide release terms for each pathway multiplied by appropriate dose conversion factors supplied for each pathway.

Two methods are available for specification of the release inventories:

- direct input from cards of activity released for each radionuclide and each pathway,
- input of a basic radionuclide inventory from which release inventories are calculated using release factors for each pathway and radionuclide.

The first method is useful for runs involving inventories to be considered only once or twice. However, when a basic inventory can be defined for use with several release cases, or when parametric studies are to be performed, then the second method may greatly reduce the effort required to run ALLDOS. The second method involves establishing a basic radionuclide inventory such as the activity (in curies) of each fission product in reprocessed waste per metric ton of heavy metal. This data file may be supplied to ALLDOS by card input or as a data library on File 15. The actual release for each pathway is calculated using release factors defined for each pathway and each radionuclide class. This calculation may be represented by the following equations:

$$Q_a^i = F_{ai} \cdot Q_{oi} \qquad (2.1\text{-}1)$$

$$Q_t^i = F_{ti} \cdot Q_{oi} \qquad (2.1\text{-}2)$$

$$Q_f^i = F_{fi} \cdot Q_{oi} \qquad (2.1\text{-}3)$$

where

Q_a^i • release of radionuclide i to airborne pathway, Ci/year

Q_t^i • release of radionuclide i to waterborne pathway, Ci/year

Q_f^i • release of radionuclide i to terrestrial pathway, Ci/year

Q_{oi} • activity of radionuclide i in the basic inventory

F_{ai} • fraction of radionuclide i in the basic inventory that is released to the airborne pathway, $year^{-1}$

F_{ti} • fraction of radionuclide in in the basic inventory that is released to the waterborne pathway, $year^{-1}$

F_{fi} • fraction of radionuclide in in the basic inventory that is released to the terrestrial pathway, $year^{-1}$

The above equations apply to chronic releases (1 year or longer) and to acute releases. However, for acute releases the fractions give total activity released rather than activity per year. When the first method for release inventory specification is used, the parameters Q_a^i, Q_t^i and Q_f^i are supplied directly on cards.

To simplify input the release factors F_{ai}, F_{ti} and F_{fi} are supplied by radionuclide class rather than by each radionuclide. The class definitions are specified through input with up to 80 classes allowed. The defined classes are used for all release pathways. The basic inventory has a class associated with each radionuclide entry. A given radionuclide may have more than one entry by specifying different classes for each entry. When this is done the total release for the radionuclide is the sum over all entries multiplied by the appropriate release factors. For example, if radionuclide i has three entries designated by (1), (2) and (3) then the total release for the terrestrial pathway is given by

$$Q_f^i = F_{fi}(1)\, Q_{oi}(1) + F_{fi}(2)\, Q_{oi}(2) + F_{fi}(3)\, Q_{oi}(3) \qquad (2.1.4)$$

where

$F_{fi}(j)$ = release factor for the j-th contribution to the terrestrial release term of radionuclide i, $year^{-1}$,

$Q_{oi}(j)$ = basic inventory of the j-th entry for radionuclide i, curies.

When this method is used to generate the release terms a report is printed showing all non-zero contributions for all radionuclides in the release terms.

The release terms are used to generate dose result tables for the maximum individual and the population using dose conversion factors and environmental transport factors. The dose conversion factors are defined for each release pathway, release period and dose commitment period. A detailed description of dose conversion factor preparation is given in Section 3.0. The dose conversion factors are supplied to ALLDOS as data libraries (see Appendix B).

The environmental transport factors (see Section 2.2) include consideration of atmospheric dispersion, waterborne dispersion and population distribution. For releases lasting longer than one year a "plant-life" factor is also applied to the airborne release pathway doses. This is necessary because the airborne pathway dose conversion factors are normalized to one curie total release rather than to a release rate of one curie per year (as for the terrestrial pathway and waterborne pathway).

The doses are calculated for the maximum individual as follows:

$$A_{mT}^i = E_x^i\, Q_a^i\, (E/Q)_a\, T_c \qquad (2.1\text{-}5)$$

$$B_{mTo}^i = DA_{oT}^i\, Q_a^i\, (E/Q)_a\, T_c \qquad (2.1\text{-}6)$$

$$C_{mTo}^i = DT_{oT}^{mi}\, Q_f^i\, (E/Q)_t \qquad (2.1\text{-}7)$$

$$D_{mTo}^i = DF_{oT}^{mi}\, Q_t^i\, F_m \qquad (2.1\text{-}8)$$

$$M_{dTo}^i = A_{mT}^i + B_{mTo}^i + C_{mTo}^i + D_{mTo}^i \qquad (2.1\text{-}9)$$

where

A^i_{mT} • dose contribution from external exposures to radionuclide i (airborne pathway) for the maximum individual for exposure period T, rem

E^i_x • external dose conversion factor for radionuclide i, rem per ($Ci \cdot sec/m^3$)

$(E/Q)_a$ • time-integrated air concentration at the location of the maximum individual for the airborne pathway, sec/m^3

T_c • plant-life factor based on the release duration, years. For short releases T_c is set to 1.0

B^i_{mTo} • maximum individual dose contribution to organ o from inhalation uptake of radionuclide i (airborne pathway) for exposure period T, rem

DA^i_{oT} • inhalation dose conversion factor for radionuclide i, organ o and exposure period T, rem per ($Ci \cdot sec/m^3$)

C^i_{mTo} • maximum individual dose contribution to organ o and radionuclide i from airborne terrestrial pathways for exposure period T, rem

$(E/Q)_t$ • time-integrated air concentration for the maximum individual for the terrestrial pathway, sec/m^3

DT^{mi}_{oT} • maximum individual airborne release dose conversion factor for organ o, and radionuclide i and exposure period T, rem per (sec/m^3) per (Ci/year)

D^i_{mTo} • maximum individual dose contribution to organ o and radionuclide i from waterborne release pathways for exposure period T, rem

DF^{mi}_{oT} • maximum individual waterborne release dose conversion factor for organ o, radionucide i and exposure period T, $rem \cdot sec/ft^3$ per Ci/year

F_m • maximum individual waterborne release environmental transport factor, sec/ft^3

M^i_{dTo} • total dose to the maximum individual for organ o, radionuclide i and exposure period T, rem.

The waterborne pathway dose conversion factor is normalized to the river flow rate used as the source of contaminated water and to one curie release.

In the above equations the exposure period representation T is used to define both the uptake period and the dose commitment period. The data libraries of dose conversion factors generally provide data for acute release, chronic release for one year and chronic release for several years (i.e., for the plant-life). Dose commitment periods generally considered are one year and fifty years.

The equations used to calculate the population doses are similar to Equations 2.1-5 through 2.1-9 with the environmental transfer factors $(E/Q)_a$, $(E/Q)_t$ and F_m replaced by PM_a, PM_t and F_p respectively. Also the terrestrial dose conversion factors DT_{ot}^{mi} and DF_{ot}^{mi} are replaced by DT_{oT}^{pi} and DF_{oT}^{pi} respectively. The resulting equations are

$$A_{pT}^{i} = E_x^i \, Q_a^i \, PM_a \, T_c \qquad (2.1\text{-}10)$$

$$B_{pTo}^{i} = DA_{oT}^{i} \, Q_a^i \, PM_a \, T_c \qquad (2.1\text{-}11)$$

$$C_{pTo}^{i} = DT_{oT}^{pi} \, Q_f^i \, PM_t \qquad (2.1\text{-}12)$$

$$D_{pto}^{i} = DF_{ot}^{pi} \, Q_t^i \, F_p \qquad (2.1\text{-}13)$$

$$P_{pTo}^{i} = A_{pT}^{i} + B_{pTo}^{i} + C_{pTo}^{i} + D_{pTo}^{i} \qquad (2.1\text{-}14)$$

where

- A_{pT}^{i} • population dose contribution from external exposure to radio nuclide i for exposure period T, man-rem,
- PM_a • population weighted time-integrated air concentration factor, man•sec/m^3,
- B_{pTo}^{i} • population dose contribution to organ o from inhalation uptake of radionuclide i for exposure period T, man-rem,
- C_{pTo}^{i} • population dose contribution to organ o and radionuclide i from airborne terrestrial pathways for exposure period T, man-rem,
- DT_{oT}^{mi} • airborne release population dose conversion factor for organ o, radionuclide i and exposure period T, rem per (sec/m^3) per (Ci/year),

PM_T • population weighted time-integrated air concentration factor for terrestrial pathways, man•sec/m^3,

D^i_{pTo} • population dose contribution to organ o and radionuclide i from the waterborne terrestrial pathways for exposure period T, man-rem,

DF^{pi}_{To} • waterborne release population dose conversion factor for organ o, radionuclide i and exposure period T, rem•sec/ft^3 per Ci/year,

F_p • population waterborne release environmental transport factor, man•sec/ft^3.

2.2 ENVIRONMENTAL TRANSPORT FACTORS

The transport and dispersion of released activity is described by environmental transport factors. These factors are defined for each release pathway for the maximum individual and the population. The maximum individual transport factors are:

$(E/Q)_a$ • time integrated air concentration at the location of the maximum individual for the airborne release pathway, sec/m^3,

$(E/Q)_t$ • time-integrated air concentration at the location of the maximum individual for the terrestrial pathway, sec/m^3

F_m • waterborne release pathway dilution factor, sec/ft^3.

The waterborne release transport factor is the inverse of the flow rate of the river receiving the contamination.

The population transport factors are:

PM_a • population weighted time-integrated air concentration for the airborne release pathway, man•sec/m^3,

F_p • waterborne release pathway population weighted dilution factor, man•sec/ft^3.

The population weighted air transport factors PM_a and PM_t may be represented as follows:

$$PM_a = \sum_{i}^{\text{locations}} P_i (E/Q)_i \qquad (2.2\text{-}1)$$

where

P_i • population within area i, persons

$(E/Q)_i$ • average normalized time-integrated air concentration within area i, sec/m^3

i • location index to include all populated areas near the release site.

The transport factor PM_t is calculated by Equation 2.2-1 also with appropriate values for $(E/Q)_i$. For most situations the values of PM_a and PM_t are the same.

The waterborne factor F_p may be considered to be the population served by contaminated produce divided by the receiving river flow rate. All of the above transport factors are defined for use with the dose conversion factors provided in the data libraries (see Section 3.0 and Appendix B).

3.0 DOSE CONVERSION FACTORS

This section describes preparation of dose conversion factors required by ALLDOS. Four types of dose conversion factors are supplied in the two data libraries:

File 10 library:

- external exposure to plume,
- inhalation uptake from plume,

File 12 library:

- airborne terrestrial pathways,
- waterborne terrestrial pathways.

Each of these factors is described in the following sections.

3.1 EXTERNAL EXPOSURE TO PLUME

The external dose conversion factor (E_x^i of Equations 2.1-5 and 2.1-10) gives the dose from gamma radiation to an individual exposed to an infinite plume of a radionuclide. The factors are normalized to a time-integrated air concentration of one Ci·sec/m^3 over the time of plume passage. For radionuclides that have significant beta radiations, consideration should be given to Bremsstrahlung radiation contributions to the external dose factors. The external dose conversion factors may be calculated as:

$$E_x^i = 0.23 \sum_{j=1}^{\text{photons}} \left(E_{\gamma j}^i + E_{Bj}^i\right) f_{aj}^i (1 + \mu_j d) e^{-\mu_j d} \qquad (3.1\text{-}1)$$

where

E_x^i • external dose conversion factor for radionuclide i, rem per (Ci·sec/m^3),

$E_{\gamma j}^i$ • total photon energy emitted per dissintegration by radionuclide i for energy group j, MeV per dis,

E_{Bj}^i • effective photon energy in the form of Bremsstrahlung from beta emissions of radionuclide i for energy group j, MeV per dis,

f_{aj}^{i} • effective ratio of photon absorption for tissue relative to air (dimensionless) for radionuclide i and energy group j,

μ_j • linear total attenuation coefficient of tissue (approximated by water) for photons of energy group j, cm^{-1},

d • tissue depth for which dose is to be calculated, cm,

0.23 • unit conversion factor, rem (MeV/dis) per $(Ci \cdot sec/m^3)$

$$0.23 = \frac{1}{2} \cdot \frac{3.7\times10^{10} \left(\frac{dis}{Ci\cdot sec}\right) 1.6\times10^{-6} \left(\frac{erg}{MeV}\right)}{100 \left(\frac{erg}{g\cdot rad}\right) 1293 \left(\frac{g}{m^3}\right)}$$

The factor of 1/2 accounts for the fact that the plume is semi-infinite (bounded by the ground plane).

The external doses calculated by ALLDOS are representative of the average dose to the blood forming organs which are assumed to be at a tissue depth of 5 cm (parameter d in Equation 3.1-1). This dose is also a good approximation for other organ doses (NCRP 1975) and is used to determine the external dose contribution to all organs.

3.2 INHALATION UPTAKE FROM PLUME

The inhalation dose conversion factors give the dose commitment from inhalation uptake during plume passage. Like the external dose conversion factors, the inhalation factors are normalized to the time-integrated air concentration over the uptake period. The inhalation dose factors of File 10 are given for acute, chronic and prolonged (30 year) releases and for two dose commitment periods (see Table B.1-2 in Appendix B). Generation of the current File 10 inhalation dose factors was performed using the computer program DACRIN (Houston, Strenge and Watson 1976; Strenge 1975). The program DACRIN employs the respiratory tract model adopted by the ICRP Task Group on Lung Dynamics (ICRP 1966; ICRP 1972). The gastrointestinal tract model and the retention model for other organs are those of the initial ICRP publication (1959). The sample problem in Appendix E (Section E.2) describes input to DACRIN.

3.3 TERRESTRIAL PATHWAYS FROM AIRBORNE RELEASES

The dose conversion factors for terrestrial pathways related to atmospheric releases give the accumulated dose from continued exposure to environmental contamination. The terrestrial dose factors for airborne releases are given in File 12 for both chronic and acute releases (see Appendix E for the structure of File 12). The dose factors are normalized to releases of one curie per year for chronic releases and to one curie for acute releases, with unit values for X/Q. The information in File 12 implicitly contains many of the assumptions about demography and lifestyle required; therefore the file must be established on a site-specific basis. Generation of File 12 is performed using the computer program PABLM (Napier, Kennedy, and Soldat 1980).

File 12 contains accumulated dose factors for both an average and a maximum individual. The average parameters are multiplied by a population distribution to obtain a collective dose by ALLDOS. Dose factors are included for one-year doses and accumulated doses from both acute and chronic releases. Factors for up to five organs may be included. The factors are calculated based on all the desired exposure pathways and summed. All dietary and recreational habit information is thus worked into the dose factor, making File 12 site-specific.

3.4 TERRESTRIAL PATHWAYS FROM WATERBORNE RELEASES

The dose conversion factors for terrestrial and aquatic exposure pathways also give accumulated dose from continued exposure to environmental contamination. The factors for accumulated dose from waterborne pathways are given in File 12 (see Appendix E) for both acute and chronic releases. The dose factors are normalized to releases of one curie per year for chronic releases and to one curie for acute releases, with no dilution in receiving waters. Dilution is handled in ALLDOS. Like the terrestrial pathway dose factors from atmospheric releases, many of the supporting assumptions are incorporated in these site-specific factors. These dose factors are also calculated using the program PABLM. Included in each dose factor may be contributions from irrigated food crops, farm animals, drinking water, aquatic foods, and external irradiation from contaminated soils, sediments, and water.

4.0 REFERENCES

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APPENDIX A

COMPUTER CODE DESIGN

APPENDIX A

COMPUTER CODE DESIGN

The computer code ALLDOS was developed using structured design and programming techniques. The current version is executed on the UNIVAC 1100/44 operated for the Department of Energy by Boeing Computer Services at Richland, Washington. The programming language is ASCII FORTRAN as implemented by the UNIVAC 1100 FTN compiler.

The program is composed of 18 structured modules plus four common blocks. The module hierarchy is indicated in Figures A.0-1 and A.0-2. These figures only indicate calling sequence; no logic structure is implied. A brief description of the primary function of each module is also indicated in the hierarchy diagrams. A list of the 18 modules and usage of common blocks is given in Table A.0-1.

The majority of data transfer between modules is accomplished through argument lists. Some data transfer is also done using the four common blocks described in Section A.1.

The following sections provide details of the common blocks and module design specifications. A complete listing of the FORTRAN code is given in Appendix C.

A.1 COMMON BLOCKS

The four common blocks used in ALLDOS and their general purposes are:

- blank • transfer input inventories and calculated doses
- DOSTIM • transfer dose commitment period information
- ICOM • transfer input NAMELIST parameters
- TITLE • transfer input inventory title information.

Descriptions of each common block are given in Tables A.1-1 through A.1-4.

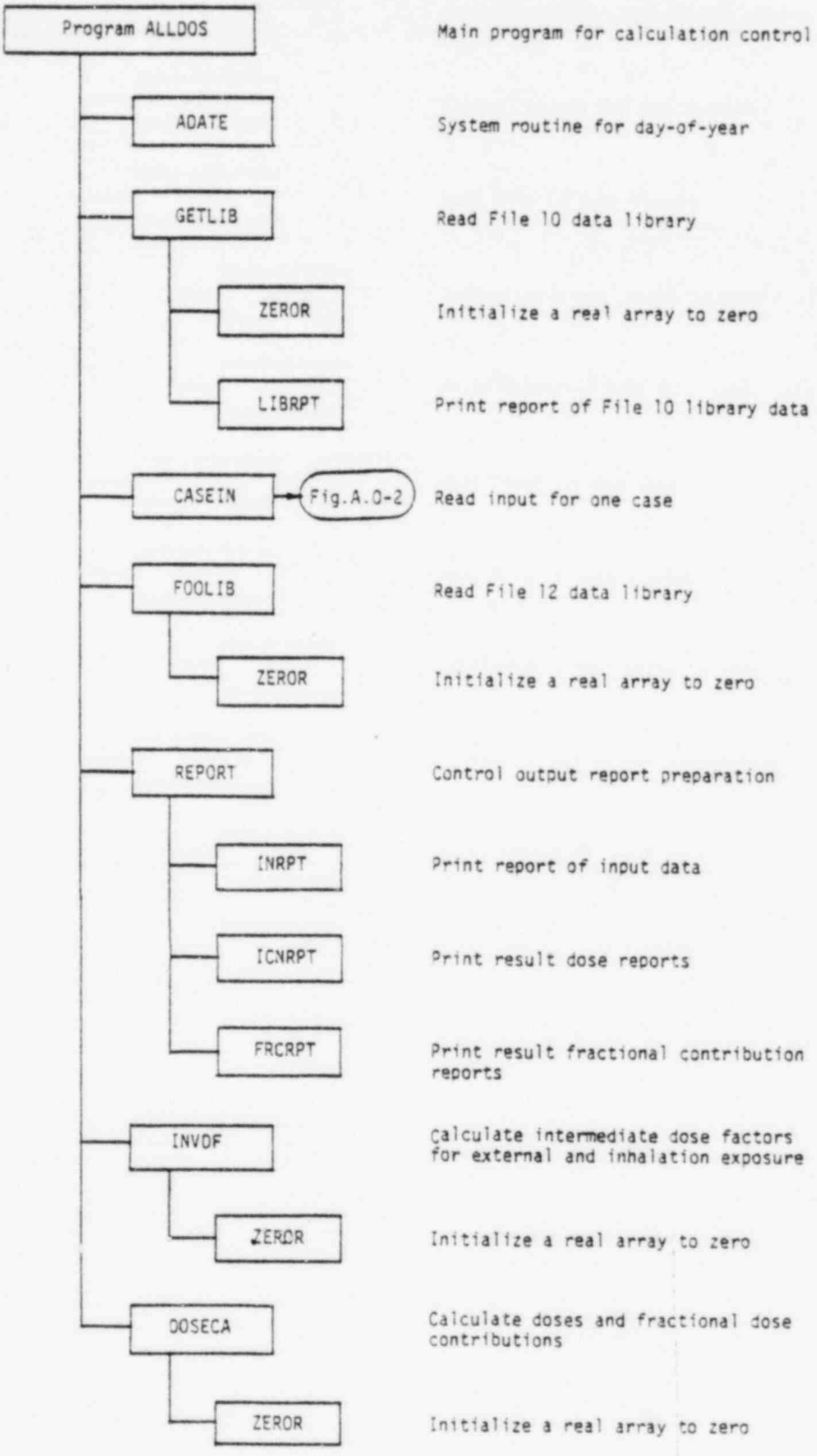


FIGURE A.0-1. Hierarchy Diagram for Main Program ALLDOS

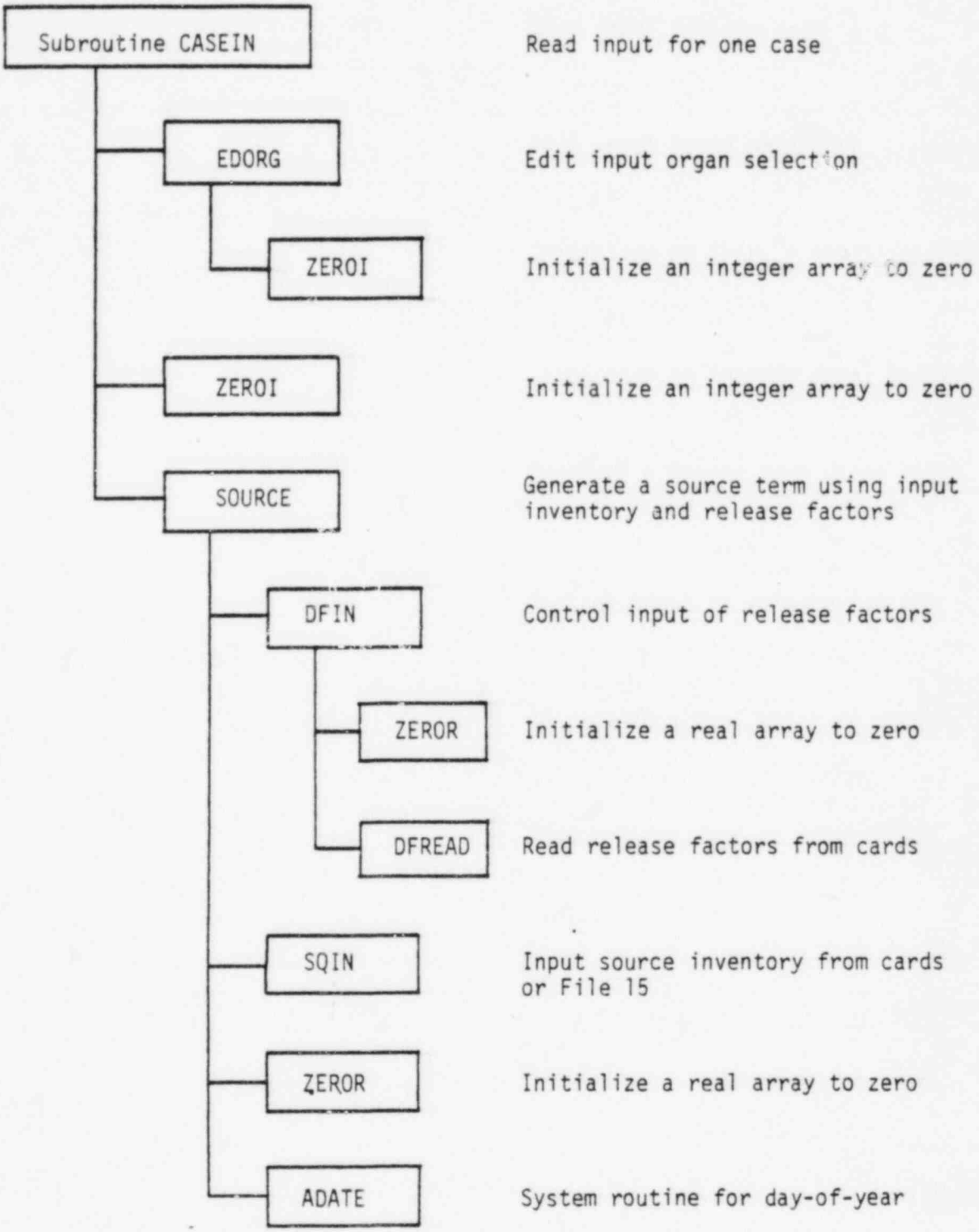


FIGURE A.0-2. Hierarchy Diagram for Subroutine CASEIN (Called by ALLDOS)

TABLE A.0-1 Common Block Usage by Module

Module Name	Common Blocks Used			
	Blank Common	ICOM	TITLE	DOSTIM
ALLDOS	used	used	-	-
CASEIN	used	used	-	-
DFIN	-	-	-	-
DFREAD	-	-	-	-
DOSECA	used	-	-	-
EDORG	-	-	-	-
FOOLIB	-	-	-	-
FRCRPT	used	used	used	used
GETLIB	-	-	-	used
ICNRPT	-	-	used	used
INRPT	used	-	-	used
INVDF	-	-	-	-
LIBRPT	-	-	-	used
REPORT	used	-	-	-
SOURCE	used	-	used	-
SQIN	-	-	used	-
ZEROI	-	-	-	-
ZEROR	-	-	-	-

TABLE A.1-1 Blank Common Parameters

Parameter	Type	Description
TC	Real	Plant life, years, used for prolonged release calculations and for acute release when LY = 3.
SQ(350)	Real	Basic radionuclide inventory activities, curies.
PDOSC(5,2,100)	Real	Population dose storage array for 5 organs, 2 time periods and 100 radionuclides, man-rem.
DMAXC(5,2,100)	Real	Maximum individual dose storage array for 5 organs, 2 time periods and 100 radionuclides, man-rem.

TABLE A.1-2 Common Block ICOM

Parameter	Type	Description
LR	Integer	Release type control integer: LR = 1 for acute release, LR = 2 for chronic release.
NREL	Integer	Number of release pathways to be considered: $2 \leq NREL \leq 3$.
LPOP	Integer	Population dose calculation control integer; LPOP > 0 to include population dose calculations.
LFCT	Integer	Control integer for printing special output reports.
LM	Integer	Maximum individual dose calculation control integer; LM > 0 to include maximum individual dose calculation.
LY	Integer	Control integer for calculation of the second dose commitment period doses.
INV	Integer	Release inventory specification control integer.
PM	Real	Population weighted air transport factor for the airborne pathway, PM_a, man·sec/m^3.
XQM	Real	Maximum individual time-integrated air concentration for the airborne pathway, $(E/Q)_a$, sec/m^3.
FPM	Real	Population weighted air transport factor for the terrestrial pathway, PM_t, man·sec/m^3.
FXQM	Real	Maximum individual time-integrated air concentration for the terrestrial pathway, $(E/Q)_t$, sec/m^3.
FLOW	Real	Maximum individual environmental transport factor for the waterborne pathway, F_m, sec/ft^3.
PFLOW	Real	Population environmental transport factor for the waterborne pathway, F_p, man·sec/ft^3.
IPATH	Integer	Release pathway selection index.

TABLE A.1-3 Common Block TITLE

Parameter	Type	Description
DSET(5)	Character	This array gives the title for the basic inventory set read from File 15.

TABLE A.1-4 Common Block DOSTIM

Parameter	Type	Description
IDTIME(4)	Integer	This array gives time periods (years) for which inhalation dose conversion factor are supplied. IDTIME(1) = dose commitment period 1 IDTIME(2) = dose commitment period 2 IDTIME(3) = dose commitment period 2 for prolonged releases IDTIME(4) = uptake period for prolonged release.

A.2 MODULE SPECIFICATIONS

This section gives design specifications and detailed information (useful for programmers when making modifications to the program) for the main program and subroutines related to data card input. The information is presented in tabular form giving:

- primary function of module
- common block usage
- subordinate routines required
- argument list definitions
- details of module operation
- error messages
- logic diagrams

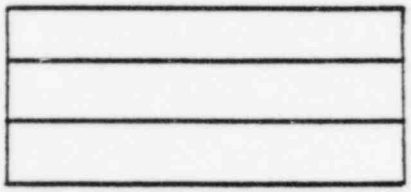
The above items are included as required for each module. The logic diagrams use flowcharting techniques described by Chapin (1974)* and are referred to as Chapin charts. The basic logic constructs used in the diagrams are indicated in Figure A.2-1.

A.2.1 ALLDOS (Main Program)

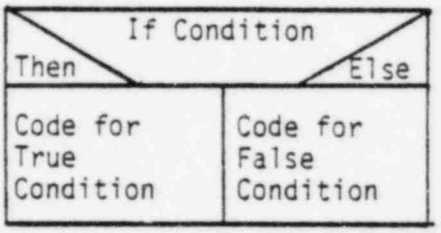
This module controls reading of data libraries, input of case data, calculation of results and reporting of results through calls to appropriate subroutines. Common block ICOM and blank common are included in ALLDOS. The following modules are called by ALLDOS.

Module	Purpose
GETLIB	Read File 10 data library
CASEIN	Read input card data and File 15 data (if required) for one case
FOOLIB	Read File 12 terrestrial pathway dose conversion factors
REPORT	Print input data report and result reports
INVDF	Calculate intermediate factors for external and inhalation doses
DOSECA	Calculate doses and fractional contributions to dose for this case

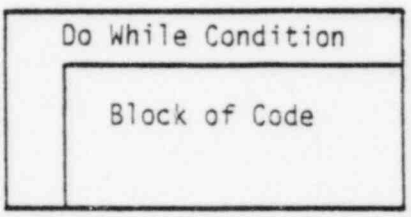
* Chapin, N. 1974. "New Format for Flowcharts", Software - Practice and Experience, Vol. 4, pp. 341-357, John Wiley and Sons, Ltd., London.



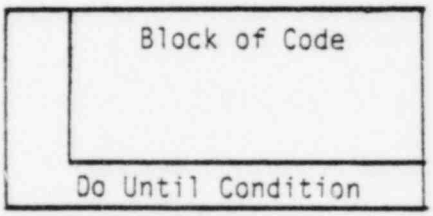
Sequential Block of Code



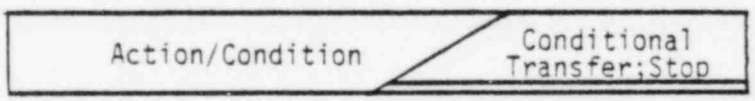
Conditional



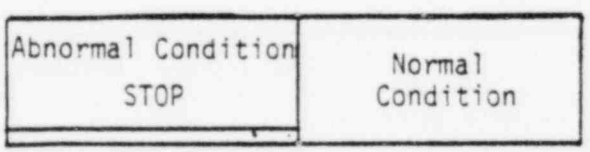
Do While Loop



Do Until Loop



Abnormal Transfer



Abnormal Termination

FIGURE A.2-1. Chapin Chart Logic Constructs

In addition to the general control function, ALLDOS defines dimensions of most data arrays used in the program. Also NAMELIST parameters are made available to subroutine call lists through inclusions of labeled common block ICOM. The logic structure of ALLDOS is indicated in Figure A.2-2.

A.2.2 CASEIN

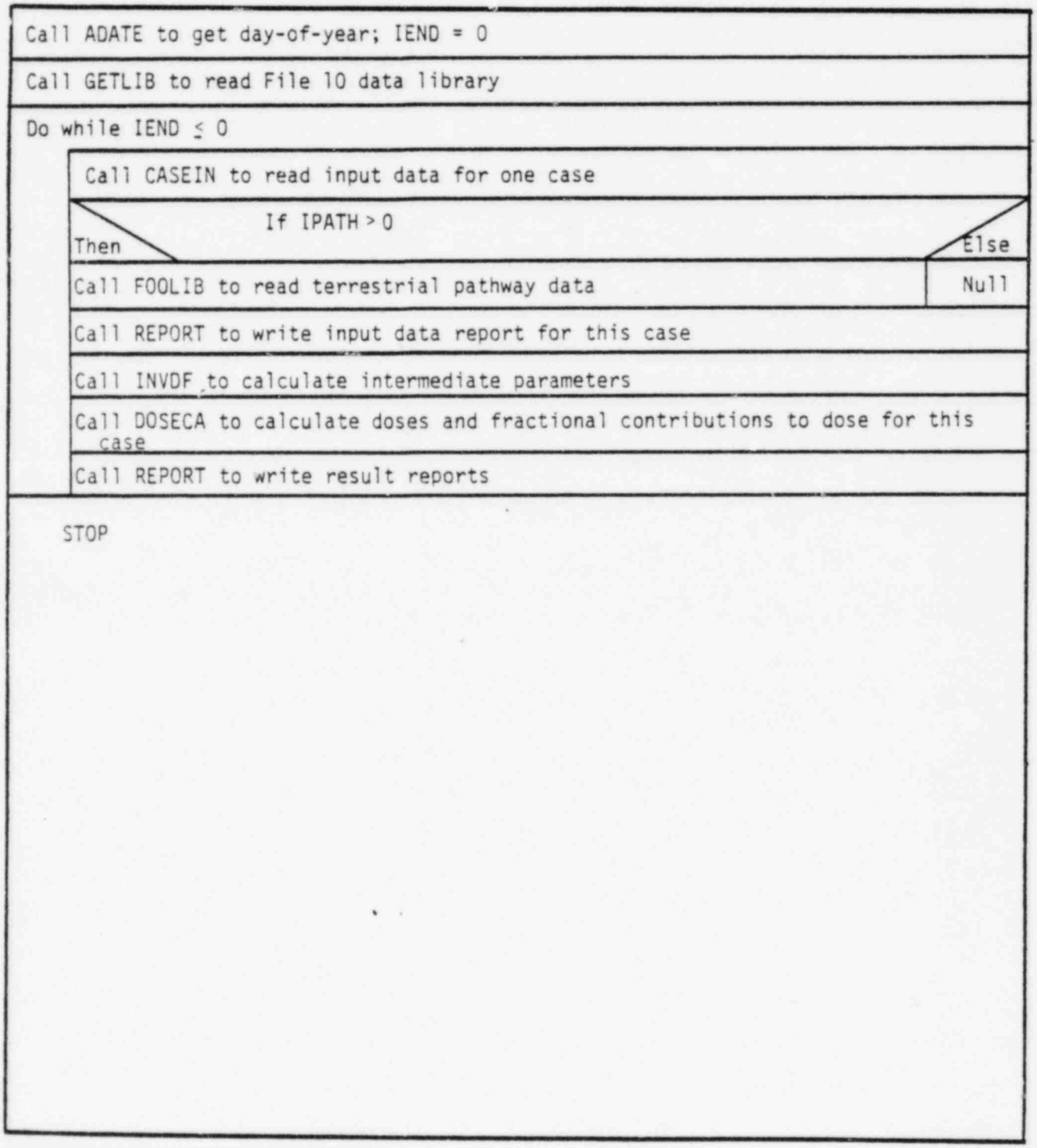
This module controls input of data for one case and generation of release inventories by pathway (when requested). Common block ICOM and blank common are included in CASEIN. CASEIN calls subroutine EDORG to edit input organ selection parameters, ZEROI to initialize the integer array ISO and SOURCE to generate release inventories. The argument list parameters have the following uses:

Parameter	Type	Description
NUC	Integer	Number of radionuclides in the master list from File 10
REC(100)	Character	Radionuclide names from the master list
NORG	Integer	Number of organs defined in File 10 master list
IORG(10)	Integer	Organ index values defined for File 10 organs
TITLE(8)	Character	Descriptive title for this case
JORG	Integer	Number of organs selected for this case
MORG(10)	Integer	Organ cross-index values for selected organs
Q(5,100)	Real	Activity (curies) of each radionuclide released for each pathway
ISO(100)	Integer	Control integer to indicate which master radionuclides are included in the release term

This module reads a case title card, a NAMELIST INPUT card set and controls input of the inventory depending on the value of INV as follows:

INV Value	Action
≤ 0	No action; use previous inventory
1	Read release activities from cards
≥ 2	Call SOURCE to generate new release activities

FIGURE A.2-2 Logic Diagram for ALLDOS



When INV = 1 cards are read giving release activities for each pathway. The parameter NREL is used to determine how many pathways are to be considered (maximum is three). The first pathway is for airborne releases for external and inhalation exposure; the second pathway is for airborne releases and terrestrial paths; and the last is for waterborne releases and terrestrial paths. Each input activity card has a radionuclide name indicating which radionuclide the activities on the card are to be assigned. This name is compared with the master radionuclide names (REC) until a match is found. If the input radionuclide name is not found, an error message is printed and execution is stopped.

The parameter IEND is set when an error condition is detected. Values of IEND set in CASEIN (and subroutines of CASEIN) are:

IEND Value	Error Condition
3	End-of-file encountered on attempt to read a title card. This is the normal mode for termination of the run.
4	An input organ index value, LORG(N), is not in the master organ list IORG.
5	End-of-file encountered on reading release inventory cards (INV = 1).
6	An input radionuclide name can not be found in the master list (INV = 1).

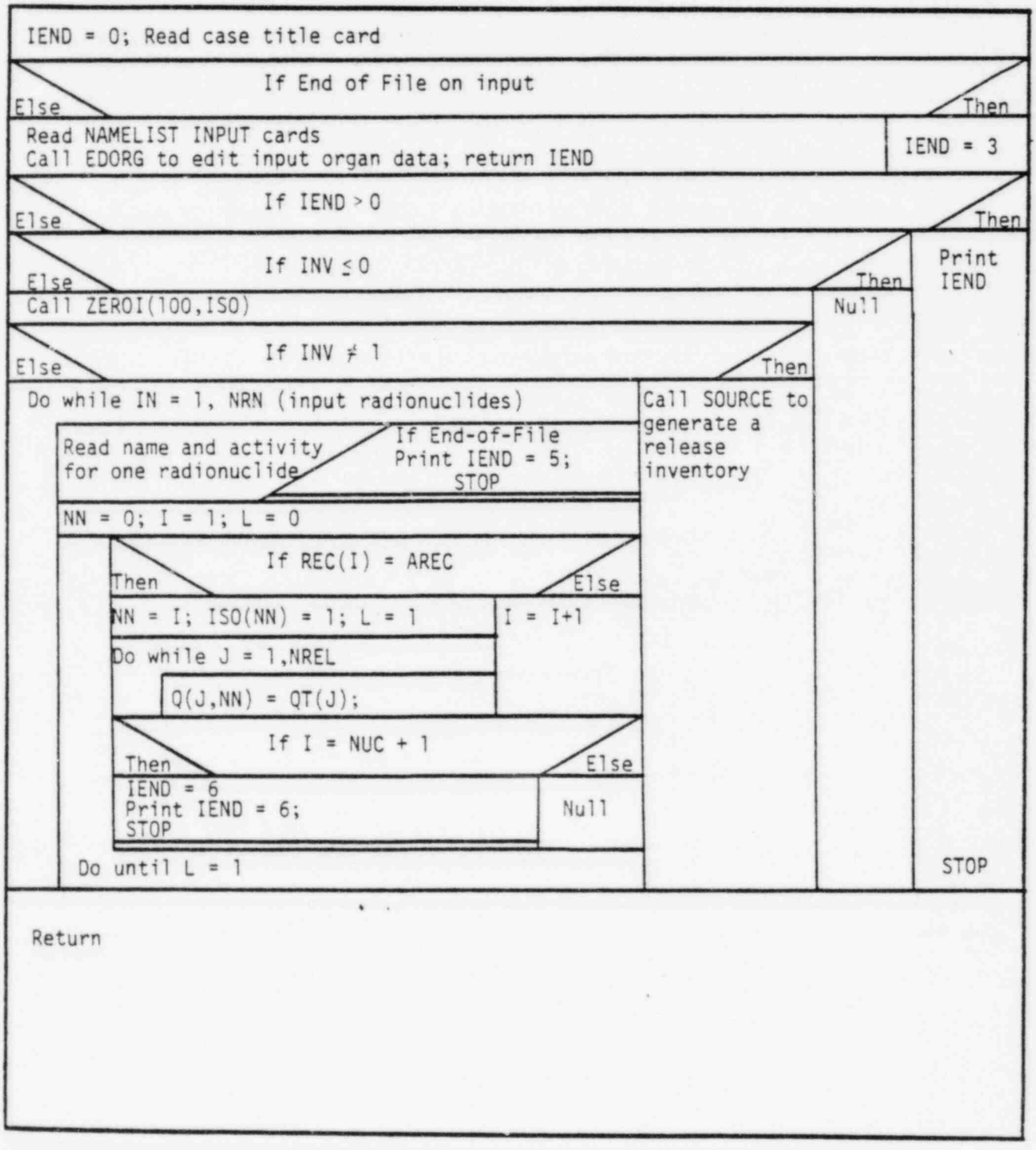
A logic diagram for CASEIN is given in Figure A.2-3.

A.2.3 DFREAD

This module reads a set of release factors from the card input file. The argument list parameter DF(80) is an array to transmit the input release factors back to the calling subroutine DFIN.

Release factors are read for one radionuclide class at a time as follows:

FIGURE A.2-3 CASEIN Logic Diagram



Parameter	Columns	Format	Description
IC	1-2	I2	Radionuclide class for which the accompanying release factor is to be assigned $1 \leq IC \leq 80$. Input of these cards is terminated when IC > 80.
DF(IC)	3-10	E8-1	Release factor for the radionuclide class IC.

Cards of this type are read until a value for IC greater than 80 is read.

If an end-of-file is encountered, the error parameter IEND is set to 27 and the following message is printed: "End of file on DF input in DFREAD, IEND = 27".

A logic diagram for DFREAD is given in Figure A.2-4.

A.2.4 DFIN

This module controls input of release factors for each of three release pathways. Subroutine DFREAD is called to read release factors from cards. The argument list parameters have the following uses:

Parameter	Type	Description
LADF	Integer	Control integer for input of airborne pathway release factors for inhalation and external exposure
LTDF	Integer	Control integer for input of waterborne pathway release factors
LFDF	Integer	Control integer for input of terrestrial pathway release factors
ADF(80)	Real	Airborne pathway release factors for inhalation and external exposure by radionuclide class
TDF(80)	Real	Waterborne pathway release factors by radionuclide class
FDF(80)	Real	Terrestrial pathway release factors by radionuclide class

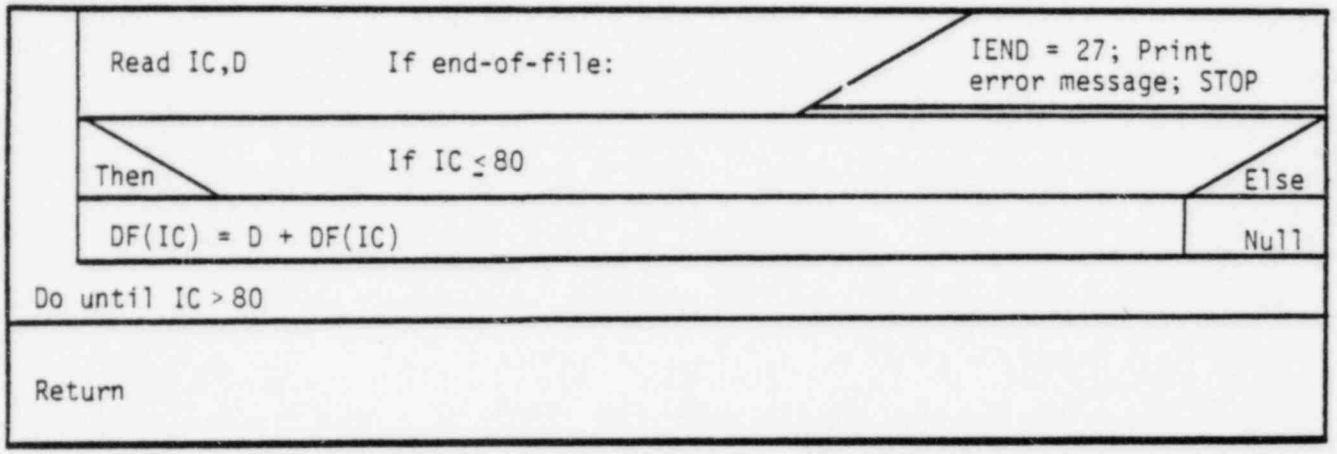


FIGURE A.2-4 DFREAD Logic Program

When any of the pathway control integers is equal to 2, a card is read giving the maximum number of radionuclide classes to be considered. This parameter (NCL) should correspond to NCLS read in subroutine SQIN and must not be greater than 80. NCL is only used to initialize the release factor arrays to zero (ADF, TDF and FDF). Release factors are read for a pathway whenever the control integer for the pathway is greater than zero. The order of input is:

- ADF (if LADF >0) - Airborne pathway
- TDF (if LTDF >0) - Waterborne pathway
- FDF (if LFDF >0) - Terrestrial pathway

A logic diagram for subroutine DFIN is given in Figure A.2-5.

A.2.5 EDORG

This module checks input organ indices against File 10 organ indices and prints an error message when an invalid input index is found. The number of nonzero organ index values is counted and saved as JORG. The cross-index parameter array MORG(5) is established. The value for MORG(I) is set to the position of input organ I in the master organ array IORG(5).

The argument list parameters have the following uses:

Parameter	Type	Description
NORG	Integer	Number of organs defined in File 10 master list
IORG(10)	Integer	Organ index values defined for File 10 organs
LORG(5)	Integer	Input organ index values
MORG(5)	Integer	Organ cross-index array for selected organs
JORG	Integer	Number of organs specified on input
IEND	Integer	Error flag set to 4 if a bad organ index is found

If one of the input organ index values is not found in the master organ index array IORG, then an error message is printed indicating which organ index is in error. The message is:

Organ ID "N" not found.

The logic diagram for EDORG is given in Figure A.2-6.

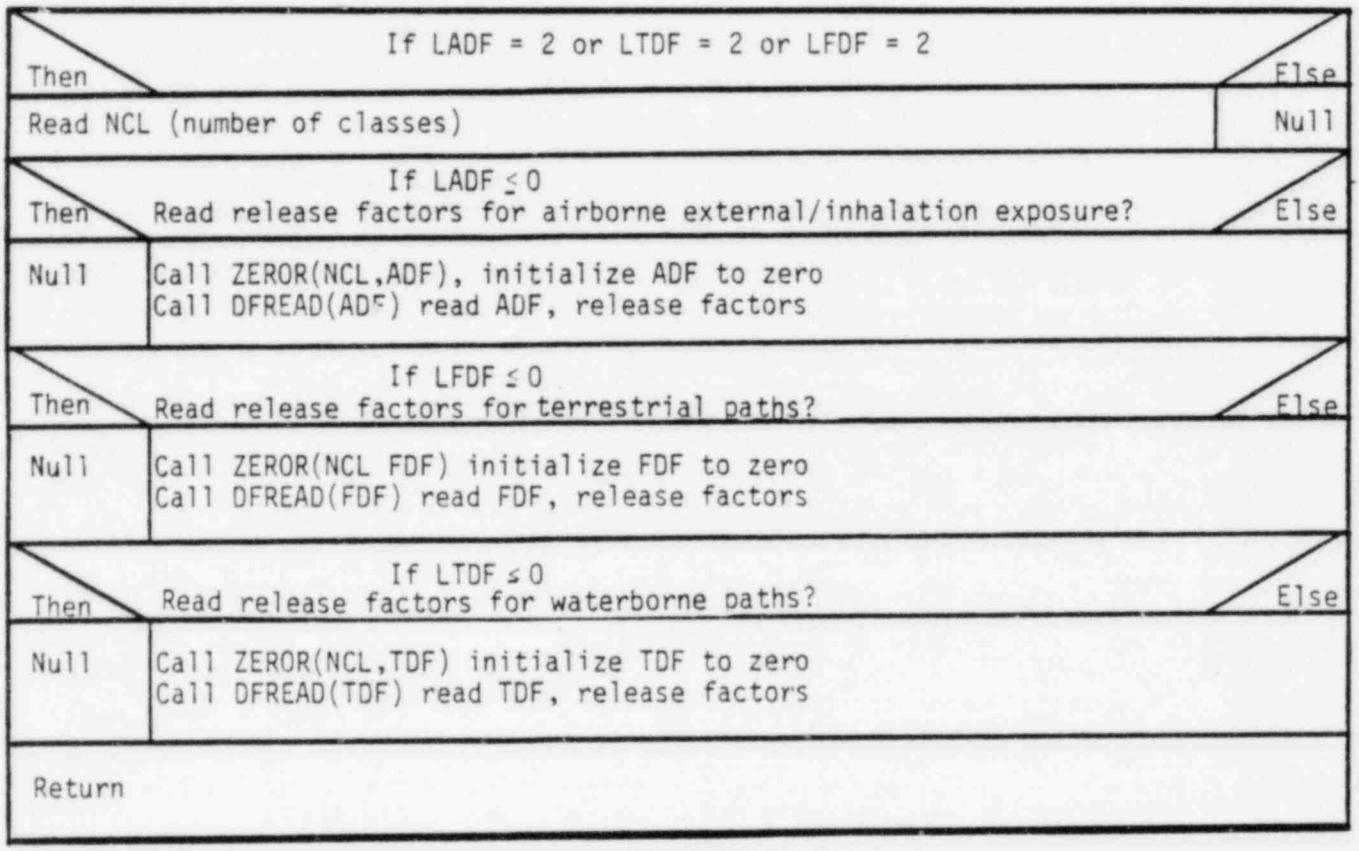
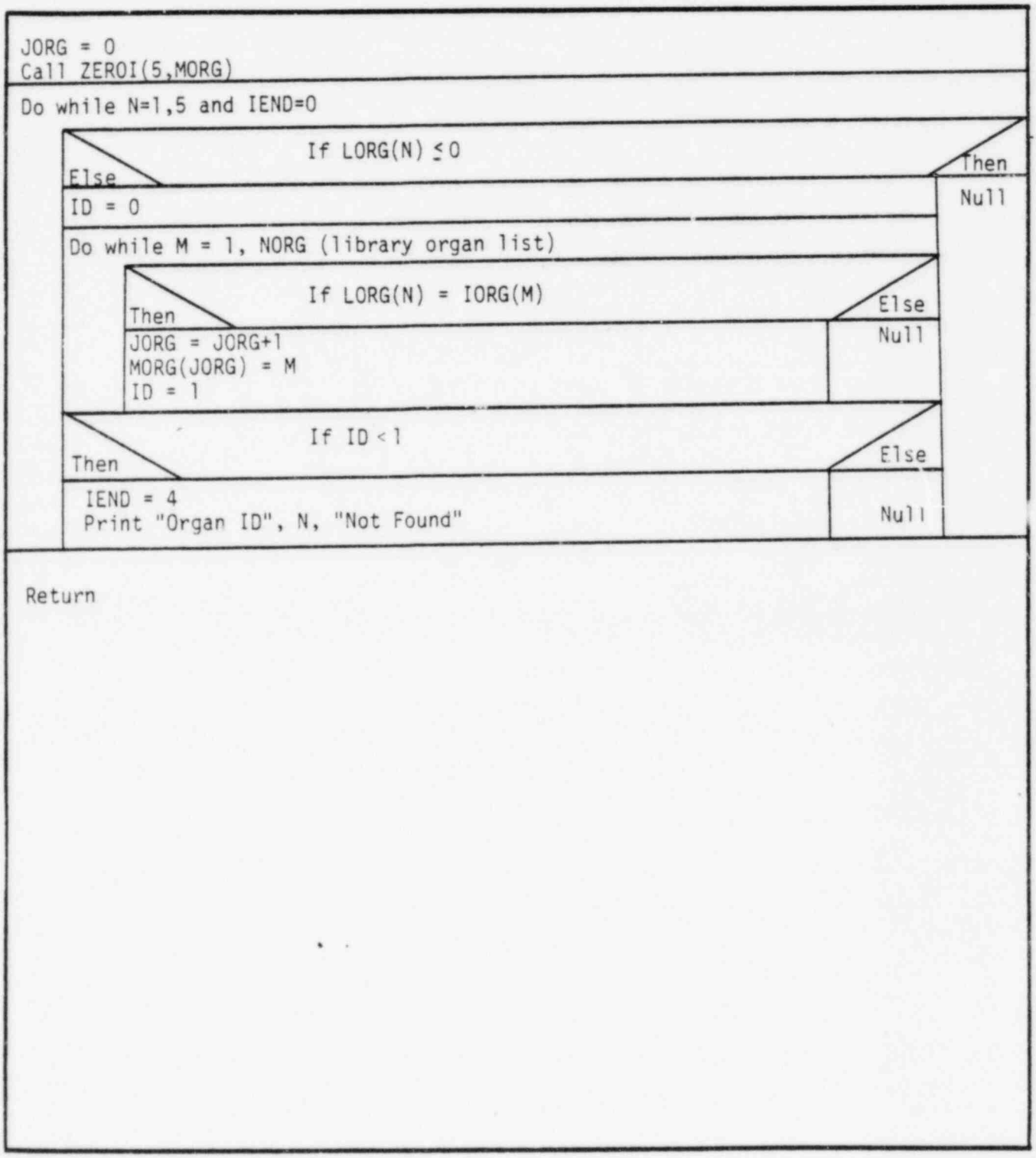


FIGURE A.2-5 DFIN Logic Diagram

FIGURE A.2-6 EDORG Logic Diagram



A.2.6 SOURCE

This module generates release inventories for each of the three release pathways. The parameter INV is used to indicate the method for calculating the release inventories. (INV is always greater than 1 when SOURCE is called.)

Common block TITLE and blank common are included in SOURCE. Module DFIN is called by SOURCE to supply release factors for each pathway. Module SQIN is called to provide the basic radionuclide inventory and module ZEROR is called to initialize array Q to zero. System routine ADATE is called to generate an 8 character day-of-year title.

The argument list parameters have the following uses:

Parameter	Type	Description
NUC	Integer	Number of radionuclides in the master list from File 10
REC(100)	Character	Radionuclide names from the master list
ISO(100)	Integer	Control integer to indicate which master list radionuclides are included in the release term
INV	Integer	Control integer for generation of the release inventory
LADF	Integer	Control integer for input of airborne pathway release factors
LTDF	Integer	Control integer for input of waterborne pathway release factors
LFDF	Integer	Control integer for input of terrestrial pathway release factors
TITLE(8)	Character	Case title
Q(5,100)	Real	Release inventory array

If any of the control integers LADF, LTDF or LFDF are positive, then subroutine DFIN is called to read in release factor data for necessary pathways. The parameter TONS is set to 1.0 if it has not been set on NAMELIST INPUT. This parameter is used to modify external and inhalation dose factors when releases last more than one year. (See module DOSECA.)

Subroutine SQIN is called only if INV is not equal to 2. When INV is 2, the previous basis inventory is used with current release factors for each pathway to generate the release inventory. The release inventory is generated as:

$$Q_{ij} = Q_{oi} D_{fij}$$

where

Q_{ij} • activity of radionuclide i released for pathway j, curies

Q_{oi} • activity of radionuclide i in the basic inventory, curies

D_{fij} • fraction of basic inventory of radionuclide i released to pathway j.

The release fractions are defined for each pathway and each radionuclide class as follows:

Parameter	Description
ADF[ICL(i)]	Fraction of radionuclide i released to the airborne pathway
TDF[ICL(i)]	Fraction of radionuclide i released to the waterborne pathway
FDF[ICL(i)]	Fraction of radionuclide i released to the terrestrial pathway
ICL(i)	Radionuclide class index for radionuclide i. This array is defined by input in subroutine SQIN
SQ(n)	Activity of radionuclide n in basic inventory

Note: n does not correspond to i.

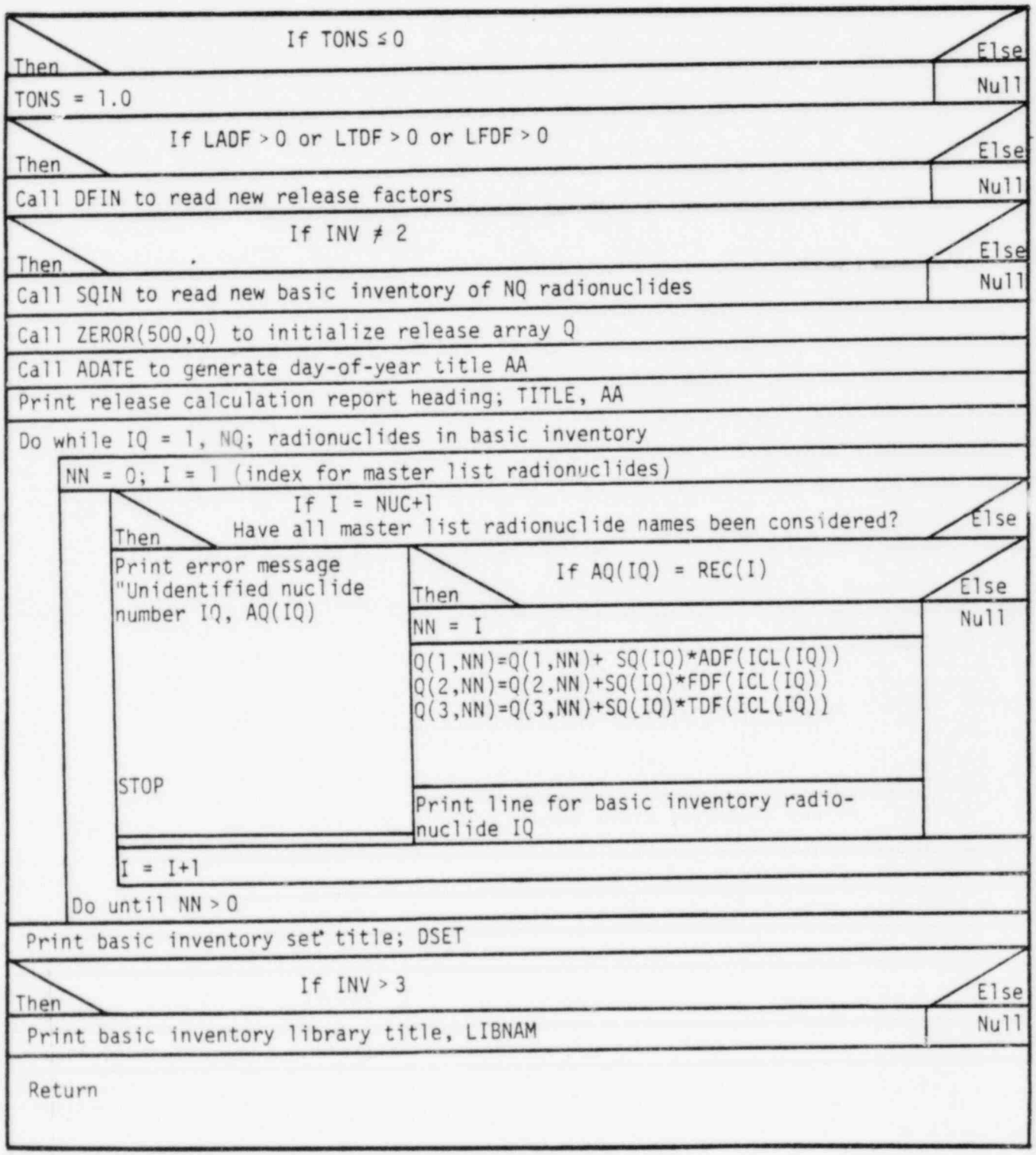
The input basic inventory radionuclides are identified by the radionuclide name array AQ. Each input inventory radionuclide name is compared to the master list names of array REC to set array index values. If a match is not found, an error message is printed and execution is stopped. The error message is:

"Unidentified nuclide number III Name"

Note that one radionuclide may appear more than once in the basic inventory and with different class index values. This allows multiple sources for one radionuclide to be added to get the total release for a pathway.

A logic diagram for subroutine SOURCE is given in Figure A.2-7.

FIGURE A.2-7 SOURCE Logic Diagram



A.2.7 SQIN

This module controls reading of the basic radionuclide inventory from cards (INV = 3) or File 15 (INV > 3). Common block TITLE is included in SQIN. The argument list parameters have the following uses:

Parameter	Type	Description
INV	Integer	Control integer for input of the basic radionuclide inventory
NQ	Integer	Number of radionuclides in the basic radionuclide inventory
SQ(350)	Real	Activity of each radionuclide in the basic inventory, curies
AQ(350)	Character	Names of each radionuclide in the basic inventory
ICL(350)	Integer	Radionuclide class for each radionuclide in the basic inventory
DFNAM(80)	Character	Title for each radionuclide class
LIBNAM(7)	Character	Title of the File 15 data library

When INV = 3 the basic inventory information is read from cards as follows:

Card Type	Parameter	Description
1	NQ	Number of radionuclides in the basic inventory
	DSET(5)	Title for this basic inventory
2	NCLS	Number of radionuclide classes to be considered in this basic inventory
3	ICLS	Index of current class
	DFNAM(ICLS)	Name of current class (Read NCLS of these cards)
4	AQ(i)	Name of current radionuclide
	ICL(i)	Class of current radionuclide
	SQ(i)	Activity of current radionuclide (Read NQ of these cards)

When INV is greater than 3, input of the basic inventory is from the File 15 data library. This library contains NSETS basic inventory sets (see card descriptions below). The value of INV-3 gives the set to be used as the basic inventory for this case. The first data card in the basic inventory data library is as follows:

Card Type	Parameter	Description
1	NSETS	Number of basic inventory sets in this data library
	LIBNAM	Title of this data library

The radionuclide class cards (same as types 2 and 3 above) follow the first card. These classes are defined for all data sets in this library. The remaining cards are given for each inventory set as described for card input data sets (INV = 3) given above for card types 1 and 4.

When input is from File 15, the file is rewound after being read because subsequent cases may also access the file.

Three error messages are generated by SQIN. When the value of INV-3 is not in the range of 1 to NSETS an error message is printed as follows:

"Inventory not found (NSETS) set in library. ISET = ISET).

When an end-of-file is encountered on the card input file the following message is printed:

"End of file on input, IEND = 29"

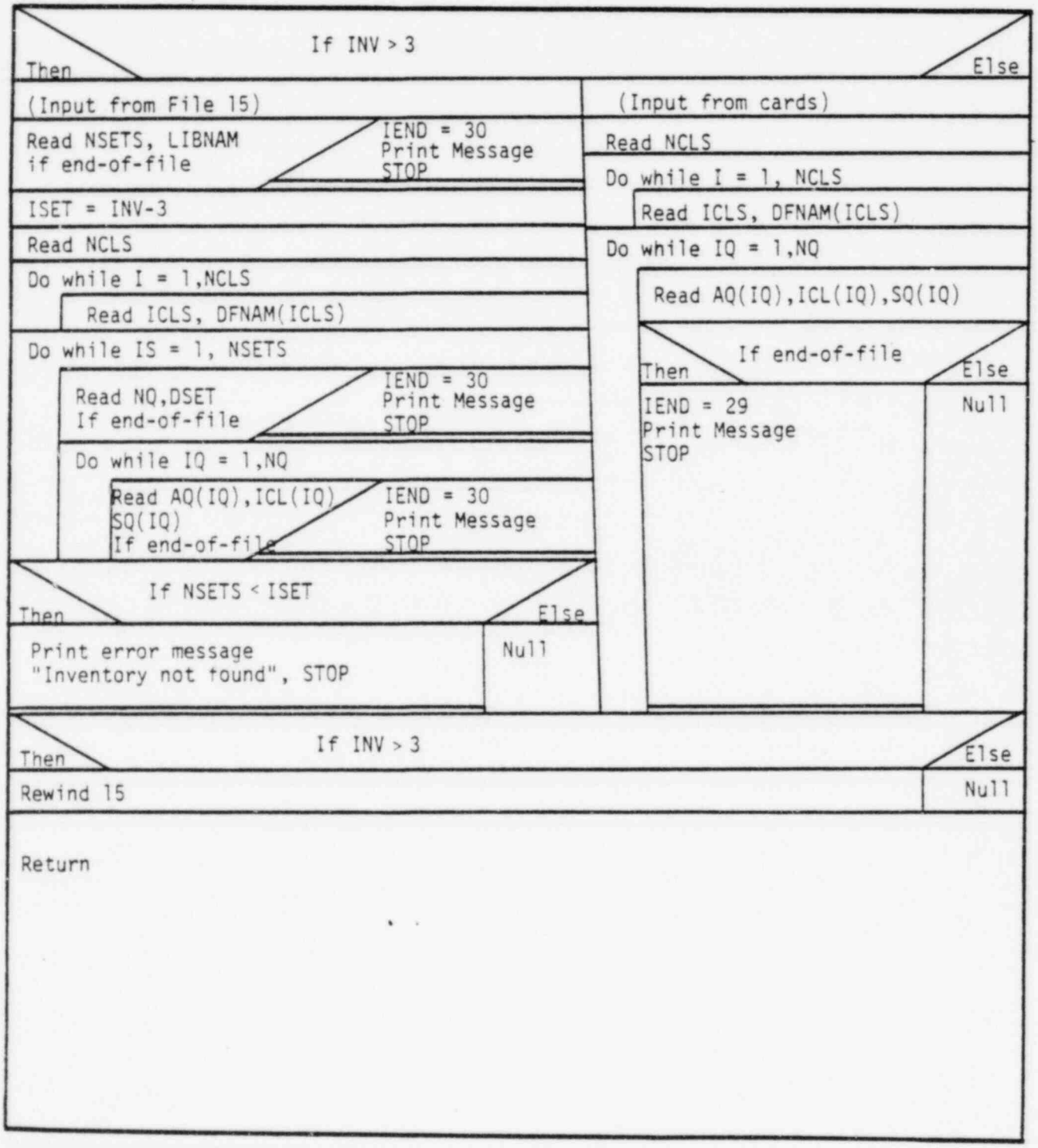
When an end-of-file is encountered on File 15 the following message is printed:

"End of file on source, IEND = 30"

Execution is stopped when any of these errors is detected.

A logic diagram for subroutine SQIN is given in Figure A.2-8.

FIGURE A.2-8 SQIN Logic Diagram



APPENDIX B

DATA LIBRARIES

APPENDIX B

DATA LIBRARIES

The code ALLDOS uses two data libraries to provide dose conversion factors plus a third optional library for basic inventory data. The data libraries used by ALLDOS are:

File 10 - Radionuclide identification plus external and inhalation dose conversion factor data library.

File 12 - Terrestrial pathway dose conversion factor data library.

File 15 - Radionuclide inventory data library.

The following sections describe each data file.

B.1 File 10 - Radionuclide Identification/Dose Conversion Factors

This data library contains master radionuclide identification symbols, organ identification parameters and dose conversion factor data for external exposure and inhalation uptake. The first card image of the library contains the following information:

Parameter	Columns	Format	Description
NUC	1-5	I5	Number of radionuclides for which data will be supplied in this library, $1 \leq$ NUC ≤ 100.
NORG	6-10	I5	Number of organs for which data is supplied in this library, $1 \leq$ NORG ≤ 10.
NT*	11-15	I5	Number of dose times for which data is supplied in this library, $1 \leq$ NT ≤ 2.
NR*	16-20	I5	Number of release modes to be considered (i.e., acute, chronic), $1 \leq$ NT ≤ 3.
IORG(10)	21-23 24-26 : : 48-50	10I3	Organ index values for each organ that data will be provided for, $1 \leq$ IORG(i) ≤ 23.

* The parameters NT and NR are not currently used by the program.

Values for organ indices are used to identify requested organs for each run through the imput parameter LORG(10). A suggested organ index list is given in Table B.1-1.

The second card contains an 80 character descriptive title to be printed on an output report to indicate which version of this data library was accessed. Each version should therefore have a unique title.

The third card (and fourth if necessary) gives titles for organs that data will be supplied for. Ten characters are allowed for each organ with eight organ names per card (format 8A10). If more than 8 organs are specified ($9 \leq NORG \leq 10$) then an additional card is read. The names are stored in array ONAME(10). The organ index values and the organ names should correspond by position; i.e., IORG(i) is the index for ONAME(i). (See suggested organs in Table B.1-1.)

After the last organ name card a card is read giving dose commitment period information as follows:

Parameter	Columns	Format	Description
IDTIME(1)	1-5	I5	Dose commitment time for 1st period for acute and chronic uptake, years (integer value).
IDTIME(2)	6-10	I5	Dose commitment time for 2nd period for acute and chronic uptake, years (integer value).
IDTIME(3)	11-15	I5	Dose commitment time to be used for acute and chronic releases (prolonged) when the parameter LY = 3, years (integer value).
IDTIME(4)	16-20	I5	Uptake period (plant life) for prolonged releases, years (integer value).

TABLE B.1-1 Suggested Organ Index List

Organ of Reference	Index Value
Total body	1*
Adrenals	9
Bone	6*
Brain	13
Fat	7
GI Tract	
Stomach	20
Small intestine	21
Upper large intestine	22
Lower large intestine	23
Heart	18
Kidneys	3*
Liver	4*
Lungs	8*
Muscle	14
Ovaries	11
Pancreas	17
Prostate	15
Skin	12
Spleen	5
Testes	10
Thyroid	16*

* These organs are included in the current version of the data library (see Appendix C listing).

The remainder of the library contains dose conversion factor data for each radionuclide (NUC total radionuclides). The first card for each radionuclide contains radionuclide identification symbols, an external dose conversion factor and a control parameter to indicate if inhalation data will be provided for the radionuclide. The data is as follows:

Parameter	Columns	Format	Description
REC(i)	1-8	A8	Radionuclide symbol for radionculide i, i.e, KR85. The spelling of this symbol must be used when supplying input radionuclide identification symbols.
-	9-14	6X	Blank
EXDF(1,i)	15-22	E8.1	External dose conversion factor for gamma dose at 5 cm tissue depth, rem per (Ci•sec/m^3).
EXDF(3,i)	23-30	E8.1	External dose conversion factor for gamma dose at 1 cm tissue depth, rem per (Ci•sec/m^3).
EXDF(2,i)	31-38	E8.1	External dose conversion factor for gamma dose to surface tissue, rem per (Ci•sec/m^3).
LO	39040	I2	Control parameter for input of inhalation dose factors: $LO \leq 0$ for no inhalation factor input $1 \leq LO \leq 10$ for input of inhalation dose conversion factors for LO organs, one card per ogran.

ALLDOS uses only the 5 cm external dose conversion factor, EXDF(1,i). When the control parameter LO is positive additional cards are read for this radionuclide. Each additional card contains inhalation dose conversion factors for one organ as follows:

Parameter	Columns	Format	Description
MO	1-2	I2	Organ index for which the data on this card are to be assigned. MO must correspond to a value in the array IORG.
-	3-6	4X	Blank
ODF(1,j,i)	7-14	E8.1	Inhalation dose conversion factor for organ j and radionuclide i for the first exposure type.
ODF(2,j,i)	15-22	E8.1	Inhalation dose conversion factor for the second exposure type.
ODF(3,j,i)	23-30	E8.1	Inhalation dose conversion factor for the third exposure type.
ODF(4,j,i)	31-38	E8.1	Inhalation dose conversion factor for the fourth exposure type.
ODF(5,j,i)	39-46	E8.1	Inhalation dose conversion factor for the fifth exposure type.

The exposure types are defined for specific uptake periods and dose commitment periods as indicated in Table B.1-2. The acute uptake dose conversion factors are based on an inhalation ventilation rate of 3.5×10^{-4} m^3 per sec while

TABLE B.1-2 Inhalation Exposure Types

Exposure Type Index	Uptake Period	Dose Commitment Period*
1	Acute	1 year
2	Acute	50 years
3	1 year	0
4	1 year	49 years
5	30 yuears	40 years

* Measured from the end of the uptake period.

the other factors are based on a rate of 2.3×10^{-4} m^3/sec. The inhalation dose conversion factors have units of rem per (Ci·sec/m^3) for the organ of interest.

B.2 File 12 - Terrestrial Pathway Dose Conversion Factor Data Library

This library contains dose conversion factors for terrestrial pathways representative of the site of interest. Because these factors are dependent on site specific parameters this data library must be developed for each site to be studied. The preparation of the dat library is discussed in Section E.2.1. The first card of the library gives the number of radionuclides (NISO) for which data will be supplied plus a descriptive title which is printed immediately. The format of this card is I5, 7A10.

The data library contains sixteen sets of data as described in Table B.2-1. The first card of each set contains a control parameter (NI) and a descriptive title. The format is I5,7A10. A zero value for NI causes reading of this data library to stop; otherwise all 16 sets are read. The terrestrial pathway dose conversion factors are read next with each card containing data for one radionuclide. These cards contain the following information:

TABLE B.2-1 Terrestrial Pathway Data Sets

Set Number	Exposed Group	Release Mode	Release Type	Dose Commitment Period*
1	Maximum individual	Air	Acute	Period 1
2	Maximum individual	Air	Acute	Period 2
3	Population	Air	Acute	Period 1
4	Population	Air	Acute	Period 2
5	Maximum individual	Water	Acute	Period 1
6	Maximum individual	Water	Acute	Period 2
7	Population	Water	Acute	Period 1
8	Population	Water	Acute	Period 2
9	Maximum individual	Air	Chronic	Period 1
10	Maximum individual	Air	Chronic	Period 2
11	Population	Air	Chronic	Period 1
12	Population	Air	Chronic	Period 1
13	Maximum individual	Water	Chronic	Period 1
14	Maximum individual	Water	Chronic	Period 2
15	Population	Water	Chronic	Period 1
16	Population	Water	Chronic	Period 2

* Dose commitment periods are defined by the user.

Parameter	Columns	Format	Description
RIN(i)	1-7	A7	Radionuclide identification symbol. This symbol must match the symbol for this radionuclide as given in the File 10 library. If a match is not found, data for the radionuclide is ignored.
-	8	1X	Blank
DF(j)	9-18 19-28 • • • 49-58	5E10.2	Dose conversion factors for five organs for this radionuclide and data set. The organs must be the same as those specified on input cards for all runs this library is used with.

When the first data set is read, the RIN parameter is compared with the File 10 input parameter REC to establish a cross index array for the two libraries. For the remainder of the sets the input symbol is compared to the RIN values from the first set. If a miss-match occurs (i.e., if the i-th card does not have RIN(i) as its symbol) then an error message is printed and execution is stopped.

Care must be taken to coordinate organs selected on input cards with those for which data is available here. The two organ lists must correspond exactly.

The acute release dose factors have units of rem per Ci released to the environment for each organ. The chronic release dose factors have units of rem per Ci/year released for each organ. If the chronic release period is N years then the total release is N curies. This is in contrast to the external and inhalation dose factors which are based on a total release of 1 curie over the uptake period.

B.3 File 15 - Radionuclide Inventory Data Library

This data library is used to supply radionuclide inventory activities for calculation of releases in conjunction with release factors (DF values). The

library is only read when the input inventory specification control parameter (INV) is greater than 3.

The organization of the library is:

- title card
- radionuclide class definition
- inventory sets

The title card contains the number of sets (NSETS) of inventory cards to be provided plus a descriptive title for the library. The format is I3, 7X, 7A10. The number of sets must be greater than zero. The radionuclid class identification cards are as follows:

Parameter	Columns	Format	Description
Card 1			
NCLS	1-3	I3	Number of classes to be defined. $1 \leq NCLS \leq 80$.
Cards 2 +			
ICLS	1-3	I3	Class number being defined by this card. $1 \leq ICLS \leq 80$.
-	4-10	7X	Blank
DFNAM(ICLS)	11-20	A10	Descriptive title for this radionuclide class.

The radionuclide classes defined on these cards are used in specifying the radionuclide inventory sets that follow and in specifying the release fractions used to generate the release inventories (see Appendix D on input preparation). the user must coordinate definition and use of the radionuclide classes.

The inventory sets are composed of a title card and one card for each radionuclide as follows:

Parameter	Columns	Format	Description
Card 1			
NQ	1-3	I3	Number of radionuclide cards to follow.
-	4-10	7X	Blank
DSET(5)	11-60	5A10	Title for this inventory set.
Cards 2+ (NQ total)			
AQ(i)	1-8	A8	Radionuclide identification corresponding to a radionuclide symbol (REC) in the File 10 data library.
ICL(i)	9-10	I2	Index of the radionuclide class assigned to this radionuclide. ICL should correspond to one of the values submitted for ICLS in the class definition cards above.
SQ(i)	11-20	E10.1	Activity of this radionuclide in the current inventory set, curies.

The above card formats are repeated for each inventory set to be defined (NSETS).

APPENDIX C

PROGRAM AND DATA LIBRARY LISTINGS

APPENDIX C

PROGRAM AND DATA LIBRARY LISTINGS

This appendix presents listings of the computer program ALLDOS and two data libraries as follows:

Figure C.0-1 - Program Listing

Figure C.0-2 - File 10, Data Library

Figure C.0-3 - File 12, Data Library

A File 15 data library is not shown here because that library is optional and is to be provided by the user. Appendix E provides a sample File 15 library for use with the sample problem.

```
                                    MODULE  ALLDOS
C     MAIN PROGRAM, ALLDOS
C
C#######################################################################
C
C     THIS MODULE CONTROLS READING OF DATA LIBRARIES, INPUT OF CASE
C     DATA, CALCULATION OF RESULTS AND REPORTING OF RESULTS
C     THROUGH CALL TO APPROPRIATE SUBROUTINES.
C
C#######################################################################
C
C
      INCLUDE ALLDOS.ICOM,LIST
C
      COMMON // TC, SO(350), PDOSC(5,2,100), DMAXC(5,2,100)
C
      DIMENSION IORG(10),REC(100),EXDF(3,100),ODF(5,10,100), ONAME(10),
     . TITLE(8),MORG(10),Q(5,100),ISO(100),RIGAD(5,4,100),RIGLD(5,4,100)
     .,DMAX(5,2,100),TMAX(5,2),PDOSE(5,2,100),TPDOSE(5,2),PSUB(2)
     .,DMSUB(2),PINH(5,2),DMINH(5,2),PAFD(5,2),DMAFD(5,2),PLFD(5,2),
     . DMLFD(5,2),FRID(5,2,100),FRED(3,100)
C
      CHARACTER ONAME*10, DAIT*8, XX*8, REC*8, TITLE*10
C
      IEND = 0
C
C     GET CURRENT DATE--
      CALL ADATE (DAIT, XX)
C
C     READ DATA LIBRARY--
      CALL GETLIB (NUC, NORG, IORG, REC, EXDF, ODF, ONAME, IEND, DAIT)
C
C     START OF CASE--
    1 IF (IEND .GT. 0) GO TO 99
C
C     READ DATA FOR CURRENT CASE--
      CALL CASEIN (NUC, REC, NORG, IORG, TITLE, JORG, MORG, Q, ISO)
C
C
C     IF FOOD PATHWAY SELECTED--
      IF (IPATH .GT. 0) THEN
        CALL FOOLIB (NUC, REC, Q, RIGAD, RIGLD, LR, JORG)
      ENDIF
C
C
C     WRITE REPORT DESCRIBING INPUT FOR CURRENT CASE--
      CALL REPORT (1, DAIT, LR, LFCT, LPOP, LM, TITLE, JORG,
     .    MORG, Q, ISO, NUC, REC, ONAME, PM, FPM, PFLOW, XQM, FXQM,
     .    FLOW, INV, DMAX, TMAX, PDOSE, TPDOSE, PSUB, DMSUB, PINH,
     .    DMINH, PAFD, DMAFD, PLFD, DMLFD, IPATH)
C
C
C     CALCULATE DOSE FACTORS FOR CURRENT INVENTORY--
      CALL INVDF (NUC, Q, EXDF, ODF, MORG, JORG, ISO, LR, LY, FRID,FRED)
C
C
C     CALCULATE DOSES FOR CURRENT RELEASE INVENTORY--
    2 CALL DOSECA(JORG,MORG,PM,FPM,PFLOW,XQM,FXQM,FLOW,FRID,FRED,
     .RIGAD,RIGLD,PDOSE,TPDOSE,DMAX,TMAX,PSUB,DMSUB,PINH,DMINH,PAFD,
     .DMAFD,PLFD,DMLFD,NUC)
C
C
C     WRITE DOSE REPORTS FOR CURRENT CASE--
      CALL REPORT (2, DAIT, LR, LFCT, LPOP, LM, TITLE, JORG,
     .    MORG, Q, ISO, NUC, REC, ONAME, PM, FPM, PFLOW, XQM, FXQM,
     .    FLOW, INV, DMAX, TMAX, PDOSE, TPDOSE, PSUB, DMSUB, PINH,
     .    DMINH, PAFD, DMAFD, PLFD, DMLFD, IPATH)
C
C     RETURN TO START FOR NEXT CASE--
   11 GO TO 1
C
C     END OF RUN
   99 STOP
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE CASEIN

      SUBROUTINE CASEIN(NUC,REC,NORG,IORG,TITLE,JORG,MORG,Q,ISO)
C
C=======================================================================
C
C     CASEIN CONTROLS INPUT OF NUCLIDE INVENTORY AND CALCULATION
C     DESCRIPTION FOR THE NEXT CASE.
C
C=======================================================================
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------
C     PARAMETER   TYPE        DESCRIPTION
C-----------------------------------------------------------------------
C
C     NUC         INTEGER     NO. OF RADIONUCLIDES IN MASTER LIST (FILE 10)
C     REC(100)    CHARACTER   RADIONUCLIDE NAME FROM MASTER LIST
C     NORG        INTEGER     NO. OF ORGANS DEFINED IN FILE 10 MASTER LIST
C     IORG(10)    INTEGER     ORGAN INDEX VALUES FOR FILE 10 ORGANS
C     TITLE(8)    CHARACTER   DESCRIPTIVE TITLE FOR THIS CASE
C     JORG        INTEGER     NO. OF ORGANS SELECTED FOR THIS CASE
C     MORG(10)    INTEGER     ORGAN CROSS-INDEX VALUES FOR SELECTED ORGANS
C     Q(5,100)    REAL        ACTIVITY (CURIES) OF EACH RADIONUCLIDE RE-
C                             LEASES FOR EACH PATHWAY
C     ISO(100)    INTEGER     CONTROL INTEGER TO INDICATE WHICH MASTER RAD-
C                             IONUCLIDES ARE INCLUDED IN THE RELEASE TERM
C
C-----------------------------------------------------------------------
C
C
      INCLUDE ALLDOS.ICOM,LIST
C
      COMMON // TC, SQ(350), PDOSC(5,2,100), DMAXC(5,2,100)
C
      DIMENSION REC(100), IORG(10), MORG(10), LORG(5), Q(5,100), QT(5),
     .ISO(100), TITLE(8)
C
      CHARACTER TITLE*10, AREC*8, REC*8
C
      NAMELIST /INPUT/ LR, NREL, LPOP, LFCT, LM, LORG, NRN, LY,
     .    INV, LADF, LTDF, LFDF, TC, PM, XQM,
     .    FPM, FXQM, FLOW, PFLOW, IPATH
C
C     INITIALIZE ERROR FLAG--
      IEND=0
C
C     READ CASE TITLE (CARD TYPE 1)--
      READ (5,100,END=98) TITLE
  100 FORMAT (8A10)
C
C     READ NAMELIST INPUT--
      READ (5,INPUT)
C
C     EDIT INPUT DATA--
      CALL EDORG (NORG, IORG, LORG, MORG, JORG, IEND)
C
      IF (IEND .GT. 0)   GO TO 99
C     THEN ERROR HAS BEEN FOUND.
C
      IF (INV .LE. 0)   GO TO 21
C     THEN NO ACTION IS TAKEN, USE PREVIOUS INVENTORY.
C
      CALL ZEROI (100, ISO)
C
      IF (INV .NE. 1) GO TO 22
C     ELSE READ RELEASE ACTIVITY FROM CARD TYPE 2--
C
      DO 20 IN = 1, NRN
        READ (5,200,END=97) AREC, (QT(K), K=1,NREL)
  200   FORMAT (A8, 2X, 5E10.1)
C
        NN = 0
        I = 1
    7   IF (I .NE. NUC+1)   GO TO 9
```

FIGURE C.0-1. Program Listing

```
C
C       ERROR CONDITION - RADIONUCLIDE NOT FOUND--
        IEND = 6
        PRINT 401, IN, AREC, IEND
  401   FORMAT (1H1, ' INPUT RADIONUCLIDE ', I4, A8, ' CANNOT '
     .  'BE FOUND IN THE MASTER LIST, STOP'/ ' IEND = ', I2)
        STOP
C
C       TEST INPUT NAME AGAINST MASTER LIST NUCLIDES--
    9   IF (REC(I) .EQ. AREC)   GO TO 11
        I = I + 1
        GO TO 7
C
C       NUCLIDE FOUND, SET FLAG AND ACTIVITIES--
   11   NN = I
        ISO(NN) = 1
C
        DO 12 J = 1, NREL
          Q(J,NN) = QT(J)
   12   CONTINUE
   20 CONTINUE
C
      GO TO 21
C
C     GENERATE NEW RELEASE ACTIVITIES--
   22 CALL SOURCE(NUC,REC,ISO,INV,LADF,LTDF,LFDF,TITLE,Q,IEND)
C
   21 CONTINUE
C
C     SET LY TO DEFAULT VALUE IF VALUE NOT SUPPLIED IN NAMELIST,
C     USED FOR PRINTING REPORTS--
      IF (LY .NE. 3)  LY = 2
C
      RETURN
C
C     ERROR CONDITIONS--
C
   97 IEND=5
      GO TO 99
C
   98 IEND=3
   99 PRINT 300,IEND
  300 FORMAT(1H1,'END OF FILE ON INPUT IEND =',I4)
      STOP
C
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE  DFIN

      SUBROUTINE DFIN (LADF, LTDF, LFDF, ADF, TDF, FDF)
C
C*****************************************************************************
C
C     DFIN READS UP TO THREE SETS OF DF VALUES AS REQUESTED
C
C*****************************************************************************
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER   TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     LADF        INTEGER     CONTROL INTEGER FOR INPUT OF AIRBORNE PATH-
C                             WAY RELEASE FACTORS/INHALATION, EXT. EXPOSURE
C     LTDF        INTEGER     CONTROL INTEGER FOR INPUT OF LIQUID EFFLUENT
C                             TERRESTRIAL PATHWAY RELEASE FACTOR
C     LFDF        INTEGER     CONTROL INTEGER FOR INPUT OF AIRBORNE EFFLUENT
C                             TERRESTRIAL PATHWAY RELEASE FACTORS
C     ADF(80)     REAL        AIRBORNE PATHWAY RELEASE FACTORS FOR INHAL-
C                             ATION & EXTERNAL EXPOSURE BY RADIONUCLIDE
C     TDF(80)     REAL        WATERBORNE TERRESTRIAL PATHWAY RELEASE
C                             FACTORS BY RADIONUCLIDE CLASS
C     FDF(80)     REAL        AIRBORNE TERRESTRIAL PATHWAY RELEASE FACTOR
C                             BY RADIONUCLIDE CLASS
C
C-----------------------------------------------------------------------------
C
      DIMENSION ADF(80), TDF(80), FDF(80)
C
C     IF ANY RELEASE CONTROL INTEGER IS 2;, READ CLASSES, CARD TYPE 3
      IF (LADF .EQ. 2 .OR. LTDF .EQ. 2 .OR. LFDF .EQ. 2) READ(5,100) NCL
      IF(LADF.LE.0) GO TO 3
C
C     READ AIRBORNE PATHWAY/EXTERNAL AND INHALATION VALUES--
      CALL ZEROR (NCL, ADF)
      CALL DFREAD (ADF)
C
C     READ DF VALUES FOR AIRBORNE/TERRESTRIAL--
    3 IF (LFDF .LE. 0) GO TO 2
      CALL ZEROR (NCL, FDF)
      CALL DFREAD (FDF)
C
C     READ DF VALUES FOR LIQUID/TERRESTRIAL--
    2 IF (LTDF .LE. 0)   GO TO 4
      CALL ZEROR (NCL, TDF)
      CALL DFREAD (TDF)
    4 RETURN
C
  100 FORMAT(I2)
C
      END
```

FIGURE C.0-1. Program Listing

MODULE DFREAD

```
      SUBROUTINE DFREAD (DF)
C
C*****************************************************************************
C
C     DFREAD READS A SET OF DF VALUES INTO A DF ARRAY UNTIL 99 IS READ
C     IN COLUMNS 1 AND 2
C
C*****************************************************************************
C
C                 ARGUMENT LIST PARAMTER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER   TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     DF(80)      REAL        RELEASE FACTOR FOR EACH RADIONUCLIDE CLASS
C
C-----------------------------------------------------------------------------
C
C
      DIMENSION DF(80)
C
C     READ 80 VALUES (CARD TYPE 4), THEN RETURN--
    1 READ (5,100,END=99) IC, D
      IF (IC .GT. 80)  GO TO 3
C
C     SET TO CORRESPONDING VALUE IN DF ARRAY--
      DF(IC) = DF(IC) + D
C
      GO TO 1
C
C     ERROR CONDITION--
   99 IEND=27
      PRINT 200, IEND
      STOP

    3 RETURN
C
C     FORMAT STATEMENTS--
C
  100 FORMAT (I2, E8.1)
  200 FORMAT(1H1,'END OF FILE ON DF INPUT IN DFREAD, IEND =',I3)
C
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE DOSECA

      SUBROUTINE DOSECA(JORG,MORG,PM,FPM,PFLOW,XOM,FXOM,FLOW,FRID,FRED,
     .RIGAD,RIGLD,PDOSE,TPDOSE,DMAX,TMAX,PSUB,DMSUB,PINH,DMINH,PAFD,
     .DMAFD,PLFD,DMLFD,NUC)
C
C*****************************************************************
C
C     DOSECA CONTROLS DOSE CALCULATIONS
C
C*****************************************************************
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------
C     PARAMETER   TYPE        DESCRIPTION
C-----------------------------------------------------------------
C
C     JORG        INTEGER     NO. OF ORGANS DEFINED IN FILE 10 MASTER LIST
C     MORG        INTEGER     ORGAN CROSS-INDEX VALUES FOR SELECTED ORGANS
C     PM          REAL        POPULATION DISPERSION FACTOR / AIRBORNE PATH
C     FPM         REAL        POPULATION DISPERSION FACTOR/TERRESTRIAL PATH
C     PFLOW       REAL        POPULATION DILUTION FACTOR / WATERBORNE PATH
C     XOM         REAL        MAX. INDIVIDUAL AIR CONC. / AIRBORNE PATH
C     FXOM        REAL        MAX. INDIVIDUAL AIR CONC. / TERRESTRIAL PATH
C     FLOW        REAL        MAX. INDIVIDUAL DILUTION FACTOR / WATERBORNE
C     FRID        REAL        INHALATION DOSE CONVERSION FACTORS
C     FRED        REAL        EXTERNAL DOSE CONVERSION FACTORS
C     RIGAD       REAL        TERRESTRIAL PATHWAY DOSE CONVERSION FACTOR
C     RIGLD       REAL        WATERBORNE PATHWAY DOSE CONVERSION FACTOR
C     PDOSE       REAL        FRACTIONAL CONTRIBUTION TO POPULATION DOSE
C     TPDOSE      REAL        TOTAL POPULATION DOSES
C     DMAX        REAL        FRACTIONAL CONTRIB. TO MAX. INDIVIDUAL DOSE
C     TMAX        REAL        TOTAL MAXIMUM INDIVIDUAL DOSES
C     PSUB        REAL        TOTAL POPULATION EXTERNAL DOSES
C     DMSUB       REAL        TOTAL MAXIMUM INDIVIDUAL EXTERNAL DOSE
C     PINH        REAL        TOTAL POPULATION INHALATION DOSE
C     DMINH       REAL        TOTAL MAX. INDIVIDUAL INHALATION DOSE
C     PAFD        REAL        TOTAL POPULATION TERRESTRIAL PATHWAY DOSE
C     DMAFD       REAL        TOTAL MAX. INDIVIDUAL TERRESTRIAL PATH DOSE
C     PLFD        REAL        TOTAL POPULATION WATERBORNE PATHWAY DOSE
C     DMLFD       REAL        TOTAL MAX. INDIVIDUAL WATERBORNE PATH DOSE
C     NUC         INTEGER     NO. OF RADIONUCLIDES IN MASTER LIST (FILE 10)
C
C-----------------------------------------------------------------
C
C
      COMMON // TC, SQ(350), PDOSC(5,2,100), DMAXC(5,2,100)
C
      DIMENSION MORG(10), FRID(5,2,100), FRED(3,100), RIGAD(5,4,100),
     .RIGLD(5,4,100), PDOSE(5,2,100), TPDOSE(5,2), DMAX(5,2,100),
     . TMAX(5,2),PSUB(2),  DMSUB(2),  PINH(5,2),DMINH(5,2),PAFD(5,2),
     . DMAFD(5,2), PLFD(5,2), DMLFD(5,2)
C
      CALL ZEROR(10,TMAX)
      CALL ZEROR(10,TPDOSE)
      CALL ZEROR(10,PINH)
      CALL ZEROR(10,PAFD)
      CALL ZEROR(10,PLFD)
      CALL ZEROR(10,DMINH)
      CALL ZEROR(10,DMAFD)
      CALL ZEROR(10,DMLFD)
      CALL ZEROR(2,PSUB)
      CALL ZEROR(2,DMSUB)
C
C     ADD DOSES FOR EACH NUCLIDE--
C
C
C     FOR EACH RADIONUCLIDE IN THE MASTER LIST--
      DO 20 NN = 1, NUC
C
C       FOR EACH DOSE COMMITMENT PERIOD--
        DO 10 IT = 1, 2
C
          PL = 1.
          IF (IT .EQ. 2) PL = TC
```

FIGURE C.0-1. Program Listing

```
C
C         CALCULATE EXTERNAL DOSES BY NUCLIDE--
          AP = FRED(1,NN) * PM * PL
          AM = FRED(1,NN) * XQM * PL
C
C        -IT- IS THE INDEX FOR LIQUID RELEASE MAXIMUM INDIVIDUAL DOSES.
C        -ITP- IS THE INDEX FOR LIQUID RELEASE POPULATION DOSES.
C
          ITP = IT + 2
C
C         CALCULATE TOTAL EXTERNAL DOSE--
          PSUB(IT) = PSUB(IT) + AP
          DMSUB(IT) = DMSUB(IT) + AM
C
C         FOR EACH SELECTED ORGAN--
          DO  5 JO=1,JORG
C
C           CALCULATE POPULATION DOSES--
            BP = FRID(JO,IT,NN) * PM * PL
            CP = RIGAD(JO,ITP,NN) * FPM
            DP = RIGLD(JO,ITP,NN) * PFLOW
C
            PDOSE(JO,IT,NN) = AP + BP + CP + DP
            TPDOSE(JO,IT) =TPDOSE(JO,IT) + PDOSE(JO,IT,NN)
C
C           CALCULATE TOTALS BY PATHWAY--
            PINH(JO,IT) = PINH(JO,IT) + BP
            PAFD(JO,IT) = PAFD(JO,IT) + CP
            PLFD(JO,IT) = PLFD(JO,IT) + DP
C
C           CALCULATE MAXIMUM INDIVIDUAL DOSES--
C
            BM = FRID(JO,IT,NN) * XQM * PL
            CM = RIGAD(JO,IT,NN) * FXQM
            DM = RIGLD(JO,IT,NN) * FLOW
C
            DMAX(JO,IT,NN) = AM + BM + CM + DM
C
C           CALCULATE TOTALS BY PATHWAY--
            DMINH(JO,IT) = DMINH(JO,IT) + BM
            DMAFD(JO,IT) = DMAFD(JO,IT) + CM
            DMLFD(JO,IT) = DMLFD(JO,IT) + DM
C
            TMAX(JO,IT) = TMAX(JO,IT) + DMAX(JO,IT,NN)
C
  5       CONTINUE
 10     CONTINUE
 20   CONTINUE
C
C      CALCULATE FRACTIONAL DOSE CONTIRUBTIONS--
C
C      FOR EACH SELECTED ORGAN--
       DO 30 IM = 1,JORG
C
C        FOR EACH COMMITMENT PERIOD--
         DO 28 IT = 1,2
C
C           MAXIMUM INDIVIDUAL CONTRIBUTIONS--
C
C           TEST FOR ZERO TOTAL DOSE; IF ZERO, SKIP--
            IF (TMAX(IM,IT) .LE. 0.)  GO TO 24
C
            FAC =1./TMAX(IM,IT)
C
C           FOR EACH RADIONUCLIDE IN MASTER LIST--
            DO 22 NN = 1, NUC
              DMAXC(IM,IT,NN) = DMAX(IM,IT,NN)
              DMAX(IM,IT,NN) = DMAX(IM,IT,NN) * FAC
 22         CONTINUE
C
C           POPULATION CONTRIBUTIONS--
C
C           TEST FOR ZERO TOTAL DOSE; IF ZERO, SKIP--
```

FIGURE C.0-1. Program Listing

```
                                    MODULE DOSECA

   24      IF (TPDOSE(IM,IT) .LE. 0.)  GO TO 28
C
           FAC = 1. / TPDOSE(IM,IT)
C
C          FOR EACH RADIONUCLIDE IN MASTER LIST--
           DO 25 NN = 1, NUC
C
             PDOSC(IM,IT,NN) = PDOSE(IM,IT,NN)
             PDOSE(IM,IT,NN) = PDOSE(IM,IT,NN) * FAC
C
   26      CONTINUE
   28    CONTINUE
   30 CONTINUE
      RETURN
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE EDORG

      SUBROUTINE EDORG (NORG, IORG, LORG, MORG, JORG, IEND)
C
C*****************************************************************************
C
C     EDORG EDITS INPUT ORGAN IDENTIFIERS AGAINST LIBRARY ORGAN
C     IDENTIFIERS.  A CROSS INDEX ARRAY (MORG) IS ESTABLISHED TO
C     INDICATE THE LOCATION OF ORGAN DATA IN LIBRARY ARRAYS.
C
C*****************************************************************************
C
C                  ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     NORG         INTEGER     NO. OF ORGANS DEFINED IN FILE 10 MASTER LIST
C     IORG(10)     INTEGER     ORGAN INDEX VALUES DEFINED FOR FILE 10 ORGANS
C     LORG(5)      INTEGER     INPUT ORGAN INDEX VALUES
C     MORG(5)      INTEGER     ORGAN CROSS-INDEX ARRAY FOR SELECTED ORGANS
C     JORG         INTEGER     NO. OF ORGANS SPECIFIED ON INPUT
C     IEND         INTEGER     ERROR FLAG SET WHEN BAD ORGAN INDEX FOUND
C
C-----------------------------------------------------------------------------
C
C
      DIMENSION IORG(10), LORG(5), MORG(5)
C
C     INITIALIZE PARAEMTERS--
      JORG=0
      CALL ZERO1(5,MORG)
C
      DO 1 N=1,5
C
C       IF ERROR FLAG IS SET, RETURN TO CALLING PROGRAM
        IF(IEND.NE.0) GO TO 4
C
C       IF THIS ORGAN IS NOT CONSIDERED, GO TO BOTTOM OF LOOP
        IF(LORG(N).LE.0) GO TO 1
C
        ID=0
C
C       ESTABLISH ORGAN CROSS-INDEX--
        DO 2 M=1,NORG
          IF(LORG(N).NE.IORG(M)) GO TO 5
          JORG=JORG+1
          MORG(JORG)=M
          ID=1
    5     CONTINUE
    2   CONTINUE
C
C       DETERMINE IF THERE IS AN ERROR--
        IF (ID .LT. 1) GO TO 3
C
        GO TO 1
C
C       ERROR CONDITION--
    3   IEND=4
        PRINT 100, N
C
    1 CONTINUE
    4 CONTINUE
C
  100 FORMAT(10X,'ORGAN ID',I3,' NOT FOUND')
C
      RETURN
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE  FOOLIB

      SUBROUTINE FOOLIB (NUC, REC, Q, RIGAD, RIGLD, LR, JORG)
C
C*****************************************************************************
C
C     FOOLIB READS DATA FOR FOOD PATHWAY DOSES AND MULTIPLIES BY CI.
C
C*****************************************************************************
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     NUC          INTEGER     NO. OF RADIONUCLIDE IN MASTER LIST
C     REC(100)     CHARACTER   RADIONUCLIDE NAME FROM THE MASTER LIST
C     Q(5,100)     REAL        RELEASE INVENTORY ARRAY
C     RIGAD        REAL        TERRESTRIAL PATHWAY DOSE CONVERSION FACTOR
C     RIGLD        REAL        WATERBORNE PATHWAY DOSE CONVERSION FACTOR
C     LR           INTEGER     CONTROL INTEGER FOR ACUTE/CHRONIC RELEASE
C     JORG         INTEGER     NO. OF ORGANS SPECIFIED ON INPUT
C
C-----------------------------------------------------------------------------
C
      DIMENSION REC(100), Q(5,100), TITLE(7), DF(5), RIN(100)
      DIMENSION RIGAD(5,4,100), RIGLD(5,4,100)
      DIMENSION INR(100), DFAA(5,4,100), DFCA(5,4,100), DFAL(5,4,100),
     .          DFCL(5,4,100)
C
      CHARACTER TITLE*10, RI*7, RIN*7,REC*8
C
      DATA IFRST /1/
C
      CALL ZEROR (2000, RIGAD)
      CALL ZEROR (2000, RIGLD)
C
      IF (IFRST .GT. 1)    GO TO 150
      IFRST = IFRST + 1
C
C     READ DATA FROM FILE 12. FOOD DOSE CONVERSION FACTORS--
      READ (12,100,END=99) NISO, TITLE
      NIN=0
      PRINT 200, NISO, TITLE
C
C     LOOP ON DATA SETS--
      DO 50 ISET =1, 15
        READ (12,100,END=99) NI, TITLE
        IF (NI .LE. 0)   GO TO 150
        NIN = NIN + 1
        IF (ISET .EQ. 1)   GO TO 10
        IF (ISET .LE. 4)   GO TO 20
        IF (ISET .LE. 8)   GO TO 30
        IF (ISET .LE. 12)  GO TO 40
        IF (ISET .LE. 15)  GO TO 50
C
C
C       FIRST SET.  READ DATA AND ESTABLISH NUCLIDE INDEX ARRAY INR--
C
C       LOOP ON NUCLIDES--
   10   DO 15 NN = 1, NISO
C
          READ (12,300,END=90) RIN(NN), DF
          INR(NN) = 100
C
C         FIND RIN IN MASTER ARRAY REC--
          DO 11 IS = 1, NUC
            ISO = IS
            IF (REC(IS) .EQ. RIN(NN) )   GO TO 12
   11     CONTINUE
C
          PRINT 400, NN, RIN(NN), ISET
          GO TO 15
C
   12     INR(NN) = ISO
```

FIGURE C.0-1. Program Listing

```
                                MODULE  FOOL13
C
C         SET DATA FOR ORGAN--
          DO 13 IO = 1, 4
            DFAA(IO,1,ISO) = DF(IO)
   13     CONTINUE
C
   15   CONTINUE
        GO TO 50
C
C       SET DATA FOR SETS 2 - 4, ACUTE AIR PATH--
   20   DO 25 NN = 1, NISO
          ISO = INR(NN)
          READ (12,300,END=99) RI, (DFAA(I,NIN,ISO), I=1,4)
          IF (RI .NE. RIN(NN))   GO TO 99
   25   CONTINUE
        IF (NIN .EQ. 4)   NIN = 0
        GO TO 50
C
C       SET DATA FOR SETS 5-8 , ACUTE LIQUID PATH--
   30   DO 35 NN = 1, NISO
          ISO = INR(NN)
          READ (12,300,END=99) RI, (DFAL(I,NIN,ISO), I=1,4)
          IF (RI .NE. RIN(NN))   GO TO 99
   35   CONTINUE
        IF (NIN .EQ. 4) NIN = 0
        GO TO 50
C
C       SET DATA FOR SETS 7-12, CHRONIC AIR PATH--
   40   DO 45 NN = 1, NISO
          ISO = INR(NN)
          READ (12,300,END=99) RI, (DFCA(I,NIN,ISO), I=1,4)
          IF (RI .NE. RIN(NN))    GO TO 98
   45   CONTINUE
        IF (NIN .EQ. 4) NIN = 0
        GO TO 50
C
C       SET DATA FOR SETS 13-16, CHRONIC LIQUID PATH--
   50   DO 55 NN = 1, NISO
          ISO = INR(NN)
          READ (12,300,END=99) RI, (DFCL(I,NIN,ISO), I=1,4)
          IF (RI .NE. RIN(NN))   GO TO 98
   55   CONTINUE
        IF (NIN .EQ. 4)   NIN = 0
C
   60 CONTINUE
C
C     END OF LIBRARY INPUT--
C
C     SET DATA FOR CURRENT RELEASE TYPE--
  150 IF (LR .GT. 1)   GO TO 70
C
C     ACUTE RELEASE--
      DO 65 NN = 1, NUC
        DO 63 IM = 1, JORG
          DO 61 K = 1, 4
C
            RIGAD(IM,K,NN) = DFAA(IM,K,NN) * Q(2,NN)
            RIGLD(IM,K,NN) = DFAL(IM,K,NN) * Q(3,NN)
C
   61     CONTINUE
   63   CONTINUE
   65 CONTINUE
      GO TO 30
C
C     CHRONIC RELEASE--
   70 DO 75 NN = 1, NUC
        DO 73 IM = 1, JORG
          DO 71 KK = 1, 4
C
            RIGAD(IM,KK,NN) = DFCA(IM,KK,NN) * Q(2,NN)
            RIGLD(IM,KK,NN) = DFCL(IM,KK,NN) * Q(3,NN)
C
   71     CONTINUE
```

FIGURE C.0-1. Program Listing

```
   73   CONTINUE
   75 CONTINUE
   80 RETURN
C
C     PRINT ERROR MESSAGE FOR DATA OUT OF ORDER--
   98 PRINT 500, ISET, NN, RI, RIN(NN)
      STOP
C
C     END OF FILE MESSAGE--
   99 PRINT 600, ISET, NN, RIN(NN)
      STOP
C
C     FORMAT STATEMENTS--
C
  100 FORMAT(I5,7A10)
  200 FORMAT(1H0,'FOOD FACTOR LIBRARY - ',7A10)
  300 FORMAT(A7,1X,5E10.2)
  400 FORMAT(' FOOD LIBRARY NUCLIDE',I3,2X,A7,'WAS NOT FOUND.  SET',I3)
  500 FORMAT(' FOOD DATA OUT OF ORDER IN SET',I3,' NUCLIDE',I3,2X,A7,
     .' DOES NOT MATCH ',A7)
  600 FORMAT(' END OF FILE ON FOOD LIBRARY READ. SET',I4,' NUCLIDE',I4,
     .2X,A7)
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE FRCRPT

      SUBROUTINE FRCRPT (NUC, ISO, REC, YA, JORG, MORG, ONAME, TITLE,
                         DAIT, DMAX, PDOSE)
C
C*****************************************************************************
C
C     FRCRPT  PRINTS 4 REPORTS.     FIRST  FOR MI - 1 YEAR
C                                   SECOND FOR MI - 70 YEARS
C                                   THIRD  FOR POP - 1 YEAR
C                                   FOURTH FOR POP - 70 YEARS
C
C*****************************************************************************
C
C                  ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     NUC          INTEGER     NO. OF RADIONUCLIDES IS MASTER LIST (FILE 10)
C     ISO(100)     INTEGER     WHICH RADIONUCLIDES INCLUDED IN RELEASE TERM
C     REC(100)     CHARACTER   RADIONUCLIDE NAME FROM THE MASTER LIST
C     YA           CHARACTER   TEXT FOR HEADING ('YEARS')
C     JORG         INTEGER     NO. OF ORGANS SELECTED FOR THIS CASE
C     MORG         INTEGER     ORGAN CROSS-INDEX VALUES FOR SELECTED ORGANS
C     ONAME        CHARACTER   ORGAN NAMES
C     TITLE(8)     CHARACTER   CASE TITLE
C     DAIT         CHARACTER   DAY OF YEAR
C     DMAX         REAL        MAX. INDIVIDUAL DOSE FRACTIONAL CONTRICUTION
C     PDOSE        REAL        POPULATION DOSE FRACTIONAL CONTRIBUTION
C
C-----------------------------------------------------------------------------
C
      INCLUDE ALLDOS.ICOM,LIST
      INCLUDE ALLDOS.DOSTIM,LIST
C
      COMMON /TITLE/ DSET(5)
C
      COMMON // TC, SC(350), PDOSC(5,2,100), DMAXC(5,2,100)
C
C
      DIMENSION ISO(100), REC(100), MORG(10), ONAME(10), TITLE(8),
     .DMAX(5,2,100), PDOSE(5,2,100), INDX(4), IDX(4)
C
      CHARACTER TITLE*10, REC*8, ONAME*10, DAIT*8, DSET*10, YA*6
C
      DATA IDX / 1, 2, 1, 2/
C
      INDX(1) = 1
      INDX(2) = LY
      INDX(3) = 1
      INDX(4) = LY
C
C     LOOP ON REPORTS--
      DO 50 IRP = 1, 4
        IF (IRP .LE. 2 .AND. LM .LE .0) GO TO 50
        IF (IRP .GE. 3 .AND. LPOP .LE. 0) GO TO 50
        IKK = 1
        IF (LFCT .EQ. 3) IKK = 2
C
        DO 45 IK = 1, IKK
          PRINT 100, TITLE, DSET, DAIT
          IF (LFCT .EQ. 2)  GO TO 15
          IF (IK .EQ .2)  GO TO 15
          IF (IRP .LE. 2) PRINT 200, IDTIME(INDX(IRP)), YA
          IF (IRP .GT. 2) PRINT 300, IDTIME(INDX(IRP)), YA
          GO TO 16
C
   15     IF (IRP .LE. 2) PRINT 250, IDTIME(INDX(IRP)), YA
          IF (IRP .GT. 2) PRINT 350, IDTIME(INDX(IRP)), YA
C
   16     PRINT 400, ( ONAME(MORG(I)), I = 1, JORG)
C
C         LOOP ON NUCLIDES FOR MAXIMUM INDIVIDUAL--
          IF (IRP .GT. 2) GO TO 30
```

FIGURE C.0-1. Program Listing

```
                                MODULE FRCRPT

            IF (IKK .EQ. 1 .AND. LFCT .EQ. 2) GO TO 22
            IF (IK .EQ. 2 .AND. LFCT .EQ. 3) GO TO 22
C
            DO 20 NN = 1, NUC
              IF (ISO(NN) .LE. 0) GO TO 20
              PRINT 500, REC(NN), (DMAX(I,IDX(IRP),NN), I = 1, JORG)
   20       CONTINUE
C
            GO TO 30
C
   22       DO 24 NN = 1, NUC
              IF (ISO(NN) .LE. 0) GO TO 24
              PRINT 500, REC(NN), (DMAXC(I,IDX(IRP),NN), I = 1, JORG)
   24       CONTINUE
   30       IF (IRP .LT. 3) GO TO 45
            IF (LPOP .LE. 0) GO TO 45
C
C           LOOP ON NUCLIDES FOR POPULATION--
            IF (IKK .EQ. 1 .AND. LFCT .EQ. 2)  GO TO 42
            IF (IK .EQ. 2 .AND. LFCT .EQ. 3)  GO TO 42
C
            DO 40 NN = 1, NUC
              IF (ISO(NN) .LE. 0) GO TO 40
              PRINT 500, REC(NN), (PDOSE(I,IDX(IRP),NN), I=1,JORG)
   40       CONTINUE
C
            GO TO 45
C
   42       DO 44 NN = 1, NUC
              IF (ISO(NN) .LE. 0)  GO TO 44
              PRINT 500,REC(NN),(PDOSC(I,IDX(IRP),NN),I=1,JORG)
   44       CONTINUE
C
   45    CONTINUE
   50 CONTINUE
C
      RETURN
C
C     FORMAT STATEMENTS--
C
  100 FORMAT(1H1,8A10/16X,5A10/37X,A8)
C
  200 FORMAT(1H0,' FRACTIONAL DOSE BY NUCLIDE FOR THE MAXIMUM INDIVIDUAL
     ..  DOSE TIME ',I2, A6)
C
  250 FORMAT(1H0,' DOSE BY NUCLIDE FOR THE MAXIMUM INDIVIDUAL.  DOSE TIM
     *E ',I2, A6)
C
  300 FORMAT(1H ,' FRACTIONAL DOSE BY NUCLIDE FOR THE POPULATION.  DOSE
     .TIME ', I2, A6)
C
  350 FORMAT(1H ,' DOSE BY NUCLIDE FOR THE POPULATION.  DOSE TIME  '
     *,I2, A6)
C
  400 FORMAT(1H0,'   NUCLIDE ',5(2X,A10))
C
  500 FORMAT(5X,A7,5(2X,1PE10.1E2))
C
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE  GETLIB

      SUBROUTINE GETLIB (NUC, NORG, IORG, REC, EXDF, ODF, ONAME, IEND,
     .                   DAIT)
C
C=======================================================================
C
C     GETLIB READS FILE 10 DATA LIBRARY
C
C=======================================================================
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------
C
C     NUC          INTEGER     NO. OF RADIONUCLIDES IN MASTER LIST
C     NORG         INTEGER     NO. OF ORGANS DEFINED IN FILE 10 MASTER FILE
C     IORG         INTEGER     ORGAN INDEX VALUES DEFINED FOR FILE 10 ORGANS
C     REC(100)     CHARACTER   RADIONUCLIDE NAME FROM THE MASTER LIST
C     EXDF(3,100) REAL         EXTERNAL DOSE FACTORS ARRAY
C     ODF(5,10,100) REAL       ORGAN DOSE FACTOR ARRAY
C     ONAME(10)    CHARACTER   ORGAN NAMES
C     IEND         INTEGER     ERROR FLAG SET WHEN BAD ORGAN INDEX FOUND
C     DAIT         CHARACTER   DAY-OF-YEAR
C
C-----------------------------------------------------------------------
C
      INCLUDE ALLDOS.DOSTIM,LIST
C
      DIMENSION REC(100), IORG(10), AL(100), EXDF(3,100), ODF(5,10,100),
     .ONAME(10), OD(5), HEAD(9)
C
      CHARACTER HEAD*10, ONAME*10, REC*7
C
      IEND=0
C
C     READ FIRST TWO CARDS FROM DATA LIBRARY--
      READ (10,100,END=98) NUC,NORG,NT,NR,IORG,HEAD, (ONAME(I),I=1,NORG)
      READ (10,100,END=98) (IDTIME(I), I=1,4)
C
C     INITIALIZE ARRAYS TO ZERO--
    1 CALL ZEROR (100, AL)
      CALL ZEROR (5000, ODF)
      CALL ZEROR (300, EXDF)
C
C     READ DATA FOR EACH NUCLIDE--
      DO 10 I = 1, NUC
      READ(10,200,END=95) REC(I),AL(I),EXDF(1,I),EXDF(3,I),EXDF(2,I),LO
    3 IF (LO .LE. 0) GO TO 10
C
C     READ INHALATION DOSE FACTORS--
      DO 7 IO = 1, LO
      READ (10,300,END=95) MO, (OD(J), J=1,5)
    5 MX=0
C     IDENTIFY CURRENT NUCLIDE--
      DO 6 NO=1,NORG
      IF(IORG(NO).EQ.MO) MX=NO
    6 CONTINUE
      IF(MX.LE.0) GO TO 97
C
      ODF(1,MX,I)=OD(1)
      ODF(2,MX,I)=OD(2)
      ODF(3,MX,I)=OD(3)
      ODF(4,MX,I)=OD(4)
      ODF(5,MX,I)=OD(5)
      ODF(6,MX,I)=OD(5)
C
    7 CONTINUE
C     END OF NUCLIDE LOOP--
   10 CONTINUE
C
C     PRINT LIBRARY DATA--
      CALL LIBRPT(HEAD,NUC,REC,NORG,IORG,AL,EXDF,ODF,ONAME,DAIT)
```

FIGURE C.0-1. Program Listing

```
C
      RETURN
C
C     ERROR CONDITIONS--
   95 IEND=2
      GO TO 99
C
   96 IEND=1
      GO TO 99
C
   97 PRINT 400, MO,REC(1),NORG,IORG
      IEND=2
      GO TO 99
C
   98 PRINT 500
      IEND=1
C
   99 PRINT 600,IEND
      STOP
C
C     FORMAT STATEMENTS--
C
  100 FORMAT(4I5,10I3/(8A10))
  200 FORMAT(A7,E7.1,5E8.1,I2)
  300 FORMAT(I2,4X,5E8.1)
  400 FORMAT(' IORGAN INDEX',I4,' FOR NUCLIDE ',A6,' IS NOT IN ORGAN '
     .,'INDEX LIST OF ',I3,' VALUES = '10I3)
  500 FORMAT('1END OF INPUT ON NUCDEL AT FIRST CARD READ')
  600 FORMAT('1ERROR IN GETLIB, IEND = ',I2)
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE ICNRPT

      SUBROUTINE ICNRPT(YA,TITLE,JORG,MORG,ONAME,TMAX,TPDOSE,PSUB,DMSUB,
     . PINH,DMINH,PAFD,DMAFD,PLFD,DMLFD,DAIT)
C
C*****************************************************************************
C
C     ICNRPT PRINTS TWO REPORTS:  FIRST = MAX. INDIVIDUAL
C                                 SECOND = POPULATION
C
C*****************************************************************************
C
C                ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     YA           CHARACTER   TEXT FOR HEADINGS ('YEARS')
C     TITLE(8)     CHARACTER   CASE TITLE
C     JORG         INTEGER     NO. OF ORGANS SPECIFIED ON INPUT
C     MORG         INTEGER     ORGAN CROSS-INDEX ARRAY FOR SELECTED ORGANS
C     ONAME(10)    CHARACTER   ORGAN NAMES
C     TMAX(5,2)    REAL        TOTAL MAXIMUM INDVIDUAL DOSES
C     TPDOSE(5,2)  REAL        TOTAL POPULATION DOSES
C     PSUB(2)      REAL        TOTAL POPULATION EXTERNAL DOSE
C     DMSUB(2)     REAL        TOTAL MAX. INDIVIDUAL EXTERNAL DOSE
C     PINH(5,2)    REAL        TOTAL POPULATION INHALATION DOSE
C     DMINH(5,2)   REAL        TOTAL MAX. INDIVIDUAL INHALATION DOSE
C     PAFD(5,2)    REAL        TOTAL POPULATION TERRESTRIAL PATHWAY DOSE
C     DMAFD(5,2)   REAL        TOTAL MAX. INDIVIDUAL TERESTRIAL PATHWAY DOSE
C     PLFD(5,2)    REAL        TOTAL POPULATION WATERBORNE PATHWAY DOSE
C     DMLFD(5,2)   REAL        TOTAL MAX. INDIVIDUAL WATERBORNE PATHWAY DOSE
C     DAIT         CHARACTER   DAY-OF-YEAR
C
C-----------------------------------------------------------------------------
C
      INCLUDE ALLDOS.ICOM,LIST
      INCLUDE ALLDOS.DOSTIM,LIST
C
      COMMON /TITLE/ DSET(5)
C
      DIMENSION TITLE(8), MORG(10), ONAME(10), TMAX(5,2), TPDOSE(5,2),
     .PSUB(2), DMSUB(2), PINH(5,2), DMINH(5,2), PAFD(5,2), DMAFD(5,2),
     .PLFD(5,2), DMLFD(5,2)
C
      CHARACTER YA*5, ONAME*10, DAIT*8, TITLE*10
      CHARACTER DSET*10
C
C     PRINT HEADING FOR EACH REPORT TYPE--
      DO 50 IR = 1, 2
        PRINT 100, TITLE, DSET, DAIT
        IF (IR .EQ. 1) PRINT 200
        IF (IR .EQ. 2) PRINT 300
        PRINT 400, IDTIME(1), YA, IDTIME(LY), YA
        IF (IR .EQ. 2) GO TO 25
C
C       MAX. INDIVIDUAL REPORT--
        IF (DMSUB(1) .LE. 0.) GO TO 5
C
C       AIR SUBMERSION--
        PRINT 500, ONAME(MORG(1)), (DMSUB(I), I=1,2)
    5   IF (DMINH(1,1) .LE. 0.) GO TO 10
C
C       AIR INHALATION--
        PRINT 600, (ONAME(MORG(J)), (DMINH(J,I), I=1,2), J=1,JORG)
   10   IF (DMAFD(1,1) .LE. 0.) GO TO 15
C
C       AIR FOOD TERRESTRIAL--
        PRINT 700, (ONAME(MORG(J)), (DMAFD(J,I), I=1,2), J=1,JORG)
   15   IF (DMLFD(1,1) .LE. 0.) GO TO 20
C
C       LIQUID TERRESTRIAL--
        PRINT 800, (ONAME(MORG(J)), (DMLFD(J,I), I=1,2), J=1,JORG)
C
C       PRINT TOTALS--
```

FIGURE C.0-1. Program Listing

```
                                MODULE ICNRPT

   20   PRINT 900, (ONAME(MORG(J)), (TMAX(J,I), I=1,2), J=1,JORG)
        GO TO 50
C
C
C
C       POPULATION DOSE REPORT--
   25   IF (PSUB(1) .LE. 0.) GO TO 30
C
C       AIR SUBMERSION--
        PRINT 500, ONAME(MORG(1)),(PSUB(I),I=1,2)
   30   IF (PINH(1,1) .LE. 0) GO TO 35
C
C       AIR INHALATION--
        PRINT 600, (ONAME(MORG(J)), (PINH(J,I), I=1,2), J=1,JORG)
   35   IF (PAFD(1,1) .LE. 0.) GO TO 40
C
C       AIR FOOD TERRESTRIAL--
        PRINT 700, (ONAME(MORG(J)), (PAFD(J,I), I=1,2), J=1,JORG)
   40   IF (PLFD(1,1) .LE. 0.) GO TO 45
C
C       LIQUID TERRESTRIAL--
        PRINT 800, (ONAME(MORG(J)), (PLFD(J,I), I=1,2), J=1,JORG)
C
C       PRINT TOTALS--
   45   PRINT 900, (ONAME(MORG(J)), (TPDOSE(J,I), I=1,2), J=1,JORG)
C
   50 CONTINUE
      RETURN
C
C     FORMAT STATEMENTS--
C
  100 FORMAT(1H1,8A10/16X,5A10/37X,A8)
  200 FORMAT(1H0,20X,'MAXIMUM INDIVIDUAL DOSE COMMITMENTS (REM)')
  300 FORMAT(1H0,22X,'POPULATION DOSE COMMITMENTS (MAN-REM)')
  400 FORMAT(1H0,32X,'DOSE COMMITMENT PERIOD'/8X,'PATHWAY/ORGAN',12X,
     .I2,A6,4X,I2,A6/)
  500 FORMAT(1H ,6X,'AIR SUBMERSION'//10X,A10,8X,2(2X,1PE10.1E2)/)
  600 FORMAT(1H ,6X,'INHALATION'//5(10X,A10,8X,2(2X,1PE10.1E2)/))
  700 FORMAT(1H ,6X,'TERRESTRIAL (AIR PATHS)'//5(10X,A10,8X,2(2X,1PE10.
     .1E2)/))
  800 FORMAT(1H ,6X,'TERRESTRIAL (LIQUID PATHS)'//5(10X,A10,8X,2(2X,
     .1PE10.1E2)/))
  900 FORMAT(1H ,6X,'TOTAL DOSES'//5(10X,A10,8X,2(2X,1PE10.1E2)/))
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE INRPT

      SUBROUTINE INRPT (YA, TITLE,
     .           JORG, MORG, Q, ISO, NUC, REC, ONAME, ENAME, DAIT)
C
C*****************************************************************************
C
C     INRPT WRITES AN OUTPUT REPORT DESCRIBING INPUT FOR CURRENT CASE
C
C*****************************************************************************
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS--
C-----------------------------------------------------------------------------
C     PARAMETER   TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     YA          CHARACTER   TEXT FOR HEADINGS ('YEARS')
C     TITLE(8)    CHARACTER   CASE TITLE
C     JORG        INTEGER     NO. OF ORGANS SPECIFIED ON INPUT
C     MORG        INTEGER     ORGAN CROSS-INDEX ARRAY FOR SELECTED ORGANS
C     Q(5,100)    REAL        RELEASE INVENTORY ARRAY
C     ISO(100)    INTEGER     RADIONUCLIDES INCLUDED IN THE RELEASE TERM
C     NUC         INTEGER     NO. OF RADIONUCLIDES IN THE MASTER LIST
C     REC(100)    CHARACTER   RADIONUCLIDE NAME FROM THE MASTER LIST
C     ONAME(10)   CHARACTER   ORGAN NAMES
C     ENAME(3)    CHARACTER   EXTERNAL DOSE ORGAN NAMES
C     DAIT        CHARACTER   DAY-OF-YEAR
C
C-----------------------------------------------------------------------------
C
      INCLUDE ALLDOS.ICOM,LIST
      INCLUDE ALLDOS.DOSTIM,LIST
C
      COMMON // TC, SO(350), PDOSC(5,2,100), DMAXC(5,2,100)
C
      DIMENSION TPATH(2,3)
C
      DIMENSION TITLE(8),MORG(10),Q(5,100),ISO(100),REC(100),ONAME(10),
     .ENAME(3),YN(2),YREL(2)
C
      CHARACTER TPATH*10, YREL*8
      CHARACTER YA*6, TITLE*10, REC*8, ONAME*10, ENAME*10, DAIT*8
C
      DATA ((TPATH(I,J),I=1,2),J=1,3)/'AIR PATHWA','YS ONLY','LIQUID PAT
     .','HWAYS ONLY','AIR AND LI','QUID PATHS'/
C
      DATA YN/'YES','NO'/
      DATA YREL/'ACUTE','CHRONIC'/
C
C     PRINT PAGE HEADING AND DATE--
      NREL = 3
      PRINT 100, TITLE,DAIT
C
C     PRINT TYPE OF RELEASE, ACUTE OR CHRONIC--
      PRINT 200, YREL(LR), LR
C
C     PRINT E/O--
      IF (LPOP .GT. 0) PRINT 700, PM, FPM, PFLOW
      IF (LM .GT. 0) PRINT 1700, XOM, FXOM, FLOW
C
C     PRINT POPULATION DOSE REQUEST--
      YY = YN(2)
      IF (LPOP .GT. 0)   YY = YN(1)
      PRINT 500, YY
      PRINT 550, TC
C
C
      IF(JORG.LE.0) GO TO 4
C
C     PRINT INHALATION DOSE CALCULATION PARAMETERS--
      PRINT 600, JORG, (ONAME(MORG(I)), I=1,JORG)
      PRINT 800, IDTIME(1), YA, IDTIME(LY), YA
    4 CONTINUE
C
C     PRINT EXTERNAL DOSE CALCULATION PARAMETERS--
```

FIGURE C.0-1. Program Listing

```
                                MODULE INRPT

      PRINT 900, ENAME(1)
C
C     PRINT PERCENT CONTRIBUTION TABLE REQUEST--
      YY = YN(2)
      IF (LFCT .EQ. 1 .OR. LFCT .EQ. 3) YY = YN(1)
      PRINT 1000, YY
      YY = YN(2)
      IF (LFCT .EQ. 2 .OR. LFCT .EQ. 3) YY = YN(1)
      PRINT 1050, YY
C
C
C     PRINT MAXIMUM INDIVIDUAL REQUEST--
      YY = YN(2)
      IF (LM .EQ. 1) YY = YN(1)
      PRINT 1200, YY
C
C     PRINT PATHWAY SELECTION--
      IF (IPATH .GT. 0) PRINT 1800, IPATH, (TPATH(I,IPATH), I=1,2)
      IF (INV .LE. 0) GO TO 7
C
C     PRINT HEADING FOR NUCLIDE INVENTORY DATA--
      PRINT 1300
C
C     PRINT NUCLIDE INVENTORY--
      DO 6 I = 1, NUC
    6 CONTINUE
C
C     PRINT INPUT CHECK LINE--
    7 PRINT 1500
C
      RETURN
C
C
C     FORMAT STATEMENTS--
C
  100 FORMAT(1H1,26X,8A10,10X,A10)
  200 FORMAT(1H0,50X,'RELEASE IS ',A7,' (LR=',I2,')')
  500 FORMAT(1H ,50X,'POPULATION DOSE#',2X,A3)
  550 FORMAT(1H,50X,'PLANT LIFE= ',F5.1,' YEARS')
  600 FORMAT(1H ,50X,'INHALATION DOSE CALCULATION FOR',I3,' ORGANS',/
     . (56X,5(A10,1X)))
  700 FORMAT(1H ,50X,'POPULATION DOSE FACTORS - AIR/FOOD/LIQUID',1P3E10.
     .1)
  800 FORMAT(1H ,50X,'DOSE TIMES ARE ', 2(I2,A6,3X))
  900 FORMAT(1H ,50X,'EXTERNAL DOSE CALCULATION FOR ',3(A10,1X))
 1000 FORMAT(1H ,50X,'FRACTIONAL CONTRIBUTION TABLES#',2X,A3)
 1050 FORMAT(1H,50X,'DOSE/NUCLIDE CONTRIBUTION TABLES#',2X,A3)
 1200 FORMAT(1H ,50X,'MAXIMUM INDIVIDUAL DOSE#',2X,A3)
 1300 FORMAT(1H0,50X,'NUCLIDE INVENTORY DATA'/55X,'NUCLIDE      AIR
     .AIR-FOOD    WATER      ')
 1400 FORMAT(53X,A7,3X,1P5E10.1E2)
 1500 FORMAT(1H0,'INPUT CHECKED BY',30X,'DATE'/18X,'**************************
     .*********',6X,'**************')
 1700 FORMAT(1H ,50X,'MAXIMUM INDIVIDUAL X/Q VALUES - AIR/FOOD/LIQUID',1
     .P3E10.1)
 1800 FORMAT(1H ,50X,'PATHWAY INDEX IS',I3,' FOR ',2A10)
C
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE  INVDF

      SUBROUTINE INVDF(NUC,Q,EXDF,ODF,MORG,JORG,ISO,LR,LY,FRID,FRED)
C*****************************************************************************
C
C     INVDF CALCULATES INTERMEDIATE FACTORS FOR EXTERNAL AND
C     INHALATION DOSES
C
C*****************************************************************************
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C     NUC          INTEGER     NO. OF RADIONUCLIDES IN MASTER LIST
C     Q(5,100)     REAL        RELEASE INVENTORY ARRAY
C     EXDF(3,100) REAL         EXTERNAL DOSE FACTORS ARRAY
C     ODF(5,10,100) REAL       ORGAN DOSE FACTORS ARRAY
C     MORG         INTEGER     ORGAN CROSS-INDEX VALUES FOR SELECTED ORGANS
C     JORG         INTEGER     NO. OF ORGANS DEFINED IN FILE 10 MASTER LIST
C     ISO          INTEGER     RADIONUCLIDES INCLUDED IN RELEASE TERM
C     LR           INTEGER     CONTROL INTEGER FOR ACUTE/CHRONIC RELEASE
C     LY           INTEGER     CONTROL FOR CALC. 2ND DOSE PERIOD DOSES
C     FRID         REAL        INHALATION DOSE CONVERSION FACTORS
C     FRED         REAL        EXTERNAL DOSE CONVERSION FACTORS
C
C-----------------------------------------------------------------------------
C
      DIMENSION Q(5,100),EXDF(3,100),ODF(5,10,100),MORG(10),ISO(100),
     .   FRED(3,100),FRID(5,2,100)
C
C     INITIALIZE ARRAYS TO ZERO--
      CALL ZERO (1000, FRID)
      CALL ZERO (300, FRED)
C
      N=1
C
      LD1 = (LR-1) * 2 + 1
      LD2 = LD1 + 1
      IF (LY .EQ. 3) LD2 = 5
C
      FACT = 1.0
      IF (LD2 .EQ. 5 .AND. LR .EQ. 1)   FACT = 1.52
C
C     FOR EACH RADIONUCLIDE IN MASTER LIST--
      DO 20 IN = 1, NUC
C
        IF (ISO(IN) .LE. 0)   GO TO 20
C
C       FOR EACH EXTERNAL DOSE FACTOR--
        DO 5 I = 1, 3
          FRED(I,IN) = Q(N,IN) * EXDF(I,IN)
    5   CONTINUE
C
C       FOR EACH ORGAN--
        DO 10 JO = 1, JORG
C
          INDX = MORG(JO)
          FRID(JO,1,IN) = Q(N,IN) * ODF(LD1,INDX,IN)
          FRID(JO,2,IN) = Q(N,IN) * ODF(LD2,INDX,IN) * FACT
C
   10   CONTINUE
C
   20 CONTINUE
      RETURN
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE  LIBRPT

      SUBROUTINE LIBRPT(HEAD,NUC,REC,NORG,IORG,AL,EXDF,ODF,ONAME,DAIT)
C*****************************************************************************
C
C     THIS MODULE PRINTS A REPORT OF LIBRARY DATA.
C
C*****************************************************************************
C
C                 ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     HEAD         CHARACTER   HEADING
C     NUC          INTEGER     NO. OF RADIONUCLIDES IN MASTER LIST
C     REC(100)     CHARACTER   RADIONUCLIDE NAME FROM THE MASTER LIST
C     NORG         INTEGER     NO. OF ORGANS DEFINED IN FILE 10 MASTER LIST
C     IORG         INTEGER     ORGAN INDEX VALUES DEFINED FOR FILE 10 ORGANS
C     AL(100)      REAL        CURRENTLY NOT USED
C     EXDF(3,100) REAL         EXTERNAL DOSE FACTORS ARRAY
C     ODF(5,10,100)
C     ONAME(10)    CHARACTER   ORGAN NAMES
C     DAIT         CHARACTER   DAY-OF-YEAR
C
C-----------------------------------------------------------------------------
C
      INCLUDE ALLDOS.DOSTIM_LIST
C
      DIMENSION HEAD(8), IORG(10), AL(100), EXDF(3,100), ODF(5,10,100),
     .ONAME(10), REC(100)
C
      CHARACTER HEAD*10, DAIT*8, REC*8, ONAME*10
C
C     PRINT PAGE HEADING--
      PRINT 100
      PRINT 200, HEAD, DAIT
C
C     SET PRINT CONTROL INTEGER--
      NOM1 = NORG + 1
C
      IN = 1
    1 IF (IN .GT. NUC) GO TO 20
      IF (IN .GT. 1) PRINT 100
      PRINT 300, (IDTIME(I), I=1,2), (IDTIME(I), I=1,4)
      IC=0
C
C     PRINT DATA FOR A NUCLIDE--
    2 PRINT 400, REC(IN), EXDF(1,IN), ONAME(1),
     .(ODF(I,1,IN), I=1,5)
      IF (ODF(1,1,IN) .LE. 0.) GO TO 4
C
C     PRINT REMAINING ORGAN DATA--
      DO 3 IO = 2, NORG
        PRINT 500, ONAME(IO), (ODF(I,IO,IN), I=1,5)
    3 CONTINUE
C
      IC = IC + NOM1
    4 IC = IC + 2
      IN = IN + 1
C
      IF (IC .GT. 43) GO TO 1
      IF (IN .LE. NUC) GO TO 2
C
   20 RETURN
C
C
C     FORMAT STATEMENTS--
C
  100 FORMAT (1H1)
  200 FORMAT (15X, 'LIBRARY DATA FOR ', 2A10, 5X, A10)
  300 FORMAT(1HO,9X,'EXTERNAL DOSE FACTOR',29X,'INHALATION DOSE FACTORS'
     .,/48X, 'ACUTE UPTAKE', 15X, 'CHRONIC UPTAKE' / ' NUCLIDE', 7X,
     .'TOTAL BODY       ORGAN', 9X, I2, ' YR      ', I2, ' YRS     ',
     .I2,' YR      ',I2, ' YRS     ',I2,' YR (',I2,' YR INTAKE)')
  400 FORMAT (1HO, A8, 6X, 1PE9.2, 3X, A10, 1X, 5 (1PE9.1,2X) )
  500 FORMAT (32X, A10, 1X, 5 (1PE9.1,2X) )
      END
```

FIGURE C.0-1. Program Listing

MODULE REPORT

```
      SUBROUTINE REPORT (IPR, DAIT, LR, LFCT, LPOP, LM, TITLE, JORG,
     .    MORG, Q, ISO, NUC, REC, ONAME, PM, FPM, PFLOW, XQM, FXQM,
     .    FLOW, INV, DMAX, TMAX, PDOSE, TPDOSE, PSUB, DMSUB, PINH,
     .    DMINH, PAFD, DMAFD, PLFD, DMLFD, IPATH)
C
C*****************************************************************
C
C     REPORT CONTROLS THE PRINTING OF THE OUTPUT REPORTS AS REQUIRED.
C
C*****************************************************************
C
C                ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------
C
C     IPR          INTEGER     IF=1 TO PRINT INPUT DATA & 2 TO PRINT RESULTS
C     DAIT         CHARACTER   DAY-OF-YEAR
C     LR           INTEGER     CONTROL INTEGER FOR ACUTE/CHRONIC RELEASE
C     LFCT         INTEGER     CONTROL INTEGER FOR SPECIAL REPORT PRINTING
C     LPOP         INTEGER     CONTROL INTEGER FOR POPULATION DOSES
C     TITLE(8)     CHARACTER   CASE TITLE
C     JORG         INTEGER     NO. OF ORGANS DEFINED IN FILE 10 MASTER LIST
C     MORG         INTEGER     ORGAN CROSS-INDEX VALUES FOR SELECTED ORGANS
C     Q(5,100)     REAL        RELEASE INVENTORY ARRAY
C     ISO          INTEGER     RADIONUCLIDES INCLUDED IN RELEASE TERM
C     NUC          INTEGER     NO. OF RADIONUCLIDES IN MASTER LIST
C     REC(100)     CHARACTER   RADIONUCLIDE NAME FROM MASTER LIST
C     ONAME(10)    CHARACTER   ORGAN NAMES
C     PM           REAL        POPULATION AIRBORNE TRANSFER FACTOR
C     FPM          REAL        POPULATION TERRESTRIAL TRANSFER FACTOR
C     PFLOW        REAL        POPULATION WATERBORNE DILUTION FACTOR
C     XQM          REAL        MAX. INDIVIDUAL AIRBORNE AIR CONCENTRATION
C     FXQM         REAL        MAX. INDIVIDUAL WATERBORNE AIR CONCENTRATION
C     FLOW         REAL        MAX. INDIVIDUAL WATERBORNE DILUTION FACTOR
C     INV          INTEGER     CONTROL FOR GENERATION OF RELEASE INVENTORY
C     DMAX         REAL        FRACTIONAL CONTRIBUTION TO MAX. INDIVIDUAL DOSE
C     TMAX         REAL        TOTAL MAXIMUM INDIVIDUAL DOSES
C     PDOSE        REAL        FRACTIONAL CONTRIBUTION TO POPULATION DOSE
C     TPDOSE       REAL        TOTAL POPULATION DOSES
C     PSUB         REAL        TOTAL POPULATION EXTERNAL DOSE
C     DMSUB        REAL        TOTAL MAXIMUM INDIVIDUAL EXTERNAL DOSE
C     PINH         REAL        TOTAL POPULATION INHALATION DOSE
C     DMINH        REAL        TOTAL MAXIMUM INDIVIDUAL INHALATION DOSE
C     PAFD         REAL        TOTAL POPULATION TERRESTRIAL PATHWAY DOSE
C     DMAFD        REAL        TOTAL MAX. INDIVIDUAL TERRESTRIAL PATH DOSE
C     PLFD         REAL        TOTAL POPULATION WATERBORNE PATHWAY DOSE
C     DMLFD        REAL        TOTAL MAX. INDIVIDUAL WATERBORNE PATH DOSE
C     IPATH        INTEGER     RELEASE PATHWAY SELECTION INDEX
C
C-----------------------------------------------------------------
C
      COMMON // TC, SQ(350), PDOSC(5,2,100), DMAXC(5,2,100)
C
      DIMENSION TITLE(8), MORG(10), Q(5,100), ISO(100), REC(100),
     .    ONAME(10), DMAX(5,2,100), TMAX(5,2), PDOSE(5,2,100),
     .    TPDOSE(5,2), PSUB(2), DMSUB(2), PINH(5,2), DMINH(5,2),
     .    PAFD(5,2), DMAFD(5,2), PLFD(5,2), DMLFD(5,2),  ENAME(3)
C
      CHARACTER DAIT*8, TITLE*10, REC* 8, ONAME*10, YA*6, ENAME*10
C
      DATA ENAME /'TOTAL BODY', '   SKIN', ' GENETIC'/
      DATA YA /' YEARS'/
C
      IF (IPR .EQ. 1)  CALL INRPT (YA, TITLE, JORG,
     . MORG, Q, ISO, NUC, REC, ONAME, ENAME, DAIT)
C
      IF (IPR .NE. 2)   RETURN
C
      CALL ICNRPT (YA, TITLE, JORG, MORG, ONAME, TMAX, TPDOSE, PSUB,
     .DMSUB, PINH, DMINH, PAFD, DMAFD, PLFD, DMLFD, DAIT)
      IF (LFCT .GT. 0) CALL FRCRPT (NUC, ISO, REC, YA, JORG, MORG,
     . ONAME, TITLE, DAIT, DMAX, PDOSE)
C
      RETURN
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE SOURCE

      SUBROUTINE SOURCE(NUC,REC,ISO,INV,LADF,LTDF,LFDF,TITLE,Q)
C
C*****************************************************************************
C
C     SOURCE GENERATES A SOURCE TERM FOR THE EACH RELEASE PATHWAY USING
C     THREE SETS OF FACTORS, ADF,TDF, AND FDF.  THE INITIAL INVENTORY
C     IS READ FROM CARDS (INV=3) OR TAPE15 = SOURCE FILE ,INV=3+
C
C*****************************************************************************
C
C                  ARGUMENT LIST PARAMETERS
C-----------------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------------
C
C     NUC          INTEGER     NO. OF RADIONUCLIDES IN MASTER LIST
C     REC(100)     CHARACTER   RADIONUCLIDE NAME FROM THE MASTER LIST
C     ISO(100)     INTEGER     INDICATES WHICH RADIONUCLIDES ARE INCLUDED
C                              IN THE RELEASE TERM
C     INV          INTEGER     CONTROL INTEGER FOR GENERATION OF THE
C                              RELEASE INVENTORY
C     LADF         INTEGER     CONTROL INPUT OF AIRBORNE PATHWAY RELEASE
C                              FACTORS FOR INHALATION & EXT. EXPOSURE
C     LTDF         INTEGER     CONTROL INPUT OF AIRBORNE TERRESTRIAL
C                              PATHWAY RELEASE FACTORS
C     LFDF         INTEGER     CONTROL INPUT OF LIQUID EFFLUENT TERRES-
C                              TRIAL PATHWAY RELEASE FACTORS
C     TITLE(8)     CHARACTER   CASE TITLE
C     Q(5,100)     REAL        RELEASE INVENTORY ARRAY, CURIES
C
C-----------------------------------------------------------------------------
C
      COMMON // TC, SQ(350), PDOSC(5,2,100), DMAXC(5,2,100)
      COMMON /TITLE/ DSET(5)
C
      DIMENSION AQ(350), ICL(350)
      DIMENSION REC(100), ISO(100), Q(5,100), TITLE(8), LIBNAM(7)
      DIMENSION ADF(80), TDF(80), FDF(80), DFNAM(80)
C
      CHARACTER TITLE*10,AA*8,BB*8,REC*8,AQ*8,DFNAM*10,DSET*10,LIBNAM*10
C
C     SET PLANT-LIFE TO 1.0 IF NOT GIVEN--
      IF(TC .LE. 0.)    TC = 1.0
C
C     READ NEW DF VALUES AS REQUESTED--
C
      IF (LADF .GT. 0 .OR. LTDF .GT. 0 .OR. LFDF .GT. 0)
     .  CALL DFIN (LADF, LTDF, LFDF, ADF, TDF, FDF)
C       TO SUPPLY RELEASE FACTORS FOR EACH PATHWAY.
C
      IF (INV .NE. 2)
     .  CALL SQIN (INV, NQ, SQ, AQ, ICL, DFNAM, LIBNAM)
C       TO PROVIDE THE BASIC RADIONUCLIDE INVENTORY.
C
C     INITIALIZE ARRAYS--
      CALL ZERO(500,Q)
C
C     CALCULATE AND PRINT INVENTORY FOR RELEASE--
C
      CALL ADATE(AA,BB)
C     TO GENERATE AN 8-CHARACTER DAY-OF-YEAR TITLE.
C
C     PRINT TITLE AND DATE--
      PRINT 600, TITLE,AA
C
C     LOOP ON RADIONUCLIDE IN THE BASIC INVENTORY--
      DO 15 IQ=1,NQ
C
        NN=0
C
C       I IS THE INDEX FOR MASTER RADIONUCLIDES--
        I=1
C
```

FIGURE C.0-1. Program Listing

```
                                MODULE SOURCE

C       HAVE ALL MASTER LIST RADIONUCLIDES NAMES BEEN CONSIDERED?
    7   IF(I.NE.NUC+1) GO TO 9
C
C       ERROR CONDITION--
        IEND=26
        GO TO 99
C
C       TRY TO IDENTIFY BASIC INVENTORY NUCLIDE NAME (AQ)
C       WITH MASTER LIST NUCLIDE NAME (REC)--
    9   IF(REC(I).EQ.AQ(IQ)) GO TO 11
        I=I+1
        GO TO 7
C
C       RADIONUCLIDE AQ(IQ) MATCHES REC(I): SET FLAG ISO--
   11   NN=I
        ISO(NN)=1
C
C       ACCUMULATE FRACTION OF RADIONUCLIDE I RELEASED TO THE AIRBORNE PATH
C       FOR EXTERNAL AND INHALATION EXPOSURE--
        Q(1,NN) = Q(1,NN) + SQ(IQ)*ADF(ICL(IQ))
C
C       ACCUMULATE FRACTION OF RADIONUCLIDE I RELEASED TO THE AIRBORNE
C       TERRESTRIAL PATHWAYS--
        Q(2,NN) = Q(2,NN) + SQ(IQ)*FDF(ICL(IQ))
C
C       ACCUMULATE FRACTION OF RADIONUCLIDE I RELEASED TO THE LIQUID
C       EFFLUENT TERRESTRIAL PATHWAY--
        Q(3,NN) = Q(3,NN) + SQ(IQ)*TDF(ICL(IQ))
C
        PRINT 700, REC(NN),SQ(IQ),ADF(ICL(IQ)),FDF(ICL(IQ)),
     .  TDF(ICL(IQ)),(Q(I,NN),I=1,3),DFNAM(ICL(IQ)),REC(NN)
C
   15 CONTINUE
      PRINT 400, DSET
      IF(INV.GT.3) PRINT 500, LIBNAM
C
      RETURN
C
   99 PRINT 300, IQ,AQ(IQ)
      STOP
C
C     FORMATS--
C
  300 FORMAT(1H1,'UNIDENTIFIED NUCLIDE NUMBER ',I3,2X,A7)
C
  400 FORMAT(1H0,'ABOVE INVENTORY FROM DATA SET - ',5A10)
C
  500 FORMAT(1H0,'SOURCE LIBRARY - ',7A10)
C
  600 FORMAT(1H1,24X,8A10,9X,A8/1H0,54X,'SOURCE TERM CALCULATION SUMMARY
     .'/1H0,9X,'CURIES IN      DF          DF          DF          CURIES
     .     CURIES      CURIES  FRACTIONATION'/' NUCLIDE INVENTORY   AIR-
     .PLUME   AIR-FOOD     LIQUID     AIR-PLUME   AIR-FOOD     LIQUID
     .   CLASS       NUCLIDE')
C
  700 FORMAT(1X,A7,1PE10.1,6(2X,E10.1),5X,A10,2X,A7)
C
      END
```

FIGURE C.0-1. Program Listing

```
                                MODULE SQIN

      SUBROUTINE SQIN  (INV, NQ, SQ, AQ, ICL, DFNAM, LIBNAM)
C
C=======================================================================
C
C     SQIN READS SOURCE INVENTORY AND CLASS IDENTITY FROM CARDS OR
C     TAPE15
C
C=======================================================================
C
C                ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----------------------------------------------------------------------
C     PARAMETER    TYPE        DESCRIPTION
C-----------------------------------------------------------------------
C
C     INV          INTEGER     CONTROL INTEGER FOR INPUT OF THE BASIC
C                              RADIONUCLIDE INVENTORY
C     NQ           INTEGER     NO. OF RADIONUCLIDES IN THE BASIC RADIO-
C                              NUCLIDE INVENTORY
C     SQ(350)      REAL        ACTIVITY (CURIES) OF EACH RADIONUCLIDE IN
C                              BASIC INVENTORY
C     AQ(350)      CHARACTER   NAMES OF EACH RADIONUCLIDE IN THE BASIC INV.
C     ICL(350)     INTEGER     RADIONUCLIDE CLASS FOR EACH RADIONUCLIDE IN
C                              THE BASIC INVENTORY
C     DFNAM(80)    CHARACTER   TITLE FOR EACH RADIONUCLIDE CLASS
C     LIBNAM       CHARACTER   TITLE FOR THE FILE 15 DATA LIBRARY
C
C-----------------------------------------------------------------------
C
C
      COMMON /TITLE/ DSET(5)
C
      DIMENSION SQ(350), AQ(350), ICL(350)
      DIMENSION LIBNAM(7), DFNAM(80)
C
      CHARACTER LIBNAM*10, DSET*10, AQ*8, DFNAM*10
C
      IF (INV .GT. 3) GO TO 2
C     THEN INPUT IS FROM THE FILE 15 DATA LIBRARY.
C
C     ELSE READ DATA FROM CARDS--
C
C     READ NO. OF NUCLIDES IN BASIC INVENTORY, TITLE (CARD TYPE 5)--
      READ (5,200,END=97) NQ, DSET
C
C     READ NO. OF RADIONUCLIDE CLASSES (CARD TYPE 6)--
      READ (5,200) NCLS
C
C     READ INDEX, NAME OF CURRENT CLASS (CARD TYPE 7)--
      DO 7 I=1,NCLS
    7 READ (5, 150) ICLS, DFNAM(ICLS)
  150 FORMAT (I3, 7X, A10)
C
C     READ NAME, CLASS, ACTIVITY OF EACH RADIONUCLIDE CLASS (CARD TYPE 8)--
      DO 1 IQ=1,NQ
      READ (5,100,END=97) AQ(IQ), ICL(IQ), SQ(IQ)
    1 CONTINUE
C
      GO TO 99
C
C     READ DATA FROM FILE 15--
C
C     READ NO. OF SETS, TITLE--
    2 READ(15,200,END=98) NSETS, LIBNAM
C
C     ISET IS THE SET TO BE USED AS THE BASIC INVENTORY FOR THIS CASE--
      ISET = INV - 3
C
C     READ NO. OF RADIONUCLIDE CLASSES--
      READ(15,200) NCLS
C
C     READ INDEX, NAME OF CURRENT CLASS-
      DO 9 I=1,NCLS
    9 READ(15,150) ICLS,DFNAM(ICLS)
```

FIGURE C.0-1. Program Listing

```
                                MODULE SOIN

C
C     READ NO. OF RADIONUCLIDES IN BASIC INVENTORY, TITLE--
      DO 6 IS=1,NSETS
      READ(15,200,END=98) NQ,DSET
C
C     READ NAME, CLASS, ACTIVITY OF EACH RADIONUCLIDE--
      DO 5 IQ=1,NQ
      READ(15,100,END=98) AQ(IQ),ICL(IQ),SQ(IQ)
    5 CONTINUE
C
      IF (IS .EQ. ISET) GO TO 99
    6 CONTINUE
C
C     ERROR CONDITIONS--
C
      IEND=28
      PRINT 300, NSETS,ISET
  300 FORMAT(1H1,'INVENTORY NOT FOUND,',I3,' SET IN LIBRARY. ISET=',I3)
      STOP
C
   97 IEND=29
      PRINT 400, IEND
  400 FORMAT(1H1,'END OF FILE ON INPUT,  IEND = ',I3)
      STOP
C
   98 IEND=30
      PRINT 500, IEND
  500 FORMAT(1H1,' END OF FILE ON SOURCE,  IEND = ',I3)
      STOP
C
C     IF INPUT IS FROM TAPE, REWIND THE FILE--
   99 IF(INV.GT.3) REWIND 15
C
      RETURN
C
  100 FORMAT (A8, I2, E10.1)
  200 FORMAT (I3, 7X, 7A10)
C
      END
```

FIGURE C.0-1. Program Listing

```
  100     7     2     2  1  3  4  6  8 16 23
CWMS DATA LIBRARY, AUG 06, 1980 (DLS)
TOTAL BODYKIDNEY     LIVER      BONE       LUNGS      THYROID   LLI
    1    50    70    30
H 3             0.00+00 0.00+00 0.00+00 6
 1      2.60-02 2.60-02 1.60-02 1.70-02 1.70-02
 3      2.60-02 2.60-02 1.60-02 1.70-02 1.70-02
 4      2.60-02 2.60-02 1.60-02 1.70-02 1.70-02
 8      2.60-02 2.60-02 1.60-02 1.70-02 1.70-02
16      2.60-02 2.60-02 1.60-02 1.70-02 1.70-02
23      2.60-02 2.60-02 1.60-02 1.70-02 1.70-02
BE10            0.0                     6
 1      4.80+00 6.30+00 1.90+00 4.10+00 4.10+00
 3      2.50+01 2.80+01 1.10+01 1.90+01 1.90+01
 4      2.20+01 3.70+01 8.50+00 2.40+01 2.40+01
 6      1.10+02 2.50+02 3.90+01 1.70+02 1.70+02
 8      3.80+01 3.80+01 2.00+01 2.50+01 2.50+01
23      5.00+00 5.00+00 3.20+00 3.30+00 3.30+00
C 14            0.00+00 0.00+00 7.55-04 7
 1      1.20-01 1.20-01 7.60-02 7.88-02 7.88-02
 3      1.20-01 1.20-01 7.60-02 7.88-02 7.88-02
 4      1.20-01 1.20-01 7.60-02 7.88-02 7.88-02
 6      5.99-01 5.99-01 3.30-01 3.94-01 3.94-01
 8      1.20-01 1.20-01 7.20-02 7.90-02 7.90-02
16      1.20-01 1.20-01 7.60-02 7.89-02 7.89-02
23      3.30-01 3.30-01 2.10-01 2.10-01 2.10-01
CA41            0.00+00 0.00+00 0.00+00 4
 1      1.81-01 6.36-00 6.00-02 4.21-00 4.41+00
 6      1.63+00 5.00+01 5.40-01 3.90+01 4.10+01
 8      6.58-01 6.62-01 3.50-01 4.40-01 4.40-01
23      3.50-02 3.50-02 2.20-02 2.30-02 2.30-02
CF51            6.55-3  7.17-3  7.20-3  5
 1       8.40-2  8.40-2  4.90-2  5.50-2  5.50-2
 3       1.90-2  1.90-2  1.10-2  1.20-2  1.20-2
 8       1.40+0  1.40+0  8.10-1  9.03-1  9.03-1
16       5.00-2  5.00-2  2.90-2  3.30-2  3.30-2
23       1.20-1  1.20-1  7.70-2  7.70-2  7.70-2
MN54            1.99-01 2.08-01 2.09-01 4
 1      1.42+00 1.42+00 8.80-01 9.40-01 9.40-01
 4      8.50+00 8.50+00 5.10+00 5.60+00 5.60+00
 8      1.20+02 1.57+02 4.70+01 1.10+02 1.10+02
23      2.60+00 2.70+00 1.70+00 1.80+00 1.80+00
FE55            2.09-06 2.29-06 2.30-06 5
 1      3.20-01 7.30-01 1.10-01 4.80-01 4.80-01
 4      1.50+00 2.90+00 5.50-01 1.90+00 1.90+00
 6      1.50+00 4.50+00 5.30-01 3.00+00 3.00+00
 8      6.20+00 1.10+01 2.30+0  7.70+00 7.70+00
23      2.10-01 2.20-01 1.30-0  1.50-01 1.50-01
FE59            2.88-01 2.97-01 3.11-01 5
 1      6.00+00 6.10+00 3.30+00 4.00+00 4.00+00
 4      1.61+01 1.61+01 8.70+00 1.00+01 1.00+01
 6      7.00+00 7.10+00 3.80+00 4.60+00 4.60+00
 8      6.44+01 6.46+01 3.50+01 4.24+01 4.24+01
23      6.10+00 6.14+00 4.00+00 4.00+00 4.00+00
CO58            0.00+00 0.00+00 0.00+00 4
 1      9.60-01 9.60-01 6.10-01 6.30-01 6.30-01
 4      7.00-01 7.00-01 4.40-01 4.60-01 4.60-01
 8      6.50+01 6.60+01 3.30+01 4.30+01 4.30+01
23      2.70+00 2.70+00 1.80+00 1.80+00 1.80+00
CO60            6.06-01 6.25-01 6.34-01 4
 1      2.70+00 2.70+00 1.71+00 1.80+00 1.80+00
 4      2.00+00 2.00+00 1.30+00 1.30+00 1.30+00
 8      4.81+02 1.00+03 1.80+02 6.81+02 6.81+02
23      7.70+00 8.30+00 4.90+00 5.50+00 5.50+00
NI59            0.00+00 0.00+00 0.00+00 5
 1      2.98-01 9.40-01 1.00-01 6.21-01 6.21-01
 4      7.70-01 1.00-00 2.70-01 1.30+00 1.30+00
 6      1.54+00 5.67+00 5.30-01 3.72+00 3.72+00
 8      5.57+00 1.30+01 2.00+00 9.20+00 9.20+00
23      1.30-01 1.50-01 8.40-02 9.70-02 9.70-02
NI63            0.00+00 0.00+00 0.00+00 5
 1      8.10-01 2.52+00 2.80-01 1.65+00 1.66+00
 4      2.10+00 5.20+00 7.40-01 3.40+00 3.40+00
```

FIGURE C.0-2. File 10 Data Library

```
  6      2.10+01 7.60+01 7.20+00 5.00+01 5.00+01
  8      1.51+01 3.50+01 5.42+00 2.47+01 2.47+01
 23      3.60-01 4.00-01 2.30-01 2.60-01 2.60-01
SE79                0.0     0.0     6.0-4 5
  1      1.00-1  1.00-1  6.30-2  6.58-2  6.58-2
  3      9.00-1  9.00-1  5.70-1  5.90-1  5.90-1
  4      5.90-1  5.90-1  3.50-1  3.90-1  3.90-1
  8      7.68+0  7.73+0  4.10+0  5.10+0  5.10+0
 23      1.10-1  1.10-1  6.40-2  6.70-2  6.70-2
KR85            4.94-04 5.25-04 4.69-02 0
RR87             0.      0.     5.2E-3 4
  1      9.0E-1  9.0E-1  4.9E-1  5.9E-1  5.9E-1
  4      2.4E-0  2.4E-0  1.2E-0  1.6E-0  1.6E-0
  8      2.7E-1  2.7E-1  1.8E-1  1.8E-1  1.8E-1
 23      3.3E-2  3.3E-2  2.2E-2  2.2E-2  2.2E-2
SR90            5.12-09 5.30-09 4.20-02 4
  1      5.10+01 6.00+02 1.70+01 3.90+02 3.90+02
  6      7.60+02 8.90+03 2.50+02 5.80+03 5.90+03
  8      9.40+02 2.10+03 3.30+02 1.50+03 1.50+03
 23      1.30+01 1.50+01 8.50+00 9.70+00 9.70+00
Y 90            1.71-05 1.77-05 2.45-01 4
  1      3.70-01 3.70-01 2.37-01 2.37-01 2.37-01
  6      1.40+01 1.40+01 9.00+00 9.10+00 9.10+00
  8      1.00+01 1.00+01 6.60+00 6.70+00 6.68+00
 23      1.50+01 1.50+01 1.00+01 1.00+01 1.00+01
Y 91            8.78-04 9.05-04 1.58-01 4
  1      5.90+00 5.90+00 3.00+00 3.90+00 3.90+00
  6      2.20+02 2.20+02 1.10+02 1.50+02 1.50+02
  8      1.10+02 1.10+02 6.00+01 7.50+01 7.52+01
 23      1.40+01 1.40+01 9.10+00 9.20+00 9.20+00
ZR93            3.02-12 6.01-12 6.31-12 6
  1      7.50-01 1.70-00 2.70-01 1.10+00  1.10+0
  3      3.30+00 1.40+01 1.10+00 9.00+00  9.00+0
  4      1.90+00 3.50+00 7.14-01 2.30+00  2.30+0
  6      1.50+01 6.64+01 5.10+01 4.36+01  4.36+1
  8      1.70+01 4.00+01 6.20+00 2.90+01  2.87+1
 23      4.70-01 5.10-01 3.00-01 3.40-01  3.40-1
NB93M           2.03-05 4.04-05 4.25-05 6
  1      1.10+00 3.30+00 3.70-01 2.20+00 2.20+00
  3      4.80+00 1.50+01 1.70+00 9.80+00 9.80+00
  4      3.80+00 1.30+01 1.30+00 8.40+00 8.40+00
  6      1.10+01 4.10+01 3.70+00 2.70+01 2.70+01
  8       2.70+1  5.90+1  9.70+0  4.10+1  4.10+1
 23      7.40-01 8.00-01 4.70-01 5.30-01 5.30-01
MO93            3.00-03                 5
  1      5.10-02 5.10-02 3.30-02 3.30-02 3.30-02
  3      5.50-01 5.50-01 3.60-01 3.60-01 3.60-01
  4      1.80+00 1.80+00 9.60-01 1.20+00 1.20+00
  8      3.50+01 7.90+01 1.20+01 5.70+01 5.70+01
 23      2.30-01 2.60-01 1.50-01 1.70-01 1.70-01
ZR95            1.73-01 1.81-01 1.93-01 6
  1      1.03+01 1.04+01 5.20+00 6.70+00 6.70+00
  3      2.30+01 2.30+01 1.20+01 1.50+01 1.50+01
  4      1.40+01 1.40+01 7.40+00 9.40+00 9.40+00
  6      4.60+01 4.70+01 2.40+01 3.10+01 3.0+01
  8       1.20+2  1.20+2  6.00+1  7.70+1  7.70+1
 23      5.50+00 5.50+00 3.60+00 3.60+00 3.60+00
NB95M           1.44-02 1.65-02 1.67-02 0
NB95            1.81-01 1.89-01 1.89-01 6
  1      2.90+00 2.90+00 1.70+00 1.90+00 1.90+00
  3      5.19+00 5.19+00 3.00+00 3.41+00 3.41+00
  4      5.10+00 5.10+00 2.90+00 3.40+00 3.40+00
  6      9.80+00 9.80+00 5.60+00 6.40+00 6.40+00
  8      3.15+01 3.15+01 1.80+01 2.07+01 2.07+01
 23      3.70+00 3.70+00 2.40+00 2.50+00 2.50+00
TC99            0.00+00 0.00+00 5.00-03 6
  1      1.90-02 1.90-02 1.20-02 1.20-02  1.20-2
  3      8.40-01 8.40-01 5.10-01 5.50-01  5.50-1
  4      6.50-02 6.50-02 3.70-02 4.30-02  4.30-2
  6      4.60-02 4.60-02 2.70-02 3.00-02  3.00-2
  8      6.80+01 1.60+02 2.41+01 1.10+02  1.10+2
 23      1.20+00 1.30+00 7.40-01 8.60-01  8.60-1
RH106           2.28-03 2.42-03 3.30-02 0
```

FIGURE C.0-2. File 10 Data Library

```
RU106           2.08-02 2.20-02 3.00-01 5
  1      1.90+00 1.90+00 1.20+00 1.20+00 1.20+00
  3      2.70+01 2.70+01 1.80+01 1.80+01 1.80+01
  5      1.50+01 1.50+01 9.10+00 9.60+00 9.60-00
  8       7.60+2  1.10+3  3.00+2  7.10+2  7.10+2
 23      3.40+01 3.40+01 2.20+01 2.30+01 2.30+01
PD107           0.00+00 0.00+00 0.00+00 5
  1      7.94-03 7.94-03 5.10-03 5.20-03  5.20-3
  3      8.60-01 8.60-01 5.00-01 5.70-01  5.70-1
  4      1.10-01 1.10-01 6.40-02 6.90-02  6.90-2
  8      5.40+00 1.50+01 2.30+00 1.10+01  1.10+1
 23      1.80-01 1.90-01 1.10-01 1.30-01  1.30-1
AG110           3.94-04 4.19-04 1.46-02 0
AG110M          6.92-01 7.25-01 7.39-01 6
  1      1.40+00 1.40+00 9.00-01 9.20-01 9.21-01
  3      4.50+00 4.50+00 2.80+00 2.90+00 2.90+00
  4      2.20+00 2.20+00 1.40+00 1.50+00 1.50+00
  6      2.48+00 2.48+00 1.50+00 1.70+00 1.70+00
  8       4.00+2  5.10+2  1.60+2  3.[illegible]+2  3.44+2
 23      1.10+01 1.10+01 7.30+00 7.50+00 7.50+00
CD113M          2.10-03                 5
  1      4.70+00 6.50+00 1.90+00 4.20+00 4.20+00
  3      1.30+02 2.10+02 4.80+01 1.40+02 1.40+02
  4      1.40+02 1.90+02 5.50+01 1.20+02 1.20+02
  8      1.30+02 2.90+02 4.70+01 2.00+02 2.00+02
 23      4.80+00 5.30+00 3.10+00 3.50+00 3.50+00
SN123           5.22-03 5.39-03 1.07-01 6
  1      2.40+00 2.40+00 1.40+00 1.60+00 1.60+00
  4      1.60+00 1.60+00 8.40+01 1.00+00 1.00+00
  6      7.40+01 7.50+01 3.90+01 4.90+01 4.90+01
  8      1.90+02 2.00+02 8.10+01 1.30+02 1.30+02
 16      1.40+00 1.40+00 7.60-01 9.30-01 9.30-01
 23      1.20+01 1.20+01 7.60+00 7.70+00 7.70+00
SB125           9.02-02 1.06-01 1.14-01 6
  1      1.01+01 1.70+01 3.90+00 1.10+01 1.10+01
  4      4.80-01 8.00-01 1.90-01 5.30-01 5.30-01
  6      2.10+01 5.30+01 7.40+00 3.50+01 3.50+01
  8       1.70+2  3.10+2  8.20+1  2.10+2  2.10+2
 16      9.70-03 9.70-03 6.30-03 6.40-03 6.40-03
 23      3.80+00 4.00+00 2.40+00 2.60+00 2.60+00
TE125M          3.97-03 7.62-03 7.98-03 7
  1      2.50-01 2.50-01 1.50-01 1.60-01 1.60-01
  3      6.30+00 6.30+00 3.80+00 4.10+00 4.10+00
  4      7.80-01 7.80-01 4.70-01 5.10-01 5.10-01
  6      1.80+00 1.80+00 1.10+00 1.20+00 1.20+00
  8      2.70+01 2.70+01 1.40+01 1.80+01 1.80+01
 16      5.50-01 5.50-01 3.50-01 3.60-01 3.60-01
 23      1.90+00 1.90+00 1.30+00 1.30+00 1.30+00
SN126             1.7-2   2.1-2   2.4-2 6
  1       7.70+0  7.80+0  4.40+0  5.10+0  5.10+0
  4       5.01+0  5.10+0  2.40+0  3.40+0  3.40+0
  6       1.88+2  2.04+2  8.50+1  1.34+2  1.34+2
  8       8.00+2  1.80+3  2.80+2  1.30+3  1.30+3
 16       1.50+0  1.59+0  7.63-1  1.04+0  1.04+0
 23       4.70+0  5.10+0  3.00+0  3.40+0  3.40+0
SB126M            3.1-2   3.3-2   3.5-2 0
SB126           4.12-01 4.39-01 5.93-01 6
  1      5.90-02 5.90-02 3.90-02 3.90-02  3.90-2
  4      3.10-03 3.10-03 2.10-03 2.10-03  2.10-3
  6      1.40-01 1.40-01 9.20-02 9.20-02 9.20-02
  8      1.90+00 1.90+00 1.30+00 1.30+00  1.30+0
 16      2.90-03 2.90-03 1.90-03 1.90-03  1.90-3
 23      3.00+00 3.00+00 2.00+00 2.00+00  2.00+0
TE127M          1.16-03 2.29-03 2.78-03 7
  1      5.50-01 5.50-01 3.50-01 3.70-01 3.70-01
  3      1.60+01 1.60+01 9.50+00 1.00+01 1.00+01
  4      2.00+00 2.00+00 1.20+00 1.30+00 1.30+00
  6      4.50+00 4.50+00 2.70+00 3.00+00 3.00+00
  8      6.90+01 1.00+02 4.60+01 6.90+01 6.90+01
 16      1.20+00 1.20+00 7.50-01 7.80-01 7.80-01
 23      4.20+00 4.20+00 2.70+00 2.70+00 2.70+00
TE127           3.54-04 3.83-04 3.46-02 7
  1      1.14-02 1.14-02 7.40-03 7.40-03 7.40-03
```

FIGURE C.0-2. File 10 Data Library

```
  3      1.90-01  1.90-01  1.20-01  1.20-01  1.20-01
  4      2.20-02  2.20-02  1.50-02  1.50-02  1.50-02
  6      5.10-02  5.10-02  3.41-02  3.41-02  3.42-02
  8      5.00-01  5.00-01  3.30-01  3.30-01  3.28-01
 16      3.90-02  3.90-02  2.50-02  2.50-02  2.50-02
 23      7.30-01  7.30-01  4.80-01  4.80-01  4.80-01
I 129             3.04-03  5.71-03  5.47-03  7
  1      1.90+00  1.90+00  8.10-01  1.30+00  1.30+00
  3      1.20+00  1.20+00  7.90-01  8.10-01  8.10-01
  4      5.60-01  5.60-01  3.60-01  3.70-01  3.70-01
  6      6.90-01  6.90-01  4.30-01  4.50-01  4.50-01
  8      1.50+01  1.51+01  8.00+00  9.91+00  9.91+00
 16      1.40+03  1.50+03  6.40+02  1.00+03  1.00+03
 23      8.40-02  9.40-02  5.30-02  5.50-02  5.50-02
CS134             3.69-01  3.99-01  4.13-01  6
  1      2.40+01  2.60+01  1.10+01  1.70+01  1.70+01
  3      9.70+00  9.90+00  5.40+00  6.40+00  6.40+00
  4      2.81+01  2.90+01  1.30+01  1.90+01  1.90+01
  6      1.20+01  1.30+01  5.00+00  8.60+00  8.60+00
  8      4.50+00  4.90+00  2.30+00  3.20+00  3.20+00
 23      1.50-01  1.50-01  9.80-02  9.80-02  9.80-02
CS135             0.00+00  0.00+00  2.18-03  6
  1      1.50+00  1.70+00  6.60-01  1.10+00   1.10+0
  3      1.40+00  1.40+00  7.60-01  9.10-01   9.10-1
  4      3.40+00  3.60+00  1.60+00  2.40+00   2.40+0
  6      3.40+00  4.11+00  1.40+00  2.70+00   2.70+0
  8      5.60-01  6.30-01  2.80-01  4.10-01   4.10-01
 23      2.40-02  2.40-02  1.60-02  1.60-02   1.60-2
CS137             5.62-04  5.99-04  2.81-02  6
  1      1.30+01  1.50+01  5.90+00  9.90+00  9.90+00
  3      7.50+00  7.50+00  4.10+00  5.00+00  5.00+00
  4      2.00+01  2.20+01  9.50+00  1.40+01  1.40+01
  6      1.40+01  1.70+01  6.00+00  1.10+01  1.10+01
  8      3.50+00  3.90+00  1.80+00  2.60+00  2.60+00
 23      1.20-01  1.20-01  8.00-02  8.00-02  8.00-02
BA137M            1.38-01  1.46-01  1.47-01  0
CE144             4.25-03  5.15-03  1.13-02  6
  1      6.90+00  9.80+00  2.60+00  6.39+00  6.40+00
  3      3.10+01  4.40+01  1.20+01  2.90+01  2.90+01
  4      5.70+01  7.20+01  2.20+01  4.70+01  4.70+01
  6      1.11+02  1.80+02  4.10+01  1.20+02  1.20+02
  8      6.50+02  8.60+02  2.60+02  5.60+02  5.60+02
 23      3.10+01  3.20+01  2.00+01  2.10+01  2.10+01
PR144             7.38-03  7.65-03  2.69-01  0
PM147             0.00+00  0.00+00  2.71-03  6
  1      4.95-01  1.11+00  1.70-01  7.40-01  7.40-01
  3      2.31+00  5.10+00  7.70-01  3.42+00  3.42+00
  4      1.22+00  2.60+00  4.00-01  1.70+00  1.70+00
  6      9.60+00  3.00+01  3.20+00  2.00+01  2.00+01
  8      4.40+01  8.10+01  1.60+01  5.40+01  5.40+01
 23      1.70+00  1.80+00  1.10+00  1.20+00  1.20+00
SM147               0.       0.       0.     6
  1      1.0E+2   6.4E+2   1.7E+2   4.2E+2   4.2E+2
  3      8.8E+2   3.0E+3   8.1E+2   2.0E+3   2.0E+3
  4      1.8E+3   2.6E+3   1.4E+3   1.7E+3   1.7E+3
  6      3.6E+3   2.6E+4   3.5E+3   1.7E+4   1.7E+4
  8      1.7E+4   4.2E+4   1.4E+4   2.7E+4   2.7E+4
 23      4.9E-0   5.4E+0   3.3E-0   3.6E-0   3.6E+0
SM151             1.09-05  2.17-05  2.28-05  6
  1      3.42-01  1.15+00  1.10-01  7.57-01   7.57-1
  3      1.50+00  5.20+00  5.10-01  3.40+00   3.40+0
  4      3.20+00  4.50+00  1.20+00  3.00+00   3.00+0
  6      4.10+00  2.80+01  1.30+00  1.80+01   1.80+1
  8      3.00+01  6.90+01  1.10+01  4.90+01   4.90+1
 23      1.00+00  1.10+00  6.40-01  7.40-01   7.40-1
EU152               0.0      0.0      0.0    6
  1      5.2+00   1.6+01   1.70+0   1.0+01   1.0+01
  3      2.0+01   1.1+02   6.3+00   7.1+01   7.1+01
  4      1.40+01  1.70+01  5.50+00  1.10+01  1.10+01
  6      1.40+01  7.90+01  4.50+00  5.20+01  5.20+01
  8      2.3+02   5.1+02   8.4+01   3.6+02   3.6+02
 23      4.90+0   5.3+00   3.1+00   3.5+00   3.5+00
EU154             2.97-01  3.09-01  3.46-01  6
```

FIGURE C.0-2. File 10 Data Library

```
  1      7.50+00 2.20+01 2.50+00 1.40+01 1.40+01
  3      2.90+01 1.40+02 9.10+00 9.20+01 9.20+01
  4      2.40+01 2.90+01 9.50+00 1.90+01 1.90+01
  6      5.00+01 2.50+02 1.60+01 1.60+02 1.60+02
  8      4.00+02 8.50+02 1.40+02 5.90+02 5.90+02
 23      1.10+01 1.10+01 6.70+00 7.50+00 7.50+00
EU155            1.21-02 1.50-02 1.64-02 6
  1      1.20+00 3.20+00 4.10-01 2.10+00 2.10+00
  3      5.40+00 2.20+01 1.70+00 1.50+01 1.50+01
  4      3.90+00 4.60+00 1.60+00 3.00+00 3.00+00
  6      8.50+00 3.50+01 2.70+00 2.30+01 2.30+01
  8      5.50+01 1.30+02 2.40+01 8.90+01 8.90+01
 23      1.80+00 2.00+00 1.20+00 1.30+00 1.30+00
HO166M           3.70-03                 6
  1      6.80+00 2.60+01 2.20+00 1.70+01 1.70+01
  3      1.20+01 4.90+01 3.90+00 3.20+01 3.20+01
  4      7.40+00 3.20+01 2.40+00 2.10+01 2.10+01
  6      2.20+01 1.10+02 7.10+00 7.20+01 7.20+01
  8      2.70+02 6.20+02 9.60+01 4.40+02 4.40+02
 23      4.90+00 5.40+00 3.10+00 3.60+00 3.60+00
W 185            0.00+00 0.00+00 0.00+00 5
  1      6.90-03 6.90-03 4.40-03 4.50-03 4.50-03
  4      5.20-02 5.20-02 3.90-02 4.10-02 4.10-02
  6      2.00-01 2.00-01 1.20-01 1.30-01 1.30-01
  8      3.30+01 3.40+01 1.70+01 2.20+01 2.20+01
 23      2.80+00 2.80+00 1.80+00 1.90+00 1.90+00
PR210            3.20-4  4.59-4  4.70-4  6
  1       6.30+1  3.70+2  2.00+1  2.40+2  2.40+2
  3       3.30+3  9.00+3  1.10+3  5.90+3  5.90+3
  4       3.80+2  2.80+3  1.20+2  1.80+3  1.80+3
  6       1.00+3  1.20+4  3.20+2  7.60+3  7.60+3
  8       5.40+4  1.20+5  1.90+4  8.50+4  8.50+4
 23       1.00+1  1.10+1  6.60+0  7.60+0  7.40+0
PI210            0.0     0.0     6.91-2  6
  1       7.00-1  7.00-1  4.50-1  4.60-1  4.60-1
  3       9.80+1  9.80+1  6.40+1  6.40+1  6.40+1
  4       7.90+0  7.90+0  5.10+0  5.20+0  5.20+0
  6       1.20+0  1.20+0  7.90-1  8.00-1  8.00-1
  8       1.51+3  1.51+3  9.80+2  9.91+2  9.91+2
 23       7.70+0  7.70+0  5.00+0  5.00+0  5.00+0
PO210            0.      0.      0.      6
  1       6.4E+1  6.4E+1  3.6E+1  4.2E+1  4.2E+1
  3       1.9E+3  1.9E+3  9.7E+2  1.3E+3  1.3E+3
  4       5.4E+2  5.4E+2  3.0E+2  3.6E+2  3.6E+2
  6       2.7E+2  2.7E+2  1.5E+2  1.8E+2  1.8E+2
  8       3.4E+4  3.8E+4  1.5E+4  2.5E+4  2.4E+4
 23       1.2E+1  1.2E+1  7.6E+0  7.7E+0  7.7E+0
RA223            1.4E-2  1.5E-2  1.5E-2  6
  1       2.2E+2  2.2E+2  1.4E+2  1.5E+2  1.5E+2
  3       4.7E+1  4.7E+1  3.0E+1  3.1E+1  3.1E+1
  4       1.6E+0  1.6E+0  1.0E+0  1.1E+0  1.1E+0
  6       1.1E+3  1.1E+3  7.0E+2  7.4E+2  7.4E+2
  8       2.1E+4  2.1E+4  1.3E+4  1.4E+4  1.4E+4
 23       5.5E+1  5.5E+1  3.6E+1  3.6E+1  3.6E+1
RA224            2.05-3  2.24-3  2.25-3  4
  1       6.70+1  6.70+1  4.30+1  4.40+1  4.40+1
  6       3.32+2  3.32+2  2.18+2  2.18+2  2.20+2
  8       7.38+3  7.38+3  4.80+3  4.90+3  4.90+3
 23       5.40+1  5.40+1  3.50+1  3.50+1  3.50+1
RA225                                    6
  1      3.00+02 3.00+02 1.90+02 2.00+02 2.00+02
  3      4.90+01 4.90+01 3.10+01 3.20+01 3.20+01
  4      1.70+00 1.70+00 1.10+00 1.10+00 1.10+00
  6      1.50+03 1.50+03 9.30+02 9.90+02 9.90+02
  8      2.40+04 2.40+04 1.50+04 1.60+04 1.60+04
 23      5.30+01 5.30+01 3.50+01 3.50+01 3.50+01
RA226            1.57-3  1.93-3  1.95-3  4
  1       2.47+3  6.70+4  7.80+2  4.40+4  4.60+4
  6       2.49+3  9.30+4  7.90+2  6.10+4  6.40+4
  8       1.40+5  3.20+5  5.00+4  2.30+5  2.30+5
 23       6.40+1  7.00+1  4.00+1  4.70+1  4.70+1
RA228            3.00-03                 4
  1      4.90+03 3.70+04 1.60+03 2.40+04 2.40+04
```

FIGURE C.0-2. File 10 Data Library

```
  4      4.10+03 3.40+04 1.30+05 2.20+04 2.20+04
  8      1.70+05 3.50+05 6.10+04 2.40+05 2.40+05
 23      1.10+01 1.20+01 6.90+00 7.70+00 7.70+00
AC225             0.00+00                       6
  1      7.70+01 7.70+01 4.90+01 5.10+01 5.10+01
  3      1.70+02 1.70+02 1.10+02 1.10+02 1.10+02
  4      1.50+03 1.50+03 9.40+02 9.90+02 9.90+02
  6      1.20+03 1.20+03 7.30+02 7.60+02 7.60+02
  8      1.80+04 1.80+04 1.10+04 1.20+04 1.20+04
 23      6.90+01 6.90+01 4.50+01 4.60+01 4.60+01
AC227             1.00-4  1.81-4  1.99-4  6
  1      1.91+3  4.49+4  5.92+2  2.90+4  3.01+4
  3      1.30+3  3.10+4  4.10+2  2.10+4  2.10+4
  4      1.10+4  9.40+4  3.50+3  6.20+4  6.20+4
  6      2.90+4  7.10+5  8.90+3  4.70+5  4.80+5
  8      4.01+5  9.00+5  1.40+5  6.31+5  6.31+5
 23      1.60+1  1.70+1  1.00+1  1.10+1  1.10+1
TH227             1.4E-2  1.6E-2  1.6E-2  6
  1      1.1E+2  1.1E+2  6.6E+1  7.2E+1  7.2E+1
  3      3.8E+2  3.8E+2  2.3E+2  2.5E+2  2.5E+2
  4      6.5E+1  6.5E+1  3.9E+1  4.3E+1  4.3E+1
  6      3.8E+3  3.8E+3  2.3E+3  2.5E+3  2.5E+3
  8      2.70+4  2.70+4  1.7E+4  1.8E+4  1.8E+4
 23      9.4E+1  9.4E+1  6.2E+1  6.2E+1  6.2E+1
TH228             5.11-4  5.00-4  6.04-4  6
  1      1.90+3  6.60+3  5.10+2  4.31+3  4.31+3
  3      5.10+3  1.80+4  1.70+3  1.20+4  1.20+4
  4      8.80+2  3.10+3  2.90+2  2.00+3  2.00+3
  6      5.50+4  1.90+5  1.90+4  1.30+5  1.30+5
  8      2.60+5  4.40+5  9.80+4  2.90+5  2.90+5
 23      1.10+2  1.10+2  6.80+1  7.40+1  7.40+1
TH229             6.19-3  5.98-3  6.03-3  6
  1      3.21+3  1.59+5  9.90+2  1.00+5  1.10+5
  3      5.40+3  2.30+5  1.70+3  1.50+5  1.60+5
  4      9.30+2  4.60+4  2.90+2  3.00+4  3.30+4
  6      6.40+4  3.30+6  2.00+4  2.10+6  2.30+6
  8      3.40+5  7.90+5  1.20+5  5.70+5  5.70+5
 23      9.80+1  1.10+2  6.20+1  7.20+1  7.20+1
TH230             9.83-5  1.25-4  1.27-4  6
  1      4.70+2  2.30+4  1.40+2  1.50+4  1.70+4
  3      5.30+3  2.20+5  1.60+3  1.50+5  1.60+5
  4      9.10+2  4.50+4  2.80+2  2.90+4  3.20+4
  6      1.63+4  7.70+5  5.10+3  5.00+5  5.50+5
  8      6.10+4  1.40+5  2.20+4  1.01+5  1.01+5
 23      1.20+1  1.30+1  7.30+0  8.50+0  8.50+0
TH232             0.      0.      0.      6
  1      6.00+2  3.00+4  1.90+2  1.89+4  2.10+4
  3      4.50+3  1.90+5  1.40+3  1.20+5  1.30+5
  4      7.80+2  3.90+4  2.40+2  2.50+4  2.70+4
  6      1.80+4  9.60+5  5.70+3  5.60+5  6.10+5
  8      7.20+4  1.70+5  2.60+4  1.20+5  1.20+5
 23      9.80+0  1.10+1  6.20+0  7.20+0  7.20+0
PA231             4.2E-3  4.7E-3  4.8E-3  6
  1      1.4E+3  6.5E+4  4.2E+2  4.2E+4  4.4E+4
  3      6.90+3  3.4E+5  2.1E+3  2.2E+5  2.4E+5
  4      1.2E+3  5.9E+4  3.7E+2  3.9E+4  4.2E+4
  6      3.3E+4  1.5E+6  1.0E+4  1.0E+6  1.1E+6
  8      8.9E+4  2.1E+5  3.2E+4  1.5E+5  1.5E+5
 23      1.4E+1  1.5E+1  8.7E+0  1.0E+1  1.0E+1
PA233             4.12-02 4.63-02 4.96-02 6
  1      2.60-01 2.60-01 1.50-01 1.70-01  1.70-1
  3      1.10+00 1.10+00 6.40-01 7.30-01  7.30-1
  4      2.90-01 2.90-01 1.70-01 1.90-01  1.90-1
  6      1.50+00 1.50+00 8.80-01 1.01+00  1.01+0
  8      1.70+01 1.70+01 1.00+01 1.10+01  1.10+1
 23      2.90+00 2.90+00 1.90+00 1.90+00  1.90+0
U 232             4.52-05 5.55-05 5.62-02 5
  1      1.10+03 1.20+03 4.50+02 8.10+02 8.10+02
  3      1.79+03 1.80+03 1.00+03 1.20+03 1.20+03
  6      9.20+03 1.70+04 3.20+03 1.10+04 1.10+04
  8      2.40+05 5.50+05 8.60+04 3.90+05 3.91+05
 23      1.30+01 1.40+01 8.20+00 9.40+00 9.40+00
U 233             0.0     0.0     0.0     5
```

FIGURE C.0-2. File 10 Data Library

```
  1       2.00+2  2.20+2  8.10+1  1.50+2  1.50+2
  3       9.20+2  9.30+2  4.60+2  5.40+2  5.40+2
  6       1.90+3  3.70+3  6.70+2  2.40+3  2.40+3
  8       6.40+4  1.50+5  2.30+4  1.00+5  1.00+5
 23       1.20+1  1.30+1  7.60+0  8.70+0  8.70+0
U 234             2.00-05 2.51-05 2.65-05 5
  1      1.90+02 2.20+02 8.00+01 1.40+02 1.40+02
  3      8.10+02 8.10+02 4.50+02 5.30+02 5.30+02
  6      1.90+03 3.50+03 6.50+02 2.30+03 2.30+03
  8      6.20+04 1.40+05 2.20+04 1.00+05 1.00+05
 23      1.20+01 1.30+01 7.40+00 8.60+00 8.60+00
U 235             2.7E-2  3.1E-2  3.1E-2  5
  1       1.8E+2  2.0E+2  7.5E+1  1.3E+2  1.3E+2
  3       7.5E+2  7.6E+2  4.2E+2  5.0E+2  5.0E+2
  6       1.8E+3  3.4E+3  6.2E+2  2.2E+3  2.2E+3
  8       5.9E+4  1.4E+5  2.1E+4  9.6E+4  9.6E+4
 23       1.5E+1  1.6E+1  9.4E+0  1.1E+1  1.1E+1
U 236             0.00+00 0.00+00 0.00+00 5
  1      1.80+02 2.10+02 7.50+01 1.40+02 1.40+02
  3      7.80+02 7.90+02 4.40+02 5.20+02 5.20+02
  6      1.80+03 3.40+03 6.20+02 2.20+03 2.20+03
  8      6.00+04 1.40+05 2.10+04 9.80+04 9.80+04
 23      1.10+01 1.20+01 6.90+00 8.00+00 8.00+00
U 237             1.74-02 2.00-02 2.01-02 0
U 238             0.00+00 0.00+00 8.31-03 5
  1      1.70+02 1.90+02 7.00+01 1.30+02 1.30+02
  3      7.10+02 7.10+02 4.00+02 4.70+02 4.70+02
  6      1.70+03 3.20+03 5.90+02 2.10+03 2.10+03
  8      5.50+04 1.30+05 2.00+04 9.01+04 9.01+04
 23      1.00+01 1.20+01 6.60+00 7.70+00 7.70+00
U 240             7.50-03                 0
NP237             3.25-03 4.33-03 4.42-03 6
  1      4.80+02 2.30+04 1.50+02 1.50+04  1.60+4
  3      3.20+03 1.60+05 1.00+03 1.10+05  1.20+5
  4      8.40+03 4.40+05 2.60+03 2.90+05  3.20+5
  6      1.10+04 5.10+05 3.40+03 3.30+05  3.60+5
  8      6.20+04 1.40+05 2.20+04 1.00+05  1.00+5
 23      1.50+01 1.70+01 9.70+00 1.10+01  1.10+1
NP238             0.00+00                 0
NP239             2.22-02 2.46-02 2.47-02 6
  1      1.60-02 1.60-02 1.00-02 1.00-02  1.00-2
  3      8.70-02 8.70-02 5.70-02 5.70-02  5.70-2
  4      2.50-01 2.50-01 1.60-01 1.60-01  1.60-1
  6      2.90-01 2.90-01 1.90-01 1.90-01  1.90-1
  8      1.60+00 1.60+00 1.10+00 1.10+00  1.14+0
 23      3.60+00 3.60+00 2.30+00 2.30+00  2.30+0
PU239             3.73-04 2.39-04 7.77-04 6
  1      5.50+02 2.30+04 1.70+02 1.50+04 1.60+04
  3      2.50+03 9.60+04 7.70+02 6.30+04 6.70+04
  4      9.60+03 3.10+05 3.00+03 2.00+05 2.10+05
  6      1.20+04 4.90+05 3.80+03 3.10+05 3.30+05
  8      7.20+04 1.70+05 2.60+04 1.20+05 1.20+05
 23      1.40+01 1.50+01 8.90+00 1.00+01 1.00+01
PU239             3.73-04 3.39-04 7.77-04 6
  1      5.20+02 2.60+04 1.60+02 1.70+04 1.80+04
  3      2.30+03 1.10+05 7.20+02 6.90+04 7.50+04
  4      9.00+03 3.30+05 2.80+03 2.20+05 2.30+05
  6      1.20+04 5.50+05 3.60+03 3.60+05 3.90+05
  8      6.70+04 1.60+05 2.40+04 1.10+05 1.10+05
 23      1.30+01 1.40+01 8.10+00 9.40+00 9.40+00
PU240             3.22-04 6.38-04 6.71-04 6
  1      5.20+02 2.60+04 1.60+02 1.70+04 1.80+04
  3      2.30+03 1.10+05 7.20+02 6.90+04 7.50+04
  4      9.00+03 3.30+05 2.80+03 2.20+05 2.30+05
  6      1.20+04 5.50+05 3.60+03 3.60+05 3.90+05
  8      6.70+04 1.60+05 2.40+04 1.10+05 1.10+05
 23      1.30+01 1.40+01 8.30+00 9.60+00 9.60+00
PU241             0.00+00 0.00+00 0.00+00 6
  1      2.10+01 4.30+02 6.70+00 2.80+02 2.90+02
  3      1.00+02 1.90+03 3.20+01 1.30+03 1.30+03
  4      1.60+02 2.80+03 5.10+01 1.90+03 1.80+03
  6      5.00+02 1.20+04 1.90+02 7.60+03 7.60+03
  8      1.30+02 2.80+02 4.40+01 2.00+02 2.00+02
```

FIGURE C.0-2. File 10 Data Library

```
23      2.70-01 2.90-01 1.70-01 2.00-01 2.00-01
PU242           4.04-04 8.03-04 8.44-04 6
 1      5.00+02 2.50+04 1.50+02 1.60+04 1.80+04
 3      2.20+03 1.00+05 5.90+02 6.70+04 7.20+04
 4      8.60+03 3.20+05 2.70+03 2.10+05 2.20+05
 6      1.10+04 5.10+05 3.40+03 3.30+05 3.60+05
 8      5.50+04 1.50+05 2.30+04 1.10+05 1.10+05
23      1.30+01 1.40+01 8.00+00 9.20+00 9.20+00
PU243           4.20-03                 6
 1      1.80-03 1.80-03 1.20-03 1.20-03 1.20-03
 3      8.40-03 8.40-03 5.50-03 5.50-03 5.50-03
 4      2.20-02 2.20-02 1.40-02 1.40-02 1.40-02
 6      4.50-02 4.50-02 3.00-02 3.0 -02 3.0 -02
 8      2.20-01 2.20-01 1.40-01 1.50-01 1.50-01
23      2.20-01 2.20-01 1.50-01 1.50-01 1.50-01
PU244           0.00+00                 6
 1      5.70+02 2.90+04 1.80+02 1.90+04 2.00+04
 3      2.60+03 1.20+05 7.90+02 7.70+04 8.30+04
 4      9.90+03 3.70+05 3.10+03 2.40+05 2.50+05
 6      1.30+04 6.00+05 3.90+03 3.90+05 4.20+05
 8      7.40+04 1.70+05 2.60+04 1.20+05 1.20+05
23      1.90+01 2.10+01 1.20+01 1.40+01 1.40+01
AM241           5.03-03 7.23-03 7.42-03 6
 1      5.50+02 2.20+04 1.70+02 1.40+04 1.50+04
 3      3.70+03 1.60+05 1.20+03 1.00+05 1.10+05
 4      9.60+03 3.50+05 3.00+03 2.30+05 2.40+05
 6      1.20+04 5.50+05 3.80+03 3.60+05 3.90+05
 8      7.20+04 1.70+05 2.60+04 1.20+05 1.20+05
23      1.40+01 1.60+01 9.00+00 1.00+01 1.00+01
AM242M          8.34-04 1.41-03 1.69-03 6
 1      5.90+02 2.21+04 1.80+02 1.40+04 1.50+04
 3      4.00+03 1.60+05 1.20+03 1.00+05 1.10+05
 4      9.60+03 3.30+05 3.00+03 2.10+05 2.20+05
 6      1.30+04 5.60+05 4.10+03 3.60+05 3.90+05
 8      5.10+04 1.20+05 1.90+04 8.30+04 8.30+04
23      1.80+01 2.00+01 1.10+01 1.30+01 1.30+01
AM242           6.74-04 1.34-03 2.30-02 6
 1      1.10+00 1.10+00 7.40-01 7.40-01 7.40-01
 3      7.50+00 7.50+00 4.90+00 4.90+00 4.90+00
 4      1.90+01 1.90+01 1.20+01 1.20+01 1.20+01
 6      2.60+01 2.60+01 1.70+01 1.70+01 1.70+01
 8      2.40+02 2.40+02 1.60+02 1.60+02 1.60+02
23      1.60+00 1.60+00 1.00+00 1.00+00 1.00+00
AM243           3.24-04 4.56-04 4.69-04 6
 1      5.20+02 2.20+04 1.60+02 1.40+04 1.50+04
 3      3.60+03 1.60+05 1.10+03 1.00+05 1.10+05
 4      9.10+03 3.40+05 2.80+03 2.20+05 2.40+05
 6      1.20+04 5.50+05 3.60+03 3.60+05 3.90+05
 8      6.90+04 1.60+05 2.40+04 1.10+05 1.10+05
23      1.70+01 1.80+01 1.10+01 1.20+01 1.20+01
CM242           1.15-05 1.34-05 1.35-05 6
 1      3.70+02 4.90+02 1.50+02 3.20+02 3.20+02
 3      1.70+03 2.20+03 5.40+02 1.40+03 1.40+03
 4      6.40+03 8.30+03 2.50+03 5.50+03 5.50+03
 6      8.40+03 1.10+04 3.30+03 7.30+03 7.30+03
 8      4.40+04 5.00+04 1.90+04 3.30+04 3.30+04
23      1.50+01 1.50+01 9.50+00 9.[illegible]+00 9.70+00
CM243           1.70-02                 6
 1      5.80+02 1.50+04 1.80+02 1.00+04 1.00+04
 3      2.60+03 6.90+04 8.10+02 4.50+04 4.70+04
 4      1.00+04 2.40+05 3.10+03 1.60+05 1.60+05
 6      1.30+04 3.70+05 4.00+03 2.40+05 2.50+05
 8      7.50+04 1.70+05 2.70+04 1.20+05 1.20+05
23      1.50+01 1.60+01 9.50+00 1.10+01 1.10+01
CM244           3.0F-04 6.09-04 6.40-04 6
 1      5.50+02 1.20+04 1.70+02 7.60+03 7.80+03
 3      2.50+03 5.30+04 7.70+02 3.50+04 3.50+04
 4      9.60+03 1.60+05 2.70+03 1.10+05 1.10+05
 6      1.20+04 2.90+05 3.90+03 1.80+05 1.90+05
 8      7.50+04 1.70+05 2.70+04 1.20+05 1.20+05
23      1.50+01 1.60+01 9.20+00 1.10+01 1.10+01
CM245           6.61-03 7.62-03 7.68-03 6
 1      5.40+02 2.30+04 1.70+02 1.50+04 1.60+04
```

FIGURE C.0-2. File 10 Data Library

```
 3      2.50+03 1.10+05 7.60+02 6.90+04 7.40+04
 4      9.50+03 3.60+05 2.90+03 2.30+05 2.50+05
 6      1.20+04 5.70+05 3.80+03 3.70+05 4.10+05
 8      7.00+04 1.60+05 2.50+04 1.20+05 1.20+05
23      1.40+01 1.50+01 8.60+00 9.00+00 9.00-00
CM246           0.00+00                 6
 1      5.40+02 2.30+04 1.70+02 1.50+04 1.60+04
 3      2.50+03 1.10+05 7.60+02 6.90+04 7.40+04
 4      9.50+03 3.60+05 2.90+03 2.30+05 2.50+05
 6      8.10+03 3.90+05 2.50+03 2.60+05 2.70+05
 8      7.10+04 1.60+05 2.50+04 1.20+05 1.20+05
23      1.30+01 1.50+01 8.70+00 9.70+00 9.70+00
CM247           0.00+00                 6
 1      5.30+02 2.30+04 1.60+02 1.50+04 1.60+04
 3      2.40+03 1.00+05 7.40+02 6.80+04 7.30+04
 4      9.30+03 3.50+05 2.90+03 2.30+05 2.40+05
 6      1.20+04 5.50+05 3.60+03 3.60+05 3.90+05
 8      7.00+04 1.60+05 2.50+04 1.20+05 1.20+05
23      1.70+01 1.90+01 1.10+01 1.30+01 1.30+01
CM248           0.00+00                 6
 1      4.40+03 1.90+05 1.40+03 1.20+05 1.30+05
 3      2.00+04 8.60+05 6.10+03 5.60+05 6.00+05
 4      7.70+04 2.90+06 2.40+04 1.90+06 2.00+06
 6      9.80+04 4.60+05 3.00+04 3.00+06 3.30+06
 8      5.80+05 1.30+06 2.10+05 9.50+05 9.50+05
23      2.80+02 3.10+02 1.80+02 2.10+02 2.10+02
```

FIGURE C.0-2. File 10 Data Library

```
   87      ALLDOS SAMPLE PROBLEM, PABLM INPUT FILE
   87      ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX. IND., AIR RELEASE, 1/1 DOSE
H 3       1.50E+03   .00       1.50E+03  1.50E+03
C 14      1.31E+05  5.73E+05   1.31E+05  1.31E+05
CO60      1.39E+02  5.99E+01   5.99E+01  5.99E+01
NI59      6.45E+00  3.29E+01    .00       .00
NI63      1.75E+01  4.48E+02    .00       .00
SE79      7.81E+01   .00        .00       .00
PD107     4.09E-01   .00        .00       .00
SN123     1.15E+01  4.14E+02    .00      5.15E+00
U 234     5.20E+02  4.29E+03   3.21E-02  3.21E-02
U 235     4.99E+02  4.11E+03   9.28E-04  9.28E-04
SR90      8.26E+02  3.08E+03    .00       .00
Y 90      1.34E-03  5.49E-02   1.02E-04  1.02E-04
Y 91      5.27E-02  1.47E+00   2.40E-02  2.40E-02
ZR93      3.51E-03  5.55E-02    .00       .00
NB93M     9.58E-03  5.50E-02   3.51E-03  3.51E-03
ZR95      6.55E-02  2.96E-01    .00       .00
NB95M      .00       .00        .00       .00
NB95      3.14E+00  3.20E+00   3.11E+00  3.11E+00
TC99      2.47E+00  5.58E+00   7.57E-01   .00
RU106     9.36E+00  3.99E+01   4.75E+00  4.75E+00
RH106      .00       .00        .00       .00
AG110M    7.43E+00  1.23E+01    .00       .00
AG110      .00       .00        .00       .00
SB125     1.78E+01  3.41E+01    .00      2.87E-02
TE125M    6.45E+00  4.54E+01   3.48E-02  1.47E+01
SN126     7.57E+01  9.78E+02   3.95E+01  4.58E+01
SB126M     .00       .00        .00       .00
SB126     8.50E-02  1.22E-01   5.79E-02  5.92E-02
TE127M    1.58E+01  1.24E+02    .00      3.37E+01
TE127     3.91E-02  1.81E-01   6.75E-05  1.34E-01
I 129     2.55E+03  1.41E+03   2.00E+01  2.07E+05
CS134     2.52E+03  1.22E+03   3.26E+02  4.47E+01
CS135     1.63E+02  3.37E+02   3.54E+01   .00
CS137     1.39E+03  1.41E+03   2.37E+02  1.82E+01
BA137M     .00       .00        .00       .00
CE144     1.09E+00  3.47E+00   9.30E-01  9.30E-01
PR144     4.15E-05  4.15E-05   4.15E-05  4.15E-05
ND144      .00       .00        .00       .00
PM147     1.05E-02  1.99E-01    .00       .00
SM147      .00       .00        .00       .00
SM151     2.17E-01  2.90E-01   2.10E-01  2.10E-01
TH230     9.04E+00  3.18E+02   3.43E-02  3.43E-02
RA226      .00       .00        .00       .00
RN222      .00       .00        .00       .00
PB210      .00       .00        .00       .00
BI210      .00       .00        .00       .00
PO210      .00       .00        .00       .00
U 232     2.96E+03  2.14E+04   1.14E-02  1.14E-02
TH232     1.16E+01  3.54E+02    .00       .00
RA228      .00       .00        .00       .00
AC228      .00       .00        .00       .00
TH229     7.10E+01  1.15E+03   3.28E+01  3.28E+01
RA224     2.50E+03  1.30E+04    .00       .00
PB212      .00       .00        .00       .00
BI212      .00       .00        .00       .00
U 235     4.38E+02  4.10E+03    .00       .00
TH231      .00       .00        .00       .00
PA231      .00       .00        .00       .00
AC227      .00       .00        .00       .00
TH227      .00       .00        .00       .00
RA223      .00       .00        .00       .00
NP237     1.54E+01  2.17E+02   5.22E+00  5.22E+00
PA233     5.19E-01  5.57E-01   5.09E-01  5.09E-01
U 233     5.30E+02  4.45E+03   2.51E-02  2.51E-02
TH229     7.15E+01  1.25E+03   9.56E+00  9.56E+00
RA225      .00       .00        .00       .00
AC225      .00       .00        .00       .00
U 239     4.55E+02  3.93E+03    .00       .00
TH234      .00       .00        .00       .00
PA234M     .00       .00        .00       .00
PA234      .00       .00        .00       .00
AM242M    1.15E+01  2.54E+02   1.14E-01  1.14E-01
```

FIGURE C.0-3. File 12 Data Library

```
AM242     1.38E-02  3.15E-01   .00        .00
CM242     9.33E+00  2.10E+02  1.23E-02  1.23E-02
PU242     2.87E+00  6.32E+01  4.85E-03  4.85E-03
NP238      .00        .00       .00        .00
PU239     3.20E+00  7.05E+01  5.58E-03  5.58E-03
CM244     1.07E+01  2.42E+02  1.25E-02  1.25E-02
PU244      .00        .00       .00        .00
U 240      .00        .00       .00        .00
PU240     2.99E+00  6.83E+01  5.71E-03  5.71E-03
AM243     1.58E+01  2.33E+02  5.71E+00  5.71E+00
NP239     3.93E-02  4.66E-02  3.89E-02  3.89E-02
PU239     2.98E+00  6.83E+01  3.47E-03  3.47E-03
CM245     1.47E+01  2.40E+02  4.17E+00  4.17E+00
PU241     1.25E-01  3.48E+00   .00        .00
AM241     1.14E+01  2.37E+02  7.89E-01  7.89E-01
   87     ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX.IND., AIR RELEASE, 1/70 DOSE
H  3      1.56E+03   .00      1.56E+03  1.56E+03
C  14     1.35E+05  5.80E+05  1.35E+05  1.35E+05
CO50      5.38E+02  5.56E+02  5.56E+02  5.56E+02
NI59      4.50E+01  2.70E+02   .00        .00
NI5#      1.17E+02  3.49E+03   .00        .00
SE79      7.53E+02   .00       .00        .00
PD107     1.09E+01   .00       .00        .00
SN123     1.30E+01  5.31E+02   .00       7.49E+00
U 234     8.47E+02  1.35E+04  2.25E+00  2.25E+00
U 235     8.10E+02  1.31E+04  5.50E-02  5.50E-02
S730      3.85E+04  1.43E+05   .00        .00
Y  90     3.17E-01  3.81E-01  3.15E-01  3.15E-01
Y  91     7.43E-02  1.89E+00  2.43E-02  2.43E-02
ZR93      1.50E-02  5.72E-01   .00        .00
NB93M     1.53E-01  5.84E-01  1.15E-01  1.15E-01
ZR95      8.39E-02  3.87E-01   .00        .00
NB95M      .00        .00       .00        .00
NB95      3.37E+00  3.44E+00  3.34E+00  3.34E+00
TC99      5.77E+00  1.44E+01  1.80E+00   .00
RU105     1.43E+01  4.71E+01  9.57E+00  9.57E+00
RH105      .00        .00       .00        .00
AG110M    7.50E+00  1.38E+01   .00        .00
AG110      .00        .00       .00        .00
SB125     5.18E+01  1.50E+02   .00       2.93E-02
TE125M    8.03E+00  5.90E+01  1.51E-01  1.79E+01
SN126     2.81E+03  4.29E+03  2.77E+03  2.78E+03
SB126M     .00        .00       .00        .00
SB126     3.78E+02  3.78E+02  3.78E+02  3.78E+02
TE127M    1.53E+01  1.39E+02   .00       3.52E+01
TE127     4.12E-02  1.34E-01  1.89E-03  1.35E-01
I  129    5.04E+03  3.05E+03  1.40E+03  3.55E+06
CS134     4.05E+03  2.15E+03  5.35E+02  1.57E+02
CS135     2.51E+02  5.35E+02  6.70E+01   .00
CS137     2.36E+03  3.23E+03  1.05E+03  5.41E+02
BA137M     .00        .00       .00        .00
CE144     1.93E+00  8.20E+00  1.58E+00  1.58E+00
PR144     4.04E-01  4.04E-01  4.04E-01  4.04E-01
ND144     1.42E-15  5.40E-15   .00        .00
PM147     4.02E-02  1.05E+00   .00        .00
SM147      .00        .00       .00        .00
SM151     1.14E+01  1.24E+01  1.14E+01  1.14E+01
TH230     1.12E+03  3.53E+04  2.40E+00  2.40E+00
RA225     5.16E+02  7.50E+02  5.92E+01  5.92E+01
RN222     5.01E+01  5.91E+01  5.91E+01  5.91E+01
PB210     4.35E+01  1.04E+03  2.69E-02  2.69E-02
BI210     2.18E-02  3.81E-02   .00        .00
PO210     1.02E+00  4.24E+00  1.09E-04  1.09E-04
U 232     4.74E+03  5.58E+04  5.81E-01  5.81E-01
TH232     1.39E+03  3.92E+04   .00        .00
RA223      .00        .00       .00        .00
AC228      .00        .00       .00        .00
TH228     2.29E+03  9.21E+03  2.02E+03  2.02E+03
RA224     2.56E+03  1.33E+04   .00        .00
PB212     1.47E+00  1.84E+01   .00        .00
BI212     1.29E-08  1.92E-08   .00        .00
U 235     7.57E+02  1.26E+04   .00        .00
TH231      .00        .00       .00        .00
PA231      .00        .00       .00        .00
```

FIGURE C.0-3. File 12 Data Library

```
AC227       .00         .00         .00         .00
TH227       .00         .00         .00         .00
RA223       .00         .00         .00         .00
NP237     1.49E+03    2.42E+04    4.35E+02    4.35E+02
PA233     3.99E+02    3.99E+02    3.99E+02    3.99E+02
U 233     8.53E+02    1.42E+04    1.75E+00    1.75E+00
TH229     9.32E+03    1.58E+05    5.75E+02    5.75E+02
RA225     2.55E+02    1.33E+03     .00         .00
AC225     4.85E+02    4.85E+02    4.85E+02    4.85E+02
U 238     7.17E+02    1.21E+04     .00         .00
TH234       .00         .00         .00         .00
PA234M      .00         .00         .00         .00
PA234       .00         .00         .00         .00
AM242M    9.39E+02    2.45E+04    5.84E+00    5.84E+00
AM242     1.39E-02    3.17E-01     .00         .00
CM242     2.05E+01    4.37E+02    1.19E+00    1.19E+00
PU242     3.51E+02    7.00E+03    3.39E-01    3.39E-01
NP238       .00         .00         .00         .00
PU238     3.06E+02    6.17E+03    3.74E-01    3.74E-01
CM244     4.76E+02    1.05E+04    3.10E-01    3.10E-01
PU244       .00         .00         .00         .00
U 240       .00         .00         .00         .00
PU240     3.53E+02    7.54E+03    3.99E-01    3.99E-01
AM243     1.34E+03    2.55E+04    3.38E+02    3.38E+02
NP239     2.87E+02    2.87E+02    2.87E+02    2.87E+02
PU239     3.54E+02    7.55E+03    2.43E-01    2.43E-01
CM245     1.35E+03    2.69E+04    2.91E+02    2.91E+02
PU241     4.78E+00    1.25E+02     .00         .00
AM241     1.00E+03    2.49E+04    5.52E+01    5.52E+01
   87   ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, AIR RELEASE, 1/1 DOSE
H 3       7.56E+02     .00        7.56E+02    7.56E+02
C 14      8.27E+04    3.63E+05    8.27E+04    8.27E+04
CO60      8.23E+01    4.56E+01    4.56E+01    4.56E+01
NI59      4.09E+00    2.09E+01     .00         .00
NI63      1.11E+01    2.84E+02     .00         .00
SE79      5.92E+01     .00         .00         .00
PD107     2.45E-01     .00         .00         .00
SN123     5.25E+00    2.24E+02     .00        3.33E+00
U 234     2.79E+02    2.30E+03    2.14E-02    2.14E-02
U 235     2.57E+02    2.20E+03    5.19E-04    5.19E-04
SR90      4.58E+02    1.74E+03     .00         .00
Y 90      1.13E-04    1.76E-03    5.79E-05    5.79E-05
Y 91      3.31E-02    5.53E-01    1.60E-02    1.60E-02
ZR93      1.70E-03    3.22E-02     .00         .00
NB93M     5.71E-03    8.55E-02    2.34E-03    2.34E-03
ZR95      2.85E-02    1.29E-01     .00         .00
NB95M       .00         .00         .00         .00
NB95      2.08E+00    2.11E+00    2.07E+00    2.07E+00
TC99      1.82E+00    4.11E+00    5.57E-01     .00
RU106     5.37E+00    2.00E+01    3.17E+00    3.17E+00
RH106       .00         .00         .00         .00
AG110M    5.76E+00    9.54E+00     .00         .00
AG110       .00         .00         .00         .00
SB125     9.54E+00    1.83E+01     .00        1.54E-02
TE125M    3.41E+00    2.45E+01    2.12E-02    7.77E+00
SN126     4.67E+01    5.54E+02    2.64E+01    2.99E+01
SB126M      .00         .00         .00         .00
SB126     3.85E-02    3.85E-02    3.86E-02    3.86E-02
TE127M    8.00E+00    5.99E+01     .00        1.90E+01
TE127     5.95E-05    1.54E-04    4.51E-05    1.25E-04
I 129     1.95E+03    1.03E+03    1.33E+01    1.52E+05
CS134     1.74E+03    8.37E+02    2.24E+02    2.98E+01
CS135     1.05E+02    2.33E+02    2.44E+01     .00
CS137     9.55E+02    9.74E+02    1.64E+02    1.21E+01
BA137M      .00         .00         .00         .00
CE144     5.95E-01    1.83E+00    5.19E-01    6.19E-01
PR144     2.77E-05    2.77E-05    2.77E-05    2.77E-05
ND144       .00         .00         .00         .00
PM147     5.25E-03    9.83E-02     .00         .00
SM147       .00         .00         .00         .00
SM151     1.43E-01    1.80E-01    1.40E-01    1.40E-01
TH230     4.52E+00    1.59E+02    2.28E-02    2.28E-02
RA226       .00         .00         .00         .00
RN222       .00         .00         .00         .00
```

FIGURE C.0-3. File 12 Data Library

```
PB210       .00         .00         .00         .00
BI210       .00         .00         .00         .00
PO210       .00         .00         .00         .00
U 232    1.59E+03    1.14E+04    7.57E-03    7.57E-03
TH232    5.80E+00    1.77E+02     .00         .00
RA228       .00         .00         .00         .00
AC228       .00         .00         .00         .00
TH228    4.07E+01    5.79E+02    2.18E+01    2.18E+01
RA224    2.21E+02    1.11E+03     .00         .00
PB212       .00         .00         .00         .00
BI212       .00         .00         .00         .00
U 235    2.61E+02    2.20E+03     .00         .00
TH231       .00         .00         .00         .00
PA231       .00         .00         .00         .00
AC227       .00         .00         .00         .00
TH227       .00         .00         .00         .00
RA223       .00         .00         .00         .00
NP237    8.73E+00    1.09E+02    4.15E+00    4.15E+00
PA233    4.09E-01    4.28E-01    4.05E-01    4.05E-01
U 233    2.84E+02    2.39E+03    1.57E-02    1.57E-02
TH229    3.73E+01    5.23E+02    5.43E+00    5.43E+00
RA225       .00         .00         .00         .00
AC225       .00         .00         .00         .00
U 239    2.44E+02    2.10E+03     .00         .00
TH234       .00         .00         .00         .00
PA234M      .00         .00         .00         .00
PA234       .00         .00         .00         .00
AM242M   5.75E+00    1.27E+02    7.59E-02    7.59E-02
AM242    4.57E-07    1.07E-05     .00         .00
CM242    4.45E+00    1.00E+02    8.15E-03    8.15E-03
PU242    1.43E+00    3.15E+01    3.23E-03    3.23E-03
NP239       .00         .00         .00         .00
PU238    1.50E+00    3.52E+01    3.79E-03    3.79E-03
CM244    5.35E+00    1.20E+02    8.32E-03    8.32E-03
PU244       .00         .00         .00         .00
U 240       .00         .00         .00         .00
PU240    1.49E+00    3.41E+01    3.80E-03    3.80E-03
AM243    3.84E+00    1.17E+02    3.80E+00    3.80E+00
NP239    2.59E-02    2.60E-02    2.59E-02    2.59E-02
PU239    1.49E+00    3.40E+01    2.31E-03    2.31E-03
CM245    3.01E+00    1.21E+02    2.78E+00    2.78E+00
PU241    5.24E-02    1.74E+00     .00         .00
AM241    5.84E+00    1.18E+02    5.26E-01    5.26E-01
   97    ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, AIR RELEASE, 1/70 DOSE
H 3      7.87E+02     .00        7.87E+02    7.87E+02
C 14     8.51E+04    4.30E+05    8.51E+04    8.51E+04
CO60     4.15E+02    3.77E+02    3.77E+02    3.77E+02
NI59     2.75E+01    1.55E+02     .00         .00
NI63     7.17E+01    2.14E+03     .00         .00
SE79     5.64E+02     .00         .00         .00
PD107    5.31E+00     .00         .00         .00
SN123    7.02E+00    2.88E+02     .00        4.05E+00
U 234    4.52E+02    7.28E+03    1.50E+00    1.50E+00
U 235    4.32E+02    6.97E+03    4.33E-02    4.33E-02
SR90     1.96E+04    7.31E+04     .00         .00
Y 90     2.10E-01    2.12E-01    2.10E-01    2.10E-01
Y 91     3.33E-02    9.41E-01    1.52E-02    1.52E-02
ZR93     7.25E-03    2.77E-01     .00         .00
NB93M    9.73E-02    3.35E-01    7.56E-02    7.56E-02
ZR95     3.55E-02    1.69E-01     .00         .00
NB95M     .00         .00         .00         .00
NB95     2.24E+00    2.28E+00    2.23E+00    2.23E+00
TC99     3.55E+00    9.87E+00    1.11E+00     .00
RU106    8.64E+00    2.43E+01    6.38E+00    6.38E+00
RH106       .00         .00         .00         .00
AG110M   5.88E+00    1.07E+01     .00         .00
AG110       .00         .00         .00         .00
SB125    2.78E+01    8.58E+01     .00        1.57E-02
TE125M   4.20E+00    3.07E+01    1.01E-01    9.32E+00
SN126    1.87E+03    2.59E+03    1.84E+03    1.85E+03
SB126M      .00         .00         .00         .00
SB126    2.52E+02    2.52E+02    2.52E+02    2.52E+02
TE127M   9.46E+00    7.77E+01     .00        1.98E+01
TE127    1.28E-03    1.35E-03    1.25E-03    1.34E-03
```

FIGURE C.0-3. File 12 Data Library

```
I 129      4.25E+03  2.11E+03  9.32E+02  2.51E+05
CS134      2.79E+03  1.48E+03  4.34E+02  1.04E+02
CS135      1.81E+02  4.40E+02  4.53E+01  .00
CS137      2.03E+03  2.22E+03  7.09E+02  4.27E+02
BA137M      .00       .00       .00       .00
CE144      1.22E+00  4.20E+00  1.05E+00  1.05E+00
PR144      2.59E-01  2.59E-01  2.59E-01  2.59E-01
ND144      5.39E-17  2.43E-15   .00       .00
PM147      1.99E-02  5.23E-01   .00       .00
SM147       .00       .00       .00       .00
SM151      7.62E+00  8.09E+00  7.50E+00  7.50E+00
TH230      5.56E+02  1.81E+04  1.50E+00  1.50E+00
RA226      2.85E+02  3.45E+02  3.94E+01  3.94E+01
RN222      3.94E+01  3.94E+01  3.34E+01  3.94E+01
PB210      1.91E+01  4.55E+02  1.79E-02  1.79E-02
BI210      3.55E-03  6.37E-03   .00       .00
PO210      4.37E-01  1.81E+00  7.28E-05  7.28E-05
U 232      2.54E+03  3.57E+04  3.87E-01  3.87E-01
TH232      5.95E+02  1.95E+04   .00       .00
RA228       .00       .00       .00       .00
AC228       .00       .00       .00       .00
TH228      1.47E+03  4.88E+03  1.34E+03  1.34E+03
RA224      2.27E+02  1.13E+03   .00       .00
PB212      1.15E-05  1.44E-04   .00       .00
BI212       .00      5.15E-32   .00       .00
U 235      4.11E+02  5.79E+03   .00       .00
TH231       .00       .00       .00       .00
PA231       .00       .00       .00       .00
AC227       .00       .00       .00       .00
TH227       .00       .00       .00       .00
RA223       .00       .00       .00       .00
NP237      3.14E+02  1.21E+04  2.90E+02  2.90E+02
PA233      2.66E+02  2.66E+02  2.65E+02  2.66E+02
U 233      4.61E+02  7.53E+03  1.17E+00  1.17E+00
TH229      4.25E+03  7.87E+04  4.50E+02  4.50E+02
RA225      9.60E+01  4.35E+02   .00       .00
AC225      3.23E+02  3.23E+02  3.23E+02  3.23E+02
U 233      3.84E+02  6.48E+03   .00       .00
TH234       .00       .00       .00       .00
PA234M      .00       .00       .00       .00
PA234       .00       .00       .00       .00
AM242M     4.59E+02  1.22E+04  4.55E+00  4.55E+00
AM242      4.59E-07  1.07E-05   .00       .00
CM242      1.30E+01  2.08E+02  7.93E-01  7.93E-01
PU242      1.75E-02  3.49E+03  2.25E-01  2.25E-01
NP239       .00       .00       .00       .00
PU238      1.53E+02  3.08E+03  2.49E-01  2.40E-01
CM244      2.17E+02  5.22E+03  2.05E-01  2.05E-01
PU244       .00       .00       .00       .00
U 240       .00       .00       .00       .00
PU240      1.81E+02  3.75E+03  2.46E-01  2.55E-01
AM243      7.33E+02  1.29E+04  2.55E+02  2.55E+02
NP235      1.91E+02  1.91E+02  1.91E+02  1.91E+02
PU239      1.82E+02  3.77E+03  1.52E-01  1.52E-01
CM245      7.20E+02  1.34E+04  1.94E+02  1.94E+02
PU241      2.33E+00  5.30E+01   .00       .00
AM241      5.00E+02  1.24E+04  3.68E+01  3.68E+01
   97      ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX. IND., WATER RELEASE, 1/1 DOSE
H 3        1.14E-04   .00      1.14E-04  1.14E-04
C 14       4.12E+00  1.81E+01  4.12E+00  4.12E+00
CO60       3.35E-01  1.85E-01  1.85E-01  1.86E-01
NI59       1.43E-02  7.29E-02  3.86E-07  3.86E-07
NI63       3.80E-02  9.92E-01   .00       .00
SE79       1.55E-01  5.71E-09  5.71E-09  5.71E-09
PD107      3.34E-04   .00       .00       .00
SN123      1.14E-01  4.09E+00   .00      5.06E-02
U 234      1.07E+00  8.93E+00  8.54E-05  8.54E-05
U 236      1.03E+00  8.45E+00  2.46E-05  2.46E-05
SR90       1.73E+00  5.47E+00  9.06E-08  9.06E-08
Y 90       1.21E-05  1.49E-04  8.35E-05  8.35E-05
Y 91       1.47E-04  3.12E-03  5.49E-05  5.49E-05
ZR93       7.27E-05  1.38E-04   .00       .00
NB93M      4.97E-04  4.95E-03  9.34E-06  9.34E-06
ZR93       1.35E-04  5.15E-04   .00       .00
```

FIGURE C.0-3. File 12 Data Library

NB95M	.00	.00	.00	.00
NB95	1.44E-02	1.95E-02	1.22E-02	1.22E-02
TC99	5.04E-03	1.14E-02	1.55E-03	2.18E-08
RU106	2.23E-02	8.59E-02	1.27E-02	1.27E-02
RH106	.00	.00	.00	.00
AG110M	1.50E-02	2.49E-02	.00	.00
AG110	.00	.00	.00	.00
SB125	3.57E-02	7.03E-02	.00	5.91E-05
TE125M	1.92E-02	1.38E-01	1.09E-04	4.37E-02
SN126	4.57E-01	9.25E+00	1.05E-01	1.66E-01
SB125M	.00	.00	.00	.00
SB126	3.95E-03	4.03E-03	3.90E-03	3.90E-03
TE127M	4.59E-02	3.50E-01	.00	9.81E-02
TE127	1.55E-04	7.23E-04	1.12E-05	5.37E-04
I 129	5.43E-01	2.89E-01	5.30E-03	4.22E+02
CS134	1.21E+01	5.77E+00	1.48E+00	1.19E-01
CS135	7.37E-01	1.62E+00	1.71E-01	1.11E-08
CS137	5.67E+00	6.73E+00	1.10E+00	4.86E-02
BA137M	.00	.00	.00	.00
CE144	2.81E-03	7.55E-03	2.48E-03	2.48E-03
PR144	3.75E-04	3.75E-04	3.75E-04	3.75E-04
ND144	.00	.00	.00	.00
PM147	2.24E-05	4.19E-04	1.25E-08	1.25E-08
SM147	.00	.00	.00	.00
SM151	5.72E-04	7.27E-04	5.57E-04	5.57E-04
TH230	1.95E-02	5.84E-01	9.12E-05	9.12E-05
RA225	7.98E-05	7.98E-05	7.98E-05	7.98E-05
RN222	7.74E-05	7.74E-05	7.74E-05	7.74E-05
PB210	7.90E-11	7.90E-11	7.90E-11	7.90E-11
BI210	.00	.00	.00	.00
PO210	9.96E-14	9.96E-14	9.96E-14	9.96E-14
U 232	6.10E+00	4.40E+01	3.02E-05	3.02E-05
TH232	3.41E-02	7.72E-01	9.07E-03	9.07E-03
RA228	1.97E-03	1.97E-03	1.97E-03	1.97E-03
AC228	.00	.00	.00	.00
TH229	1.74E-01	2.52E+00	9.17E-02	9.17E-02
RA224	6.01E+00	3.01E+01	.00	.00
PB212	.00	.00	.00	.00
BI212	.00	.00	.00	.00
U 235	1.01E+00	8.45E+00	3.73E-03	3.73E-03
TH231	.00	.00	.00	.00
PA231	6.57E-08	6.57E-08	6.57E-08	6.57E-08
AC227	6.22E-10	6.22E-10	6.22E-10	6.22E-10
TH227	.00	.00	.00	.00
RA223	.00	.00	.00	.00
NP237	3.57E-02	4.57E-01	1.55E-02	1.45E-02
PA233	4.98E-03	5.08E-03	4.95E-03	4.95E-03
U 233	1.09E+00	9.19E+00	5.67E-05	6.57E-05
TH229	1.52E-01	2.59E+00	2.57E-02	2.57E-02
RA225	.00	.00	.00	.00
AC225	4.09E-03	4.09E-03	4.09E-03	4.09E-03
U 238	9.40E-01	8.09E+00	1.00E-03	1.00E-03
TH234	2.82E-04	2.82E-04	2.82E-04	2.82E-04
PA234M	.00	.00	.00	.00
PA234	.00	.00	.00	.00
AM242M	2.47E-02	5.44E-01	3.03E-04	3.03E-04
AM242	3.09E-05	7.05E-04	.00	.00
CM242	2.00E-02	4.49E-01	3.89E-05	3.89E-05
PU242	5.94E-03	1.31E-01	1.29E-05	1.29E-05
NP238	.00	.00	.00	.00
PU238	6.53E-03	1.45E-01	1.51E-05	1.51E-05
CM244	2.30E-02	5.15E-01	3.32E-05	3.32E-05
PU244	.00	.00	.00	.00
U 240	.00	.00	.00	.00
PU240	6.18E-03	1.41E-01	1.52E-05	1.52E-05
AM243	3.48E-02	5.02E-01	1.52E-02	1.52E-02
NP239	2.81E-03	2.82E-03	2.81E-03	2.81E-03
PU239	6.17E-03	1.41E-01	9.23E-05	9.23E-05
CM245	3.35E-02	5.15E-01	1.11E-02	1.11E-02
PU241	2.59E-04	7.21E-03	.00	.00
AM241	2.49E-02	5.07E-01	2.10E-03	2.10E-03
87	ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX. IND., WATER RELEASE, 1/70 DOSE			
H 3	1.18E-04	.00	1.18E-04	1.18E-04
C 14	4.29E+00	2.15E+01	4.29E+00	4.29E+00

FIGURE C.C-3. File 12 Data Library

CO60	1.56E+00	1.50E+00	1.50E+00	1.50E+00
NI59	9.85E-02	5.90E-01	3.85E-07	3.85E-07
NI63	2.55E-01	7.64E+00	.00	.00
SE79	1.45E+00	5.71E-09	5.71E-09	5.71E-09
PD107	2.21E-02	.00	.00	.00
SN123	1.29E-01	5.24E+00	.00	7.38E-02
U 234	1.74E+00	2.81E+01	5.96E-03	5.95E-03
U 235	1.67E+00	2.69E+01	1.72E-04	1.72E-04
SR90	7.92E+01	2.35E+02	9.06E-08	9.06E-08
Y 00	8.49E-04	9.88E-04	8.45E-04	8.45E-04
Y 91	1.71E-04	4.02E-03	6.58E-05	6.58E-05
ZR93	3.10E-05	1.19E-03	.00	.00
NB93M	3.13E-03	3.53E-02	3.05E-04	3.05E-04
ZR95	1.74E-04	8.03E-04	.00	.00
NB95M	.00	.00	.00	.00
NB95	1.53E-02	2.12E-02	1.28E-02	1.28E-02
TC99	1.17E-02	2.02E-02	3.64E-03	2.18E-08
RU106	3.54E-02	1.04E-01	2.55E-02	2.55E-02
RH106	.00	.00	.00	.00
AG110M	1.54E-02	2.80E-02	.00	.00
AG110	.00	.00	.00	.00
SB125	1.07E-01	3.30E-01	.00	6.04E-05
TE125M	2.27E-02	1.67E-01	4.18E-04	5.06E-02
SN126	7.75E+00	2.18E+01	7.35E+00	7.43E+00
SB126M	.00	.00	.00	.00
SB126	1.01E+00	1.01E+00	1.01E+00	1.01E+00
TE127M	4.87E-02	4.00E-01	.00	1.02E-01
TE127	1.70E-04	7.70E-04	1.50E-05	5.44E-04
I 129	1.32E+00	7.07E-01	3.71E-01	7.44E-02
CS134	1.92E+01	1.00E+01	2.72E+00	4.17E-01
CS135	1.25E+00	3.03E+00	3.19E-01	1.11E-08
CS137	1.29E+01	1.41E+01	3.56E+00	1.70E+00
BA137M	.00	.00	.00	.00
CE144	4.92E-03	1.77E-02	4.20E-03	4.20E-03
PR144	1.45E-03	1.45E-03	1.45E-03	1.45E-03
ND144	2.85E-13	1.09E-17	.00	.00
PM147	3.49E-05	2.23E-03	1.26E-08	1.26E-09
SM147	.00	.00	.00	.00
SM151	3.04E-02	3.24E-02	3.03E-02	3.03E-02
TH230	2.40E+00	7.80E+01	6.37E-03	6.37E-03
RA226	1.29E+00	1.55E+00	1.58E-01	1.58E-01
RN222	1.58E-01	1.58E-01	1.58E-01	1.58E-01
PB210	8.75E-02	2.00E+00	7.17E-05	7.17E-05
BI210	4.42E-05	7.71E-05	.00	.00
PO210	2.05E-03	3.54E-03	2.91E-07	2.91E-07
U 232	9.20E+00	1.38E+02	1.54E-03	1.54E-03
TH232	3.50E+00	8.49E+01	5.95E-01	5.95E-01
RA228	2.10E+00	2.10E+00	2.10E+00	2.10E+00
AC228	.00	.00	.00	.00
TH229	7.30E+00	2.23E+01	5.95E+00	5.95E+00
RA224	6.14E+00	3.07E+01	.00	.00
PB212	2.09E-03	3.74E-02	.00	.00
BI212	2.53E-11	3.92E-11	.00	.00
U 235	1.84E+00	2.53E+01	2.58E-01	2.58E-01
TH231	.00	.00	.00	.00
PA231	3.25E-04	3.25E-04	3.25E-04	3.25E-04
AC227	1.35E-04	1.35E-04	1.35E-04	1.35E-04
TH227	.00	.00	.00	.00
RA223	.00	.00	.00	.00
NP237	3.35E+00	5.09E+01	1.15E+00	1.15E+00
PA233	1.06E+00	1.06E+00	1.06E+00	1.06E+00
U 233	1.78E+00	2.32E+01	4.66E-03	4.66E-03
TH229	1.82E+01	5.40E+02	1.80E+00	1.80E+00
RA225	5.35E-01	2.58E+00	.00	.00
AC225	1.29E+00	1.29E+00	1.29E+00	1.29E+00
U 238	1.55E+00	2.50E+01	6.94E-02	6.94E-02
TH234	2.18E-02	2.18E-02	2.18E-02	2.18E-02
PA234M	.00	.00	.00	.00
PA234	.00	.00	.00	.00
AM242M	2.01E+00	5.24E+01	1.82E-02	1.82E-02
AM242	3.10E-05	7.07E-04	.00	.00
CM242	4.45E-02	9.35E-01	3.17E-03	3.17E-03
PU242	7.26E-01	1.45E+01	9.00E-04	9.00E-04
NP239	.00	.00	.00	.00

FIGURE C.0-3. File 12 Data Library

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PU238      5.33E-01  1.29E+01  9.95E-04  9.95E-04
CM244      9.32E-01  2.24E+01  8.22E-04  8.22E-04
PU244       .00       .00       .00       .00
U 240       .00       .00       .00       .00
PU240      7.52E-01  1.55E+01  1.05E-03  1.05E-03
AM243      3.05E+00  5.48E+01  1.05E+00  1.05E+00
NP239      7.54E-01  7.54E-01  7.54E-01  7.54E-01
PU239      7.54E-01  1.56E+01  6.45E-04  6.45E-04
CM245      3.03E+00  5.75E+01  7.73E-01  7.73E-01
PU241      9.89E-03  2.62E-01   .00       .00
AM241      2.17E+00  5.33E+01  1.47E-01  1.47E-01
   87      ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, WATER RELEASE, 1/1 DOSE
H 3        5.54E-05   .00      5.54E-05  5.54E-05
C 14       2.54E+00  1.11E+01  2.54E+00  2.54E+00
CO60       1.58E-01  9.52E-02  9.52E-02  9.52E-02
NI59       8.29E-03  4.23E-02  3.22E-08  3.22E-08
NI63       2.25E-02  5.75E-01   .00       .00
SE79       1.35E-01  4.75E-10  4.75E-10  4.75E-10
PD107      4.37E-04   .00       .00       .00
SN123      1.35E-02  4.85E-01   .00      7.20E-03
U 234      5.73E-01  4.72E+00  4.37E-05  4.37E-05
U 235      5.49E-01  4.52E+00  1.26E-06  1.26E-05
SR90       9.50E-01  3.54E+00  7.55E-09  7.55E-09
Y 90       5.25E-07  4.72E-05  5.13E-07  5.13E-07
Y 91       5.75E-05  1.33E-03  3.29E-05  3.28E-05
ZR93       3.53E-05  5.68E-05   .00       .00
NB93M      1.53E-05  1.11E-04  4.78E-06  4.78E-06
ZR95       5.55E-05  2.59E-04   .00       .00
NB95M       .00       .00       .00       .00
NB95       4.42E-03  4.52E-03  4.39E-03  4.38E-03
TC99       3.68E-03  8.32E-03  1.13E-03  1.82E-09
RU106      1.10E-02  4.11E-02  5.49E-03  5.49E-03
RH106       .00       .00       .00       .00
AG110M     1.15E-02  1.93E-02   .00       .00
AG110       .00       .00       .00       .00
SB125      1.07E-02  3.77E-02   .00      3.17E-05
TE125M     5.95E-03  5.00E-02  4.79E-05  1.58E-02
SN126      3.77E-02  1.19E+00  5.38E-02  5.14E-02
SB126M      .00       .00       .00       .00
SB126      2.18E-04  2.19E-04  2.17E-04  2.17E-04
TE127M     1.81E-02  1.42E-01   .00      3.86E-02
TE127      2.53E-05  1.05E-05  4.79E-07  7.85E-05
I 129      3.94E-01  2.09E-01  2.72E-03  3.07E+02
CS134      3.57E+00  1.72E+00  4.59E-01  6.09E-02
CS135      2.18E-01  4.79E-01  5.05E-02  0.23E-10
CS137      1.33E+00  2.00E+00  3.36E-01  2.48E-02
BA137M      .00       .00       .00       .00
CE144      1.42E- 3  3.72E-03  1.27E-03  1.27E-03
PR144      1.28E-05  1.28E-05  1.28E-05  1.28E-05
ND144       .00       .00       .00       .00
PM147      1.07E-05  2.00E-04  1.05E-09  1.05E-09
SM147       .00       .00       .00       .00
SM151      2.93E-04  3.57E-04  2.86E-04  2.85E-04
TH230      9.33E-03  3.27E-01  4.57E-05  4.57E-05
RA226      2.71E-07  2.71E-07  2.71E-07  2.71E-07
RN222      2.63E-07  2.63E-07  2.63E-07  2.63E-07
PB210      2.59E-12  2.59E-12  2.59E-12  2.59E-12
BI210       .00       .00       .00       .00
PO210      3.39E-15  3.39E-15  3.39E-15  3.39E-15
U 232      3.25E+00  2.35E+01  1.55E-05  1.55E-05
TH232      1.23E-02  3.55E-01  3.36E-04  3.36E-04
RA228      5.59E-05  5.59E-05  5.59E-05  5.59E-05
AC228       .00       .00       .00       .00
TH228      9.39E-02  1.20E+00  4.48E-02  4.48E-02
RA224      5.42E-01  2.71E+00   .00       .00
PB212       .00       .00       .00       .00
BI212       .00       .00       .00       .00
U 235      5.38E-01  4.52E+00  1.29E-04  1.29E-04
TH231       .00       .00       .00       .00
PA231      2.24E-09  2.24E-09  2.24E-09  2.24E-09
AC227      2.12E-11  2.12E-11  2.12E-11  2.12E-11
TH227       .00       .00       .00       .00
RA223       .00       .00       .00       .00
NP237      1.79E-02  2.25E-01  8.47E-03  8.47E-03
```

FIGURE C.0-3. File 12 Data Library

```
PA233      9.53E-04  9.02E-04  9.45E-04  9.45E-04
U 233      5.84E-01  4.92E+00  3.41E-05  3.41E-05
TH229      7.70E-02  1.29E+00  1.32E-02  1.32E-02
RA225       .00       .00       .00       .00
AC225      1.39E-04  1.39E-04  1.39E-04  1.39E-04
U 238      5.02E-01  4.33E+00  3.47E-05  3.47E-05
TH234      9.59E-05  9.59E-05  9.59E-05  9.59E-05
PA234M      .00       .00       .00       .00
PA234       .00       .00       .00       .00
AM242M     1.19E-02  2.52E-01  1.55E-04  1.55E-04
AM242      5.88E-07  1.34E-05   .00       .00
CM242      9.21E-03  2.07E-01  1.69E-05  1.69E-05
PU242      2.95E-03  5.51E-02  5.50E-05  5.50E-05
NP238       .00       .00       .00       .00
PU238      3.30E-03  7.27E-02  7.74E-06  7.74E-06
CM244      1.11E-02  2.49E-01  1.70E-05  1.70E-05
PU244       .00       .00       .00       .00
U 240       .00       .00       .00       .00
PU240      3.03E-03  7.03E-02  7.77E-06  7.77E-06
AM243      1.82E-02  2.42E-01  7.77E-03  7.77E-03
NP239      1.47E-04  1.47E-04  1.47E-04  1.47E-04
PU239      3.07E-03  7.02E-02  4.72E-05  4.72E-05
CM245      1.15E-02  2.49E-01  5.58E-03  5.58E-03
PU241      1.29E-04  3.58E-03   .00       .00
AM241      1.21E-02  2.44E-01  1.08E-03  1.08E-03
   87      ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, WATER RELEASE, 1/70 DOSE
H 3        5.81E-05   .00      5.81E-05  5.81E-05
C 14       2.64E+00  1.32E+01  2.64E+00  2.64E+00
CO60       8.47E-01  7.70E-01  7.70E-01  7.70E-01
NI59       5.55E-02  3.33E-01  3.22E-08  3.22E-08
NI63       1.45E-01  4.34E+00   .00       .00
SE79       1.27E+00  4.75E-10  4.75E-10  4.75E-10
PD107      1.07E-02   .00       .00       .00
SN123      1.52E-02  5.22E-01   .00      8.77E-03
U 234      9.28E-01  1.50E+01  3.06E-03  3.06E-03
U 235      8.38E-01  1.43E+01  8.34E-05  8.34E-05
SR90       3.97E+01  1.48E+02  7.55E-09  7.55E-09
Y 90       4.30E-04  4.34E-04  4.29E-04  4.29E-04
Y 91       7.81E-05  1.71E-03  3.32E-05  3.32E-05
ZR93       1.50E-05  5.75E-04   .00       .00
NB93M      2.20E-04  9.50E-04  1.55E-04  1.55E-04
ZR95       7.62E-05  3.51E-04   .00       .00
NB95M       .00       .00       .00       .00
NB95       4.75E-03  4.85E-03  4.70E-03  4.70E-03
TC99       7.19E-03  1.79E-02  2.24E-03  1.82E-09
RU106      1.77E-02  4.99E-02  1.30E-02  1.30E-02
RH106       .00       .00       .00       .00
AG110M     1.19E-02  2.15E-02   .00       .00
AG110       .00       .00       .00       .00
SB125      5.77E-02  1.77E-01   .00      3.24E-05
TE125M     8.53E-03  5.24E-02  2.05E-04  1.89E-02
SN126      5.92E+00  5.50E+00  3.77E+00  3.79E+00
SB126M      .00       .00       .00       .00
SB126      5.14E-01  5.14E-01  5.14E-01  5.14E-01
TE127M     1.02E-02  1.58E-01   .00      4.02E-02
TE127      5.11E-06  1.30E-05  2.95E-06  1.03E-05
I 129      8.51E-01  4.29E-01  1.90E-01  5.27E+02
CS134      5.72E+00  3.03E+00  8.90E-01  2.13E-01
CS135      3.71E+01  9.03E-01  9.51E-02  9.23E-10
CS137      4.16E+00  4.55E+00  1.45E+00  8.77E-01
BA137M      .00       .00       .00       .00
CE144      2.49E-03  8.56E-03  2.15E-03  2.15E-03
PR144      5.53E-04  5.53E-04  5.53E-04  5.53E-04
ND144      1.29E-19  4.89E-19   .00       .00
PM147      4.04E-05  1.05E-03  1.05E-09  1.05E-09
SM147       .00       .00       .00       .00
SM151      1.55E-02  1.45E-02  1.55E-02  1.55E-02
TH230      1.15E+00  3.73E+01  3.25E-03  3.25E-03
RA226      5.75E-01  5.96E-01  8.05E-02  8.05E-02
RN222      8.05E-02  8.05E-02  8.05E-02  8.05E-02
PB210      3.85E-02  9.19E-01  3.56E-05  3.56E-05
BI210      7.36E-06  1.28E-05   .00       .00
PO210      8.80E-04  3.55E-03  1.49E-07  1.40E-07
U 232      5.23E+00  7.33E+01  7.90E-04  7.90E-04
```

FIGURE C.0-3. File 12 Data Library

```
TH232     1.46E+00  4.04E+01  2.03E-02  2.03E-02
RA229     7.13E-02  7.13E-02  7.13E-02  7.13E-02
AC228      .00       .00       .00       .00
TH228     3.05E+00  1.01E+01  2.80E+00  2.80E+00
RA224     5.55E-01  2.77E+00   .00       .00
PB212     2.31E-08  2.99E-07   .00       .00
BI212      .00       .00       .00       .00
U 235     8.53E-01  1.39E+01  8.77E-03  8.77E-03
TH231      .00       .00       .00       .00
PA231     1.10E-05  1.10E-05  1.10E-05  1.10E-05
AC227     4.54E-06  4.54E-06  4.54E-06  4.54E-06
TH227      .00       .00       .00       .00
RA223      .00       .00       .00       .00
NP237     1.57E+00  2.50E+01  5.93E-01  5.93E-01
PA233     5.44E-01  5.44E-01  5.44E-01  5.44E-01
U 233     9.46E-01  1.56E+01  2.39E-03  2.39E-03
TH229     8.76E+00  1.62E+02  9.20E-01  9.20E-01
RA225     1.75E-01  9.77E-01   .00       .00
AC225     5.60E-01  5.60E-01  5.60E-01  5.60E-01
U 238     7.92E-01  1.33E+01  2.35E-03  2.35E-03
TH234     7.41E-04  7.41E-04  7.41E-04  7.41E-04
PA234M     .00       .00       .00       .00
PA234      .00       .00       .00       .00
AM242M    9.58E-01  2.52E+01  9.31E-03  9.31E-03
AM242     5.90E-07  1.35E-05   .00       .00
CM242     2.07E-02  4.31E-01  1.52E-03  1.52E-03
PU242     3.61E-01  7.21E+00  4.62E-04  4.62E-04
NP238      .00       .00       .00       .00
PU238     3.15E-01  6.35E+00  5.10E-04  5.10E-04
CM244     4.49E-01  1.08E+01  4.21E-04  4.21E-04
PU244      .00       .00       .00       .00
U 240      .00       .00       .00       .00
PU240     1.74E-01  7.75E+00  5.43E-04  5.43E-04
AM243     1.51E+00  2.54E+01  5.42E-01  5.42E-01
NP239     3.90E-01  3.90E-01  3.90E-01  3.90E-01
PU239     3.75E-01  7.78E+00  5.30E-04  5.30E-04
CM245     1.48E+00  2.77E+01  3.96E-01  3.96E-01
PU241     4.91E-03  1.30E-01   .00       .00
AM241     1.05E+00  2.57E+01  7.52E-02  7.52E-02
   8*     ALLDOS/PABLM DOSE FACTOR CREATION, CHRONIC, MAX. IND., AIR RELEASE, I/I DOSE
H 3       1.71E-01   .00      1.71E-01  1.71E-01
C 14      1.49E+01  6.53E+01  1.49E+01  1.49E+01
CO60      7.37E+01  6.99E+01  6.99E+01  6.99E+01
NI59      3.35E-01  1.71E+00   .00       .00
NI63      8.14E-01  2.33E+01   .00       .00
SE79      1.27E+01   .00       .00       .00
PD107     1.52E-01   .00       .00       .00
SN123     5.30E-01  1.37E+01   .00      2.93E-01
U 234     2.77E+01  2.30E+02  3.21E-02  3.21E-02
U 235     2.59E+01  2.20E+02  9.29E-04  9.29E-04
SR90      6.83E+01  2.54E+02   .00       .00
Y 90      1.17E-04  5.75E-04  1.02E-04  1.02E-04
Y 91      2.57E-02  8.83E-02  2.40E-02  2.40E-02
ZR93      1.01E-04  3.63E-03   .00       .00
NB93M     3.83E-03  5.80E-03  3.51E-03  3.51E-03
ZR95      2.05E-03  1.34E-02   .00       .00
NB95M      .00       .00       .00       .00
NB95      3.11E+00  3.11E+00  3.11E+00  3.11E+00
TC99      1.59E-01  3.10E-01  4.83E-02   .00
RU106     5.01E+00  6.66E+00  4.76E+00  4.76E+00
RH106      .00       .00       .00       .00
AG110M    3.56E-01  5.30E-01   .00       .00
AG110      .00       .00       .00       .00
SN125     9.60E-01  1.84E+00   .00      1.55E-03
TE125M    6.20E-01  4.33E+00  3.48E-02  1.39E+00
SN126     4.14E+01  8.87E+01  3.95E+01  3.99E+01
SB126M     .00       .00       .00       .00
SB126     5.79E-02  5.80E-02  5.79E-02  5.79E-02
TE127M    2.04E+00  1.50E+01   .00      4.37E+00
TE127     1.32E-04  3.55E-04  6.75E-05  2.89E-04
I 129     1.48E+02  8.75E+01  2.00E+01  1.00E+05
CS134     1.55E+02  1.02E+02  5.84E+01  4.47E+01
CS135     7.58E+00  1.55E+01  1.75E+00   .00
CS137     8.62E+01  8.58E+01  2.90E+01  1.82E+01
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FIGURE C.0-3. File 12 Data Library

```
BA137M      .00         .00         .00         .00
CE144     9.38E-01    1.05E+00    9.30E-01    9.30E-01
PR144     4.15E-05    4.15E-05    4.15E-05    4.15E-05
ND144       .00         .00         .00         .00
PM147     5.75E-04    1.08E-02      .00         .00
SM147       .00         .00         .00         .00
SM151     2.10E-01    2.14E-01    2.10E-01    2.10E-01
TH230     5.33E-01    1.75E+01    3.43E-02    3.43E-02
RA225       .00         .00         .00         .00
RN222       .00         .00         .00         .00
PB210       .00         .00         .00         .00
BI210       .00         .00         .00         .00
PO210       .00         .00         .00         .00
U 232     1.59E+02    1.15E+03    1.14E-02    1.14E-02
TH232     5.33E-01    1.93E+01      .00         .00
RA228       .00         .00         .00         .00
AC228       .00         .00         .00         .00
TH228     3.48E+01    9.39E+01    3.28E+01    3.28E+01
RA224     2.38E+01    1.40E+02      .00         .00
PB212       .00         .00         .00         .00
BI212       .00         .00         .00         .00
U 235     2.50E+01    2.13E+02      .00         .00
TH231       .00         .00         .00         .00
PA231       .00         .00         .00         .00
AC227       .00         .00         .00         .00
TH227       .00         .00         .00         .00
RA223       .00         .00         .00         .00
NP237     5.73E+00    1.73E+01    5.22E+00    5.22E+00
PA233     6.09E-01    6.11E-01    6.09E-01    6.09E-01
U 233     2.85E+01    2.40E+02    2.51E-02    2.51E-02
TH229     1.31E+01    7.80E+01    9.66E+00    9.66E+00
RA225       .00         .00         .00         .00
AC225       .00         .00         .00         .00
U 238     2.43E+01    2.09E+02      .00         .00
TH234       .00         .00         .00         .00
PA234M      .00         .00         .00         .00
PA234       .00         .00         .00         .00
AM242M    7.35E-01    1.40E+01    1.14E-01    1.14E-01
AM242     3.43E-05    7.05E-04      .00         .00
CM242     4.84E-01    1.05E+01    1.23E-02    1.23E-02
PU242     1.61E-01    3.45E+00    4.85E-03    4.85E-03
NP238       .00         .00         .00         .00
PU238     1.80E-01    3.85E+00    5.69E-03    5.68E-03
CM244     9.01E-01    1.33E+01    1.25E-02    1.25E-02
PU244       .00         .00         .00         .00
U 240       .00         .00         .00         .00
PU240     1.58E-01    3.73E+00    5.71E-03    5.71E-03
AM243     9.25E+00    1.91E+01    5.71E+00    5.71E+00
NP239     1.39E-02    1.39E-02    1.39E-02    1.39E-02
PU239     1.56E-01    3.73E+00    3.47E-03    3.47E-03
CM245     4.75E+00    1.72E+01    4.17E+00    4.17E+00
PU241     5.31E-03    1.90E-01      .00         .00
AM241     1.37E+00    1.37E+01    7.89E-01    7.89E-01
   87     ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, MAX. IND., AIR RELEASE, 50/70 DOSE
H 3       5.34E+00      .00        5.34E+00    5.34E+00
C 14      4.65E+02    2.33E+03    4.65E+02    4.65E+02
CO60      1.71E+04    1.70E+04    1.70E+04    1.70E+04
NI59      2.15E+02    1.28E+03      .00         .00
NI63      5.02E+02    1.49E+04      .00         .00
SE79      1.63E+04      .00         .00         .00
PD107     2.54E+02      .00         .00         .00
SN123     1.35E+01    7.59E+02      .00        1.07E+01
U 234     2.02E+03    3.16E+04    5.34E+01    5.34E+01
U 235     1.39E+03    3.03E+04    1.54E+00    1.54E+00
SR90      5.35E+05    1.09E+06      .00         .00
Y 90      8.47E+00    8.50E+00    8.47E+00    8.47E+00
Y 91      7.97E-01    3.23E+00    7.30E-01    7.30E-01
ZR93      2.53E-02    0.56E-01      .00         .00
NB93M     3.10E+00    4.29E+00    2.09E+00    2.09E+00
ZR95      1.14E-01    9.23E-01      .00         .00
NB95M       .00         .00         .00         .00
NB95      1.00E+02    1.00E+02    1.00E+02    1.00E+02
TC99      9.29E+01    2.07E+02    2.58E+01      .00
RU106     2.95E+02    5.50E+02    2.87E+02    2.87E+02
```

FIGURE C.0-3. File 12 Data Library

RH106	.00	.00	.00	.00
AG110M	1.15E+01	2.10E+01	.00	.00
AG110	.00	.00	.00	.00
SB125	9.35E+01	2.89E+02	.00	5.29E-02
TE125M	5.78E+01	4.02E+02	4.54E+00	1.24E+02
SN125	5.59E+04	6.92E+04	5.58E+04	5.50E+04
SB125M	.00	.00	.00	.00
SR126	8.95E+03	8.95E+03	8.95E+03	8.95E+03
TE127M	6.93E+01	5.69E+02	.00	1.45E+02
TE127	6.50E-02	8.65E-02	5.55E-02	7.86E-02
I 129	5.14E+04	3.97E+04	3.33E+04	1.42E+07
CS134	1.04E+04	7.64E+03	5.41E+03	4.70E+03
CS135	4.82E+02	1.17E+03	1.24E+02	.00
CS137	2.11E+04	2.15E+04	1.79E+04	1.72E+04
BA137M	.00	.00	.00	.00
CE144	4.78E+01	5.76E+01	4.73E+01	4.73E+01
PR144	1.21E+01	1.21E+01	1.21E+01	1.21E+01
ND144	3.33E-15	1.24E-13	.00	.00
PM147	5.72E-02	1.77E+00	.00	.00
SM147	.00	.00	.00	.00
SM151	2.84E+02	2.87E+02	2.84E+02	2.84E+02
TH230	2.21E+03	7.15E+04	5.70E+01	5.70E+01
RA226	1.05E+04	1.25E+04	1.14E+03	1.14E+03
RN222	1.14E+03	1.14E+03	1.14E+03	1.14E+03
PB210	7.12E+02	1.55E+04	4.58E-01	4.58E-01
BI210	3.72E-01	6.50E-01	.00	.00
PO210	1.73E+01	7.13E+01	1.35E+03	1.85E+03
U 232	1.03E+04	1.44E+05	1.46E+01	1.46E+01
TH232	1.85E+03	5.29E+04	.00	.00
RA228	.00	.00	.00	.00
AC228	.00	.00	.00	.00
TH228	5.14E+04	5.95E+04	5.08E+04	5.08E+04
RA224	1.43E+03	7.15E+03	.00	.00
PB212	3.63E+01	4.61E+02	.00	.00
BI212	3.23E-07	4.83E-07	.00	.00
U 235	1.22E+03	2.02E+04	.00	.00
TH231	.00	.00	.00	.00
PA231	.00	.00	.00	.00
AC227	.00	.00	.00	.00
TH227	.00	.00	.00	.00
RA223	.00	.00	.00	.00
NP237	1.22E+04	5.15E+04	1.04E+04	1.04E+04
PA233	9.47E+03	9.47E+03	9.47E+03	9.47E+03
U 233	2.05E+03	3.29E+04	4.17E+01	4.17E+01
TH229	3.09E+04	3.17E+05	1.51E+04	1.51E+04
RA225	5.29E+03	3.15E+04	.00	.00
AC225	1.15E+04	1.15E+04	1.15E+04	1.15E+04
U 233	1.14E+03	1.93E+04	.00	.00
TH234	.00	.00	.00	.00
PA234M	.00	.00	.00	.00
PA234	.00	.00	.00	.00
AM242M	1.53E+03	3.50E+04	1.57E+02	1.57E+02
AM242	1.45E+03	3.30E+02	.00	.00
CM242	5.35E+01	3.42E+02	2.31E+01	2.91E+01
PU242	4.85E+02	9.73E+03	8.07E+00	8.07E+00
NP239	.00	.00	.00	.00
PU239	4.44E+02	8.95E+03	9.02E+00	9.02E+00
CM244	8.11E+02	1.91E+04	8.71E+00	8.71E+00
PU244	.00	.00	.00	.00
U 240	.00	.00	.00	.00
PU240	5.04E+02	1.05E+04	9.49E+00	9.49E+00
AM241	1.03E+04	4.44E+04	9.48E+03	9.48E+03
NP239	6.80E+03	6.80E+03	6.80E+03	6.80E+03
PU239	5.02E+02	1.35E+04	5.77E+00	5.77E+00
CM245	8.79E+03	5.27E+04	6.93E+03	6.93E+03
PU241	7.79E+00	2.07E+02	.00	.00
AM241	2.68E+03	3.52E+04	1.31E+03	1.31E+03
87	ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, POPULATION, AIR RELEASE, 1/1 DOSE			
H 3	8.53E-02	.00	8.53E-02	8.53E-02
C 14	9.43E+00	4.14E+01	9.43E+00	9.43E+00
CO60	4.85E+01	4.55E+01	4.55E+01	4.55E+01
NI59	2.04E-01	1.04E+00	.00	.00
NI63	5.54E-01	1.41E+01	.00	.00
SE79	1.13E+01	.00	.00	.00

FIGURE C.0-3. File 12 Data Library

PD107	8.01E-02	.00	.00	.00
SN123	2.91E-01	1.04E+01	.00	1.55E-01
U 234	1.48E+01	1.21E+02	2.14E-02	2.14E-02
U 235	1.41E+01	1.15E+02	5.18E-04	5.18E-04
SR90	3.51E+01	1.31E+02	.00	.00
Y 90	5.83E-05	8.29E-05	5.79E-05	5.79E-05
Y 91	1.58E-02	4.43E-02	1.60E-02	1.60E-02
ZR93	9.27E-05	1.75E-03	.00	.00
NB93M	2.51E-03	4.12E-03	2.34E-03	2.34E-03
ZR95	1.29E-03	5.83E-03	.00	.00
NB95M	.00	.00	.00	.00
NB95	2.07E+00	2.07E+00	2.07E+00	2.07E+00
TC99	1.05E-01	2.39E-01	3.23E-02	.00
RU106	3.29E+00	4.08E+00	3.17E+00	3.17E+00
RH106	.00	.00	.00	.00
AG110M	2.55E-01	4.40E-01	.00	.00
AG110	.00	.00	.00	.00
SB125	5.04E-01	9.57E-01	.00	8.13E-04
TE125M	3.10E-01	2.15E+00	2.32E-02	5.98E-01
SN126	2.74E+01	5.33E+01	2.54E+01	2.55E+01
SB126M	.00	.00	.00	.00
SB126	3.86E-02	3.86E-02	3.86E-02	3.86E-02
TE127M	1.07E+00	8.33E+00	.00	2.28E+00
TE127	4.51E-05	4.52E-05	4.51E-05	4.52E-05
I 129	1.04E-02	5.14E+01	1.33E+01	7.15E+04
CS134	1.11E+02	5.82E+01	3.30E+01	2.98E+01
CS135	5.13E+00	1.13E+01	1.19E+00	.00
CS137	5.82E+01	5.84E+01	1.05E+01	1.21E+01
BA137M	.00	.00	.00	.00
CE144	5.23E-01	5.82E-01	5.19E-01	5.19E-01
PR144	2.77E-05	2.77E-05	2.77E-05	2.77E-05
ND144	.00	.00	.00	.00
PM147	2.85E-04	5.33E-03	.00	.00
SM147	.00	.00	.00	.00
SM151	1.40E-01	1.42E-01	1.40E-01	1.40E-01
TH230	2.71E-01	8.73E+00	2.28E-02	2.28E-02
RA226	.00	.00	.00	.00
RN222	.00	.00	.00	.00
PB210	.00	.00	.00	.00
BI210	.00	.00	.00	.00
PO210	.00	.00	.00	.00
U 232	8.79E+01	6.05E+02	7.57E-03	7.57E-03
TH232	3.15E-01	9.51E+00	.00	.00
RA228	.00	.00	.00	.00
AC228	.00	.00	.00	.00
TH229	2.23E+01	5.23E+01	2.19E+01	2.18E+01
RA224	2.54E+00	1.27E+01	.00	.00
PB212	.00	.00	.00	.00
BI212	.00	.00	.00	.00
U 235	1.37E+01	1.15E+02	.00	.00
TH231	.00	.00	.00	.00
PA231	.00	.00	.00	.00
AC227	.00	.00	.00	.00
TH227	.00	.00	.00	.00
RA223	.00	.00	.00	.00
NP237	4.40E+00	9.31E+00	4.15E+00	4.15E+00
PA233	4.05E-01	4.05E-01	4.05E-01	4.05E-01
U 233	1.50E+01	1.25E+02	1.57E-02	1.57E-02
TH229	8.14E+00	4.05E+01	5.43E+00	5.43E+00
RA225	.00	.00	.00	.00
AC225	.00	.00	.00	.00
U 238	1.29E+01	1.10E+02	.00	.00
TH234	.00	.00	.00	.00
PA234M	.00	.00	.00	.00
PA234	.00	.00	.00	.00
AM242M	3.85E-01	6.99E+00	7.59E-02	7.59E-02
AM242	1.18E-09	2.59E-08	.00	.00
CM242	2.33E-01	5.08E+00	8.16E-03	8.16E-03
PU242	8.12E-02	1.72E+00	3.23E-03	3.23E-03
NP238	.00	.00	.00	.00
PU238	9.07E-02	1.92E+00	3.79E-03	3.79E-03
CM244	3.01E-01	6.61E+00	8.32E-03	8.32E-03
PU244	.00	.00	.00	.00
U 240	.00	.00	.00	.00

FIGURE C.0-3. File 12 Data Library

```
PU240      3.49E-02  1.85E+00  3.80E-03  3.80E-03
AM243      4.08E+00  1.00E+01  3.80E+00  3.80E+00
NP239      2.59E-02  2.59E-02  2.59E-02  2.59E-02
PU239      8.34E-02  1.86E+00  2.31E-03  2.31E-03
CM245      3.07E+00  9.25E+00  2.78E+00  2.78E+00
PU241      3.39E-03  9.44E-02   .00       .00
AM241      9.15E-01  5.35E+00  5.25E-01  5.25E-01
   87      ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, POPULATION, AIR RELEASE, 30/70 DOSE
H 3        2.59E+00   .00      2.59E+00  2.59E+00
C 14       2.95E+02  1.47E+03  2.95E+02  2.95E+02
CO60       1.14E+04  1.13E+04  1.13E+04  1.13E+04
NI59       1.09E+02  5.49E+02   .00       .00
NI63       2.58E+02  7.55E+03   .00       .00
SE79       1.44E+04   .00       .00       .00
PD107      1.22E+02   .00       .00       .00
SN123      9.81E+00  4.01E+02   .00      5.56E+00
U 234      1.02E+03  1.59E+04  3.56E+01  3.56E+01
U 235      9.51E+02  1.53E+04  1.03E+00  1.03E+00
SR90       2.44E+05  9.10E+05   .00       .00
Y 90       5.54E+00  5.54E+00  5.54E+00  5.54E+00
Y 91       5.15E-01  1.59E+00  4.87E-01  4.87E-01
ZR93       1.22E-02  4.57E-01   .00       .00
NB93M      2.05E+00  2.54E+00  1.99E+00  1.99E+00
ZR95       4.95E-02  2.29E-01   .00       .00
NB95M       .00       .00       .00       .00
NB95       5.59E+01  5.59E+01  5.58E+01  5.58E+01
TC99       4.41E+01  1.10E+02  1.38E+01   .00
RU106      1.95E+02  2.21E+02  1.91E+02  1.91E+02
RH106       .00       .00       .00       .00
AG110M     9.40E+00  1.55E+01   .00       .00
AG110       .00       .00       .00       .00
SB125      4.33E+01  1.49E+02   .00      2.73E-02
TE125M     2.85E+01  1.94E+02  3.02E+00  5.05E+01
SN126      4.39E+04  4.56E+04  4.39E+04  4.39E+04
SB126M      .00       .00       .00       .00
SB126      5.05E+03  5.95E+03  5.95E+03  5.95E+03
TE127M     3.52E+01  2.37E+02   .00      7.88E+01
TE127      3.75E-02  3.75E-02  3.75E-02  3.75E-02
I 129      3.31E+04  2.51E+04  2.22E+04  8.57E+06
CS134      6.99E+03  5.11E+03  3.51E+03  3.13E+03
CS135      3.13E+02  7.51E+02  8.02E+01   .00
CS137      1.40E+04  1.43E+04  1.10E+04  1.15E+04
BA137M      .00       .00       .00       .00
CE144      3.19E+01  3.54E+01  3.15E+01  3.15E+01
PR144      8.07E+00  8.07E+00  8.07E+00  8.07E+00
ND144      1.49E-15  5.59E-14   .00       .00
PM147      3.31E-02  8.70E-01   .00       .00
SM147       .00       .00       .00       .00
SM151      1.89E+02  1.90E+02  1.89E+02  1.89E+02
TH230      1.07E+03  3.45E+04  3.80E+01  3.80E+01
RA225      4.95E+03  5.33E+03  7.50E+02  7.50E+02
RN222      7.50E+02  7.50E+02  7.50E+02  7.50E+02
PB210      3.13E+02  7.24E+03  3.05E-01  3.05E-01
BI210      6.22E-02  1.09E-01   .00       .00
PO210      7.40E+00  3.07E+01  1.23E-03  1.23E-03
U 232      5.24E+03  7.33E+04  9.75E+00  9.75E+00
TH232      9.25E-02  2.54E+04   .00       .00
RA228       .00       .00       .00       .00
AC228       .00       .00       .00       .00
TH229      3.41E+04  4.27E+04  3.38E+04  3.38E+04
RA224      1.33E+02  6.67E+02   .00       .00
PB212      2.88E-04  3.60E-03   .00       .00
BI212      2.14E-30  3.20E-30   .00       .00
U 235      5.47E+02  1.37E+04   .00       .00
TH231       .00       .00       .00       .00
PA231       .00       .00       .00       .00
AC227       .00       .00       .00       .00
TH227       .00       .00       .00       .00
RA223       .00       .00       .00       .00
NP237      7.79E+03  2.69E+04  5.90E+03  5.90E+03
PA233      5.31E+03  5.31E+03  5.31E+03  5.31E+03
U 233      1.04E+03  1.44E+04  2.78E+01  2.78E+01
TH229      1.78E+04  1.55E+05  1.07E+04  1.07E+04
RA225      2.05E+03  1.03E+04   .00       .00
```

FIGURE C.0-3. File 12 Data Library

AC225	7.55E+03	7.55E+03	7.55E+03	7.55E+03
U 238	5.05E+02	1.02E+04	.00	.00
TH234	.00	.00	.00	.00
PA234M	.00	.00	.00	.00
PA234	.00	.00	.00	.00
AM242M	7.89E+02	1.74E+04	1.12E+02	1.12E+02
AM242	4.03E-08	9.20E-07	.00	.00
CM242	3.92E+01	4.44E+02	1.94E+01	1.94E+01
PU242	2.43E+02	4.84E+03	5.38E+00	5.38E+00
NP238	.00	.00	.00	.00
PU238	2.22E+02	4.45E+03	5.01E+00	5.01E+00
CM244	3.99E+02	9.39E+03	5.81E+00	5.81E+00
PU244	.00	.00	.00	.00
U 240	.00	.00	.00	.00
PU240	2.53E+02	5.22E+03	5.32E+00	5.32E+00
AM243	5.98E+03	2.37E+04	6.31E+03	6.31E+03
NP239	4.53E+03	4.53E+03	4.53E+03	4.53E+03
PU239	2.51E+02	5.22E+03	5.85E+00	5.85E+00
CM245	5.53E+03	2.69E+04	4.52E+03	4.52E+03
PU241	3.85E+00	1.03E+02	.00	.00
AM241	1.56E+03	1.82E+04	9.75E+02	9.75E+02

87 ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, MAX. (NO.), WATER RELEASE, 1/1 DOSE

H 3	1.14E-04	.00	1.14E-04	1.14E-04
C 14	4.12E+00	1.81E+01	4.12E+00	4.12E+00
CO60	2.05E-01	1.95E-01	1.96E-01	1.95E-01
NI59	1.05E-03	1.00E-02	3.85E-07	3.85E-07
NI63	5.34E-03	1.35E-01	.00	.00
SE79	2.91E-12	5.71E-09	5.71E-09	5.71E-09
RD107	3.35E-04	.00	.00	.00
SN123	3.18E-02	3.29E+00	.00	4.88E-02
U 234	7.89E-02	5.50E-01	8.54E-05	8.54E-05
U 235	7.57E-02	5.23E-01	2.46E-05	2.46E-05
SR90	2.05E-01	7.58E-01	9.05E-08	9.05E-08
Y 90	3.55E-06	1.00E-05	8.35E-06	8.35E-06
Y 91	7.21E-05	3.34E-04	5.49E-05	5.49E-05
ZR93	5.72E-07	1.08E-05	.00	.00
NB93M	4.86E-04	4.84E-03	9.34E-06	9.34E-06
ZR95	3.56E-06	4.32E-05	.00	.00
NB95M	.00	.00	.00	.00
NB95	1.43E-02	1.93E-02	1.22E-02	1.22E-02
TC99	3.94E-04	8.01E-04	1.21E-04	2.18E-04
RU106	1.35E-02	1.89E-02	1.27E-02	1.27E-02
RH106	.00	.00	.00	.00
AG110M	9.14E-04	1.35E-03	.00	.00
AG110	.00	.00	.00	.00
SB125	2.74E-03	5.25E-03	.00	4.41E-06
TE125M	7.50E-03	5.42E-02	1.09E-04	1.72E-02
SN126	5.88E-01	7.45E+00	1.05E-01	1.54E-01
SB126M	.00	.00	.00	.00
SB126	3.90E-03	3.90E-03	3.90E-03	3.90E-03
TE127M	1.95E-02	1.46E-01	.00	3.97E-02
TE127	8.55E-05	3.55E-04	1.12E-05	2.55E-04
I 129	4.04E-02	2.38E-02	5.30E-03	2.75E+01
CS134	7.35E+00	3.54E+00	9.41E-01	1.19E-01
CS135	4.45E-01	9.80E-01	1.03E-01	1.11E-08
CS137	4.05E+00	4.09E+00	5.96E-01	4.95E-02
BA137M	.00	.00	.00	.00
CE144	2.50E-03	2.79E-03	2.48E-03	2.48E-03
PR144	3.75E-04	3.75E-04	3.75E-04	3.75E-04
ND144	.00	.00	.00	.00
PM147	2.15E-05	4.01E-05	1.25E-08	1.25E-08
SM147	.00	.00	.00	.00
SM151	5.59E-04	5.74E-04	5.57E-04	5.57E-04
TH230	2.33E-03	3.91E-02	9.12E-05	9.12E-05
RA226	7.98E-05	7.98E-05	7.98E-05	7.98E-05
RN222	7.74E-05	7.74E-05	7.74E-05	7.74E-05
PB210	7.90E-11	7.90E-11	7.90E-11	7.90E-11
BI210	.00	.00	.00	.00
PO210	9.96E-14	9.96E-14	9.96E-14	9.96E-14
U 232	4.50E-01	3.24E+00	3.02E-05	3.02E-05
TH232	1.19E-02	9.56E-02	9.07E-03	9.07E-03
RA228	1.97E-03	1.97E-03	1.97E-03	1.97E-03
AC228	.00	.00	.00	.00
TH228	1.01E-01	3.70E-01	9.17E-02	9.17E-02

FIGURE C.0-3. File 12 Data Library

```
RA224      8.05E-01  4.03E+00    .00         .00
PB212       .00       .00        .00         .00
BI212       .00       .00        .00         .00
U 235      7.73E-02  6.23E-01   3.73E-03    3.73E-03
TH231       .00       .00        .00         .00
PA231      6.57E-08  6.57E-08   6.57E-08    6.57E-08
AC227      6.22E-10  6.22E-10   6.22E-10    6.22E-10
TH227       .00       .00        .00         .00
RA223       .00       .00        .00         .00
NP237      1.82E-02  5.55E-02   1.65E-02    1.65E-02
PA233      4.96E-03  4.97E-03   4.96E-03    4.96E-03
U 233      8.05E-02  6.77E-01   6.47E-05    6.47E-05
TH229      4.12E-02  3.33E-01   2.57E-02    2.57E-02
RA225       .00       .00        .00         .00
AC225      4.00E-03  4.09E-03   4.09E-03    4.09E-03
U 238      6.98E-02  5.93E-01   1.00E-03    1.00E-03
TH234      2.92E-04  2.92E-04   2.92E-04    2.92E-04
PA234M      .00       .00        .00         .00
PA234       .00       .00        .00         .00
AM242M     2.94E-03  5.91E-02   3.03E-04    3.03E-04
AM242       2.89E-06  5.61E-05    .00         .00
CM242      2.14E-03  4.73E-02   3.89E-05    3.89E-05
PU242      4.80E-04  1.03E-02   1.29E-05    1.29E-05
NP238       .00       .00        .00         .00
PU238      5.86E-04  1.15E-02   1.51E-05    1.51E-05
CM244      2.52E-03  5.61E-02   3.32E-05    3.32E-05
PU244       .00       .00        .00         .00
U 240       .00       .00        .00         .00
PU240      5.01E-04  1.11E-02   1.52E-05    1.52E-05
AM243      1.75E-02  5.79E-02   1.52E-02    1.52E-02
NP239      2.81E-03  2.81E-03   2.81E-03    2.81E-03
PU239      4.04E-04  1.11E-02   9.23E-06    9.23E-06
CM245      1.15E-02  5.59E-02   1.11E-02    1.11E-02
PU241      2.04E-05  5.67E-04    .00         .00
AM241      4.57E-03  5.57E-02   2.10E-03    2.10E-03
   87 ALLDOS/PADLM DOSE FACTOR CREATION- CHRONIC, MAX. IND., WATER RELEASE, 30/70 DOSE
H 3        5.55E-03   .00       5.55E-03    5.55E-03
C 14       1.29E+02  6.44E+02   1.29E+02    1.29E+02
CO60       4.57E+01  4.51E+01   4.51E+01    4.51E+01
NI59       5.53E-01  3.95E+00   1.16E-05    1.16E-05
NI63       1.53E+00  4.85E+01    .00         .00
SE79       3.13E+01  1.71E-07   1.71E-07    1.71E-07
PD107      5.13E-01   .00        .00         .00
SN123      3.09E+00  1.27E+02    .00        1.78E+00
U 234      5.16E+00  9.10E+01   1.42E-01    1.42E-01
U 235      4.83E+00  7.75E+01   4.10E-03    4.10E-03
SR90       1.12E+03  4.19E+03   2.72E-06    2.72E-06
Y 90       2.27E-02  2.31E-02   2.27E-02    2.27E-02
Y 91       2.25E-03  1.24E-02   1.97E-03    1.97E-03
ZR93       7.47E-05  2.95E-03    .00         .00
NB93M      9.23E-02  1.05E+00   7.94E-03    7.94E-03
ZR95       3.57E-04  1.69E-03    .00         .00
NB95M       .00       .00        .00         .00
NB95       4.59E-01  5.31E-01   3.85E-01    3.85E-01
TC99       1.59E-01  4.22E-01   5.27E-02    6.55E-07
RU106      7.20E-01  9.52E-01   7.55E-01    7.45E-01
RH106       .00       .00        .00         .00
AG110M     2.52E-02  4.77E-02    .00         .00
AG110       .00       .00        .00         .00
SN126      2.58E-01  7.97E-01    .00        1.46E-04
TE125M     3.17E-01  2.20E+00   1.25E-02    5.97E-01
SN126      1.85E+02  5.23E+02   1.75E+02    1.77E+02
SB125M      .00       .00        .00         .00
SB125      2.30E+01  2.19E+01   2.39E+01    2.39E+01
TE127M     5.07E-01  4.30E+00    .00        1.25E+00
TE127      2.72E-03  1.09E-02   4.80E-04    8.17E-03
I 129      1.29E+01  1.03E+01   8.81E+00    3.20E+03
CS134      3.53E+02  1.87E+02   5.44E+01    1.25E+01
CS135      2.27E+01  5.52E+01   5.91E+00    3.32E-07
CS137      2.47E+02  2.71E+02   8.12E+01    4.57E+01
BA137M      .00       .00        .00         .00
CE144      1.27E-01  1.50E-01   1.25E-01    1.25E-01
PR144      4.34E-02  4.34E-02   4.34E-02    4.14E-02
ND144      6.70E-18  2.50E-15    .00         .00
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FIGURE C.0-3. File 12 Data Library

```
PM147     2.47E-04  5.49E-03  3.78E-07  3.78E-07
SM147      .00       .00       .00       .00
SM151     7.55E-01  7.62E-01  7.55E-01  7.55E-01
TH230     9.09E+00  2.54E+02  1.51E-01  1.51E-01
RA225     2.22E+01  2.62E+01  3.04E+00  3.04E+00
RN222     3.04E+00  3.04E+00  3.04E+00  3.04E+00
PB210     1.44E+00  3.32E+01  1.22E-03  1.22E-03
BI210     7.53E-04  1.31E-03   .00       .00
PO210     3.49E-02  1.45E-01  4.05E-06  4.05E-06
U 232     2.59E+01  3.75E+02  3.89E-02  3.89E-02
TH232     2.25E+01  2.54E+02  1.42E+01  1.42E+01
RA228     4.82E+01  4.82E+01  4.82E+01  4.82E+01
AC228      .00       .00       .00       .00
TH228     1.71E+02  2.35E+02  1.69E+02  1.69E+02
RA224     2.55E+01  1.28E+02   .00       .00
PB212     7.51E-02  9.33E-01   .00       .00
BI212     5.58E-10  9.83E-10   .00       .00
U 235     9.40E+00  5.33E+01  5.13E+00  5.13E+00
TH231      .00       .00       .00       .00
PA231     5.27E-03  5.27E-03  5.27E-03  5.27E-03
AC227     2.33E-03  2.33E-03  2.33E-03  2.33E-03
TH227      .00       .00       .00       .00
RA223      .00       .00       .00       .00
NP237     3.30E+01  1.53E+02  2.74E+01  2.74E+01
PA233     2.52E+01  2.52E+01  2.52E+01  2.52E+01
U 233     5.24E+00  8.44E+01  1.11E-01  1.11E-01
TH229     9.72E+01  1.15E+03  4.27E+01  4.27E+01
RA225     1.27E+01  5.35E+01   .00       .00
AC225     3.05E+01  3.07E+01  3.05E+01  3.05E+01
U 233     4.89E+00  5.34E+01  1.65E+00  1.65E+00
TH234     5.19E-01  5.19E-01  5.18E-01  5.18E-01
PA234M     .00       .00       .00       .00
PA234      .00       .00       .00       .00
AM242M    5.14E+00  1.46E+02  4.45E-01  4.45E-01
AM242     3.73E-05  2.01E-03   .00       .00
CM242     2.20E-01  3.49E+00  7.75E-02  7.75E-02
PU242     1.44E+00  2.89E+01  2.14E-02  2.14E-02
NP238      .00       .00       .00       .00
PU238     1.31E+00  2.65E+01  2.40E-02  2.40E-02
CM244     3.14E+00  7.45E+01  2.31E-02  2.31E-02
PU244      .00       .00       .00       .00
U 240      .00       .00       .00       .00
PU240     1.49E+00  3.10E+01  2.52E-02  2.52E-02
AM243     3.08E+01  1.71E+02  2.52E+01  2.52E+01
NP239     1.31E+01  1.91E+01  1.91E+01  1.91E+01
PU239     1.48E+00  3.11E+01  1.53E-02  1.53E-02
CM245     2.51E+01  1.89E+02  1.34E+01  1.34E+01
PU241     2.70E-02  5.10E-01   .00       .00
AM241     9.20E+00  1.40E+02  3.49E+00  3.49E+00
   37  ALLDOS/PARLM DOSE FACTOR CREATION- CHRONIC, POPULATION, WATER RELEASE, 1/1 DOSE
H 3       5.54E-07   .00       5.54E-05  5.54E-05
C 14      2.54E+00  1.11E+01  2.54E+00  2.54E+00
CO60      9.07E-02  9.52E-02  9.52E-02  9.52E-02
NI59      4.32E-04  2.35E-03  3.22E-08  3.22E-08
NI63      1.26E-03  3.20E-02   .00       .00
SE79      2.29E-02  4.75E-10  4.75E-10  4.75E-10
RD107     1.64E-04   .00       .00       .00
SN121     1.61E-03  5.41E-02   .00       8.01E-04
U 234     4.19E-02  3.44E+01  4.37E-05  4.37E-05
U 235     4.00E-02  3.30E+01  1.25E-05  1.25E-05
SR90      7.49E-02  2.87E+01  7.55E-09  7.55E-09
Y 90      5.34E-07  1.33E-05  5.13E-07  5.13E-07
Y 91      3.47E-05  6.02E-04  3.28E-05  3.28E-05
ZR93      2.75E-07  5.23E-06   .00       .00
NB93M     8.83E-06  4.58E-05  4.79E-06  4.79E-06
ZR95      4.33E-06  1.06E-05   .00       .00
NB95M      .00       .00       .00       .00
NB95      4.40E-03  4.44E-03  4.38E-03  4.38E-03
TC99      2.33E-04  5.41E-04  7.33E-05  1.82E-09
RU106     5.31E-03  8.06E-03  5.49E-03  5.49E-03
RH106      .00       .00       .00       .00
AG110M    5.95E-04  9.89E-04   .00       .00
AG110      .00       .00       .00       .00
SB125     1.47E-03  2.83E-03   .00       2.19E-06
```

FIGURE C.0-3. File 12 Data Library

```
TE125M    9.40E-04  5.77E-03  4.79E-05  1.96E-03
SN126     5.38E-02  1.82E-01  5.38E-02  5.47E-02
SB126M     .00       .00       .00       .00
SB126     2.18E-04  2.19E-04  2.17E-04  2.17E-04
TE127M    2.50E-03  2.04E-02   .00      5.55E-03
TE127     2.58E-05  1.02E-05  4.79E-07  7.70E-05
I 129     2.47E-02  1.43E-02  2.72E-03  1.73E+01
CS134     3.27E-01  1.87E-01  9.12E-02  4.09E-02
CS135     1.57E-02  3.57E-02  3.85E-03  9.23E-10
CS137     1.75E-01  1.75E-01  4.97E-02  2.48E-02
BA137M     .00       .00       .00       .00
CE144     1.28E-03  1.41E-03  1.27E-03  1.27E-03
PR144     1.28E-05  1.28E-05  1.28E-05  1.28E-05
ND144      .00       .00       .00       .00
PM147     5.45E-07  1.24E-05  1.05E-09  1.05E-09
SM147      .00       .00       .00       .00
SM151     2.85E-04  2.91E-04  2.85E-04  2.85E-04
TH230     7.32E-04  2.50E-02  4.57E-05  4.57E-05
RA225     2.71E-07  2.71E-07  2.71E-07  2.71E-07
RN222     2.63E-07  2.63E-07  2.63E-07  2.63E-07
PB210     2.50E-12  2.59E-12  2.59E-12  2.50E-12
BI210      .00       .00       .00       .00
PO210     3.39E-15  3.39E-15  3.39E-15  3.39E-15
U 232     2.38E-01  1.71E+00  1.55E-05  1.55E-05
TH228     1.29E-03  2.30E-02  3.35E-04  3.35E-04
RA228     5.59E-05  5.59E-05  5.59E-05  5.59E-05
AC228      .00       .00       .00       .00
TH229     4.78E-02  1.35E-01  4.48E-02  4.48E-02
RA224     1.01E-01  5.04E+01   .00       .00
PB212      .00       .00       .00       .00
BI212      .00       .00       .00       .00
U 235     5.91E-02  3.23E-01  1.20E-04  1.20E-04
TH231      .00       .00       .00       .00
PA231     2.24E-09  2.24E-09  2.24E-09  2.24E-09
AC227     2.12E-11  2.12E-11  2.12E-11  2.12E-11
TH227      .00       .00       .00       .00
RA223      .00       .00       .00       .00
NP237     9.22E-03  2.55E-02  9.47E-03  9.47E-03
PA233     9.45E-04  9.48E-04  9.45E-04  9.45E-04
U 233     4.25E-02  5.59E-01  3.41E-05  3.41E-05
TH229     1.32E-02  1.14E-01  1.32E-02  1.32E-02
RA225      .00       .00       .00       .00
AC225     1.19E-04  1.39E-04  1.39E-04  1.19E-04
U 233     5.54E-02  3.13E-01  5.47E-05  5.47E-05
TH234     9.59E-05  9.59E-05  9.59E-05  9.59E-05
PA234M     .00       .00       .00       .00
PA234      .00       .00       .00       .00
AM242M    1.03E-03  2.07E-02  1.55E-04  1.55E-04
AM242     5.87E-07  1.34E-05   .00       .00
CM242     7.15E-04  1.57E-02  1.59E-05  1.59E-05
PU242     2.37E-04  5.08E-03  5.50E-05  5.50E-05
NP238      .00       .00       .00       .00
PU238     2.54E-04  5.57E-03  7.74E-05  7.74E-05
CM244     8.95E-04  1.95E-02  1.70E-05  1.70E-05
PU244      .00       .00       .00       .00
U 240      .00       .00       .00       .00
PU240     2.47E-04  5.49E-03  7.77E-05  7.77E-05
AM243     8.59E-03  2.52E-02  7.77E-03  7.77E-03
NP239     1.47E-04  1.47E-04  1.47E-04  1.47E-04
PU239     2.44E-04  5.48E-03  4.72E-05  4.72E-05
CM245     5.53E-03  2.49E-02  5.49E-03  5.59E-03
PU241     1.03E-05  2.70E-04   .00       .00
AM241     1.04E-03  2.01E-02  1.08E-03  1.08E-03
   ??     ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, POPULATION, WATER RELEASE, 30/70 DOSE
H 3       2.04E-03   .00      2.04E-03  2.04E-03
C 14      7.93E+01  3.97E+02  7.93E+01  7.93E+01
CO60      2.33E+01  2.31E+01  2.31E+01  2.31E+01
NI59      2.20E-01  1.35E+00  9.55E-07  9.55E-07
NI63      5.44E+01  1.52E+01   .00       .00
SE79      2.74E+01  1.43E-08  1.43E-08  1.43E-08
PD107     2.47E-01   .00       .00       .00
SN123     5.08E-02  2.08E+00   .00      2.93E-02
U 234     2.43E+00  4.13E+01  7.27E-02  7.27E-02
U 235     2.45E+00  3.95E+01  2.10E-03  2.10E-03
```

FIGURE C-3. File 12 Data Library

SR90	4.97E+02	1.85E+03	2.27E-07	2.27E-07
Y 90	1.15E-02	1.15E-02	1.15E-02	1.15E-02
Y 91	1.07E-03	3.59E-03	9.97E-04	9.97E-04
ZR93	3.50E-05	1.38E-03	.00	.00
NB93M	4.83E-03	1.35E-02	4.07E-03	4.07E-03
ZR95	1.56E-04	7.56E-04	.00	.00
NB95M	.00	.00	.00	.00
NB95	1.42E-01	1.43E-01	1.41E-01	1.41E-01
TC99	9.97E-02	2.24E-01	2.79E-02	5.46E-09
RU106	4.01E-01	4.72E-01	3.91E-01	3.91E-01
RH106	.00	.00	.00	.00
AG110M	1.90E-02	3.46E-02	.00	.00
AG110	.00	.00	.00	.00
SB125	1.37E-01	4.24E-01	.00	7.75E-05
TE125M	5.34E-02	4.34E-01	5.19E-03	1.35E-01
SN126	8.98E+01	9.56E+01	8.96E+01	8.97E+01
SB126M	.00	.00	.00	.00
SB126	1.22E+01	1.22E+01	1.22E+01	1.22E+01
TE127M	8.59E-02	7.13E-01	.00	1.82E-01
TE127	1.52E-04	3.42E-04	8.35E-05	3.05E-04
I 129	5.88E+00	5.37E+00	4.53E+00	1.85E+03
CS134	1.90E+01	1.29E+01	7.05E+00	5.40E+00
CS135	9.46E-01	2.31E+00	2.43E-01	2.77E-08
CS137	3.15E+01	3.24E+01	2.48E+01	2.34E+01
BA137M	.00	.00	.00	.00
CE144	5.50E-02	7.59E-02	5.44E-02	5.44E-02
PR144	1.60E-02	1.69E-02	1.69E-02	1.69E-02
ND144	3.00E-19	1.12E-15	.00	.00
PM147	7.69E-05	2.02E-03	3.15E-08	3.15E-08
SM147	.00	.00	.00	.00
SM151	3.87E-01	3.89E-01	3.87E-01	3.87E-01
TH230	2.85E+00	9.21E+01	7.75E-02	7.75E-02
RA226	1.00E+01	1.13E+01	1.55E+00	1.55E+00
RN222	1.55E+00	1.55E+00	1.55E+00	1.55E+00
PB210	6.81E-01	1.46E+01	5.24E-04	5.24E-04
BI210	1.25E-04	2.10E-04	.00	.00
PO210	1.49E-02	4.10E-02	2.52E-05	2.52E-05
U 232	1.39E+01	1.93E+02	1.99E-02	1.99E-02
TH232	3.23E+00	7.90E+01	4.83E-01	4.83E-01
RA228	1.54E+00	1.54E+00	1.54E+00	1.54E+00
AC228	.00	.00	.00	.00
TH228	7.11E+01	9.35E+01	7.03E+01	7.03E+01
RA224	3.19E+00	1.59E+01	.00	.00
PB212	5.73E-17	7.24E-05	.00	.00
BI212	.00	.00	.00	.00
U 235	2.04E+00	3.35E+01	2.09E-01	2.09E-01
TH231	.00	.00	.00	.00
PA231	2.13E-04	2.13E-04	2.13E-04	2.13E-04
AC227	7.94E-05	7.94E-05	7.94E-05	7.94E-05
TH227	.00	.00	.00	.00
RA223	.00	.00	.00	.00
NP237	1.55E+01	5.92E+01	1.41E+01	1.41E+01
PA233	1.20E+01	1.20E+01	1.29E+01	1.29E+01
U 233	2.67E+00	4.30E+01	5.58E-02	5.58E-02
TH229	4.00E+01	4.11E+02	2.19E+01	2.19E+01
RA225	4.15E+00	2.08E+01	.00	.00
AC225	1.56E+01	1.57E+01	1.55E+01	1.55E+01
U 239	1.77E+00	2.00E+01	5.52E-02	5.52E-02
TH234	1.75E-02	1.75E-02	1.75E-02	1.75E-02
PA234M	.00	.00	.00	.00
PA234	.00	.00	.00	.00
AM242M	2.22E+00	5.12E+01	2.29E-01	2.29E-01
AM242	1.77E-05	4.33E-04	.00	.00
CM242	3.24E-02	1.23E+00	3.95E-02	3.96E-02
PU242	7.05E-01	1.42E+01	1.10E-02	1.10E-02
NP237	.00	.00	.00	.00
PU238	5.45E-01	1.30E+01	1.23E-02	1.23E-02
CM244	1.13E+00	2.56E+01	1.19E-02	1.19E-02
PU244	.00	.00	.00	.00
U 240	.00	.00	.00	.00
PU240	7.34E-01	1.53E+01	1.29E-02	1.29E-02
AM243	1.49E+01	5.41E+01	1.29E+01	1.29E+01
NP239	9.25E+00	9.25E+00	9.25E+00	9.25E+00
PU239	7.30E-01	1.53E+01	7.85E-03	7.85E-03
CM248	1.19E+01	7.11E+01	9.43E+00	9.43E+00
PU241	1.13E-02	3.00E-01	.00	.00
AM241	3.70E+00	5.29E+01	1.70E+00	1.70E+00

FIGURE C.0-3. File 12 Data Library

APPENDIX D

INPUT PREPARATION

APPENDIX D

INPUT PREPARATION

This appendix describes input data card requirements and options for execution of ALLDOS. An input logic diagram is given in Figure D.0-1 which refers to the cards by card types. The card types are described below. The user is urged to refer to the logic diagram when preparing input to ensure proper order of the cards.

The first card for each case (card type 1) provides an 80 character descriptive title (8A10) to be printed in the heading of each output report. The next set of cards gives data for NAMELIST set INPUT. The first card of this set must begin with $INPUT in columns 2-7 and the last card must end with $END in any column except column 1. Each parameter is supplied by setting it equal to the desired value. For example, to set the prameter INV to 5, enter INV = 5 starting after column 8 on the first card. Array values are specified by including the array subscript. For example to set position 2 of array LORG to 6 enter LORG(2) = 6. Each entry must be separated by a comma. The NAMELIST INPUT parameters recognized by ALLDOS are described below.

Parameter (Dimension)	Description
NREL	Number of release pathways to be considered, $1 \leq NREL \leq 3$. When NREL is 2, the waterborne pathway is not considered and when NREL is 1 only the airborne pathway is considered. NREL is used mainly for input of release activities from cards (type 2). Use of NREL should be coordinated with IPATH.
IPATH	Release pathway selection index. IPATH = 1 for airborne and terrestrial pathways IPATH = 2 for waterborne pathway only IPATH = 3 for all three pathways

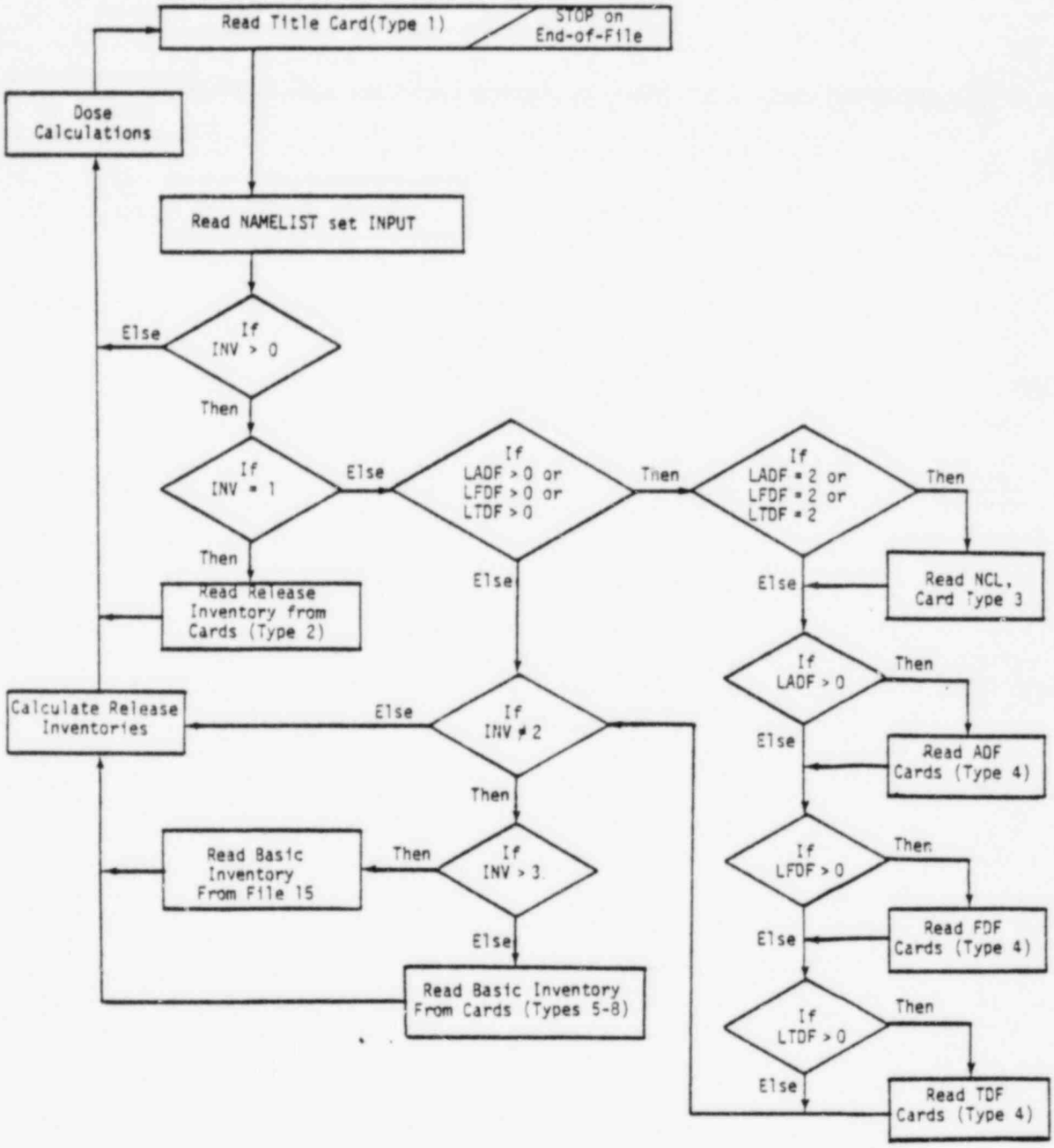

FIGURE D.0-1. ALLDOS Input Logic

Parameter (Dimension)	Description
LR	Release type control integer: LR = 1 for acute release, LR = 2 for chronic release.
LPOP	Population dose calculation control integer: LPOP $\leq$ 0 skip population doses LPOP $\geq$ 0 calculate population doses.
LFCT	Control integer for printing special output reports: LFCT $\leq$ print no special reports, LFCT = 1 print fractional contribution reports, LFCT = 2 print dose per radionuclide reports, LFCT = 3 print both of above.
LM	Maximum individual dose calculation control integer: LM $\leq$0 skip maximum individual doses, LM $\geq$0 calculate maximum individual doses.
LY	Control integer for calculation of the second dose commitment period doses. When LY = 3, the prolonged release dose conversion factors for inhalation are used for acute and chronic releases (LR = 1 or 2). For acute releases the inhalation dose conversion factors are multiplied by a factor of 1.52 to correct for ventilation rate differences between acute and chronic uptake. LY has no effect when not equal to 3.
LADF	Control integer for input of airborne pathway release factors: LADF $\leq$ 0 skip release factor input LADF $\geq$ 0 read airborne release factors LADF = 2 read number of classes, card type 3
LFDF	Control integer for input of terrestrial pathway release factors: LFDF $\leq$ 0 skip release factor input LFDF $\geq$ 0 read terrestrial release factors LFDF = 2 read number of classes, card Type 3

Parameter (Dimension)	Description
LTDF	Control integer for input of waterborne pathway release factors: LTDF $\leq$ skip release factor input LTDF $\geq$0 read waterborne release factors LTDF = 2 read number of classes, Type 3

NOTE: only one card of Type 3 will be read for a case, even if more than one of the above control parameters are set to 2.

NRN	Number of radionuclides in the release inventory read from cards: 1$\leq$NRN$\leq$100 when INV = 1.
INV	Release inventory specification control integer: INV $\leq$0 uses previous inventory, no input, INV = 1 read release inventories from cards (Type 2) INV = 2 calculate release inventories from previous basic inventory using new release factors INV = 3 read basic inventory from cards (Types 5-8) and calculate release using release factors INV >3 read basic inventory from File 15 using inventory set INV-3 and calculate release using release factors
LORG(5)	Organ selection array for this case. Values of LORG must be taken from values in the array IORG as read from the master data file in Unit 10. The values of LORG must also correspond to organs for which data is provided in the terrestrial and waterborne dose conversion factor data file on Unit 12 (see Appendix B).
PM	Population weighted air transport factor for airborne pathway, PM_a, man$\cdot$sec/m^3.
FPM	Population weighted air transport factor for the terrestrial pathway, PM_t, man$\cdot$sec/m^3.
PFLOW	Population environmental transport factor for the waterborne pathway, F_p, man$\cdot$sec/ft^3.

Parameter (Dimension)	Description
XQM	Maximum individual time-integrated air concentration for the airborne pathway, $(E/Q)_a$, sec/m^3.
FXQM	Maximum individual time-integrated iar concentration for the terrestrial pathway, $(E/Q)_t$, sec/m^3.
FLOW	Maximum individual environmental transport factor for the waterborne pathway, F_m, sec/ft^3.
TC	Plant life factor based on the release duration, years. If TC is less than or equal to 0 then it is set to 1.0.

The remaining input cards are determined by values of control parameters INV, LADF, LTDF and LFDF as indicated in the input logic flow diagram (Figure D.0-1). The remaining card types are described below.

Card Type	Columns	Format	Parameter Description
2	1-8	A8	AREC, radionuclide name for which release terms on this card will be assigned.
	9-10	2X	Blank
	11-20	E10.1	QT(1), activity released to the airborne pathway, curies.
	21-30	E10.1	QT(2), activity released to the terrestrial pathway, curies.
	31-40	E10.1	QT(3), activity released to the waterborne pathway, curies.

Note: NRN cards of this type are read when INV - 1.

3	1-2	I2	NCL, number of radionuclide classes to be used for this case, $1 \leq NCL \leq 80$.

Note: One card of this type is read when any of the parameters LADF, LTDF or LFDF is equal to 2 and INV>1.

4	1-2	I2	IC, radionuclide class index for the release fraction on this card, $1 \leq IC \leq NCL$.

Card Type	Columns	Format	Parameter Description
	3-10	E8.1	DF(IC), release fraction for this radionuclide class.

Note: Cards of this type are read until a value for IC greater than 80 is encountered.

5	1-3	I3	NQ, number of radionuclide entries in this card set, $1 \leq NQ \leq 350$.
	4-11	7X	Blank
	11-60	5A10	DSET(5), description title for this basic inventory.
6	1-3	I3	NCLS, number of radionuclide classes to be defined for this basic inventory, $1 \leq NCLS \leq 80$.
7	1-3	I3	ICLS, radionuclide class index for the class named on this card.
	4-10	7X	Blank
	11-20	A10	DFNAM(ICLS), descripive name for radionuclide class ICLS.

Note: NCLS cards of Type 7 are read.

8	1-8	A8	AQ(i), radionuclide name for activity on this card. Names must be taken from the master list on the File 10 library.
	9-10	I2	ICL(i), radionuclide class this radionuclide is assigned to, $1 \leq ICL(i) \leq NCLS \leq 80$.
	11-20	E10.1	SQ(i), activity of this radionuclide in the basic inventory, curies.

Note: NQ cards of Type 8 are read. Cards of Type 5-8 are read as a set when INV is 3.

APPENDIX E

SAMPLE PROBLEM

APPENDIX E

SAMPLE PROBLEM

This appendix illustrates use of the computer program ALLDOS. Necessary input to the computer programs DACRIN and PABLM are presented for generation of dose conversion factor parameters.

A two-part sample problem is described showing use of ALLDOS for acute and chronic releases. Use of File 15 for inventory specification is also illustrated.

E.1 Sample Problem Description

The sample problem has two cases to illustrate selection of several options. Input parameters for each case are listed in Table E.1-1. The first case is to exercise the following features:

- acute release (LR = 1, LY = 0, TC = 1)
- airborne and terrestrial pathways (NREL = 2, IPATH = 1)
- population dose calculation (LPOP = 1, PM, FPM)
- maximum individual dose calculation (LM = 1, XQM, FXQM)
- release inventory from cards (INV = 1, NRN = 5)
- four organs; total body, bone, lungs, thyroid (LORG(1) = 1,6,8,16)

The second case is to be executed immediately after the first case in the same run. Only those parameters to be changed need be specified. The features exercised in the second case are:

- chronic release for 30 years (LR = 2, LY = 3, TC = 30)
- all three pathways (NREL = 3, IPATH = 3)
- population and maximum individual dose calculation (no change)
- inventory from File 15 (INV = 5, LADF = 2, LTDF = 1, LFDF = 1)
- new dispersion parameters (PM, FPM, PFLOW, XQM, FXQM, FLOW)
- same organs

The second case uses a basic inventory set from File 15. The file for this sample problem is described in Section E.4. The second inventory set from this file is to be used (INV = 3 + 2 + 5) which is labeled "Decay for 5 years, basic inventory 2". There are three radionuclide classes for this library so the parameter on card Type 3 is set to 3 (NCL). A listing of the card input is given in Figure E.1-1.

TABLE E.1-1 Sample Problem Input Parameters

Parameter	Case 1	Case 2
NREL	2	3
IPATH	1	3
LR	1	2
LY	0	3
LPOP	1	(same)
LM	1	(same)
LFCT	0	2
LADF	0	2
LTDF	0	1
LFDF	0	1
NRN	5	(not used)
INV	1	5
LORG(1)	1,6,8,16	(same)
PM	2.0 E-3	1.0 E-3
FPM	2.0 E-3	1.0 E-3
PFLOW	0	2.5
XQM	1.0 E-4	2.0 E-6
FXQM	5.0 E-5	2.0 E-6
FLOW	0	8.3 E-6
TC	1.0	30.

Release factors are given for each pathway which are to be applied to the basic inventory activites in generation of the release activities.

The waterborne pathway parameters FLOW and PFLOW are calculated for an average annual river flow rate of 1.2×10^5 ft^3/sec and a population of 3×10^5 people.

A listing for the sample problem output is given in Figure E.1-2.

```
ALLDOS SAMPLE PRORLEM CASE 1.  RELEASE INVENTORY FROM CARDS, NO FRACTIONAL DATA
 SINPUT NREL=2,IPATH=1,LR=1,LPOP=1,LM=1,LFCT=0,LY=0,LADF=0,LFDF=0,LTDF=0,
 NPN=5,INV=1,LORG(1)=1,4,8,16,PM=2.0E-3,FPM=2.0E-3,XQM=1.0E-4,FXQM=5.0E-5,
 TC=1.  SEND
KR85            2.5E+2     0.0
SR90            6.3E+0     6.3E+0
I 129           5.9E+1     2.9E+1
CS137           2.3E+0     2.3E+0
BA137M          2.1E+0     0.0
ALLDOS SAMPLE PROBLEM CASE 2.  RELEASE INPUT USING FILE 15 RASIC INVENTORY
 SINPUT NREL=3,IPATH=3,LR=2,LFCT=2,LY=3,LADF=2,LTDF=1,LFDF=1,INV=5,
 PM=1.0E-3,FPM=1.0E-3,PFLOW=2.5,XQM=2.0E-6,FXQM=2.0E-6,FLOW=8.3E-4,
 TC=30.  SEND
 3
 1    1.0-4
 2    1.0-6
 3    1.0-8
99
 1    1.0-4
 2    1.0-6
 3    1.0-8
99
 1    1.0-3
 2    1.0-3
 3    1.0-6
99
```

FIGURE E.1-1. SAMPLE Problem Input Card Listing

```
FOOD FACTOR LIBRARY -     87      ALLDOS SAMPLE PROBLEM, PABLM INPUT FILE
FOOD LIBRARY NUCLIDE 38  ND144  WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 44  RN222  WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 51  AC228  WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 54  PB212  WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 55  BI212  WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 57  TH231  WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 69  TH234  WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 70  PA234M WAS NOT FOUND.  SET  1
FOOD LIBRARY NUCLIDE 71  PA234  WAS NOT FOUND.  SET  1
```

FIGURE E.1-2. ALLDOS Sample Problem Output

```
ALLDOS SAMPLE PROBLEM CASE 1.  RELEASE INVENTORY FROM CARDS, NO FRACTIONAL DATA                082080
                    RELEASE IS ACUTE   (LR= 1)
                    POPULATION DOSE FACTORS - AIR/FOOD/LIQUID   2.0-003   2.0-003    .0
                    MAXIMUM INDIVIDUAL X/Q VALUES - AIR/FOOD/LIQUID   1.0-004   5.0-005    .0
                    POPULATION DOSE*  YES
                    PLANT LIFE=   1.0 YEARS
                    INHALATION DOSE CALCULATION FOR  4 ORGANS
                         TOTAL BODY BONE        LUNGS       THYROID
                    DOSE TIMES ARE  1 YEARS   50 YEARS
                    EXTERNAL DOSE CALCULATION FOR TOTAL BODY
                    FRACTIONAL CONTRIBUTION TABLES*  NO
                    DOSE/NUCLIDE CONTRIBUTION TABLES*  NO
                    MAXIMUM INDIVIDUAL DOSE*  YES
                    PATHWAY INDEX IS  1 FOR AIR PATHWAYS ONLY
                    NUCLIDE INVENTORY DATA
                        NUCLIDE      AIR       AIR-FOOD   WATER
                      KR85          2.5E+02     .0         .0
                      SR90          6.3E+00    6.3E+00     .0
                      I 129         5.9E+01    2.9E+01     .0
                      CS137         2.3E+00    2.3E+00     .0
                      BA137M        2.1E+00     .0         .0

                INPUT CHECKED BY                                DATE
                                ***************************       ************
```

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 1. RELEASE INVENTORY FROM CARDS, NO FRACTIONAL DATA

082080
MAXIMUM INDIVIDUAL DOSE COMMITMENTS (REM)

PATHWAY/ORGAN	DOSE COMMITMENT PERIOD 1 YEARS	50 YEARS
AIR SUBMERSION		
TOTAL BODY	5.9E-05	5.9E-05
INHALATION		
TOTAL BODY	4.6E-02	3.9E-01
BONE	4.9E-01	5.6E+00
LUNGS	6.8E-01	1.4E+00
THYROID	8.3E+00	8.8E+00
TERRESTRIAL (AIR PATHS)		
TOTAL BODY	4.3E+00	2.1E+01
BONE	3.2E+00	5.0E+01
LUNGS	5.6E-02	2.2E+00
THYROID	3.0E+03	5.3E+03
TOTAL DOSES		
TOTAL BODY	4.3E+00	2.2E+01
BONE	3.7E+00	5.5E+01
LUNGS	7.4E-01	3.6E+00
THYROID	3.0E+03	5.3E+03

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 1. RELEASE INVENTORY FROM CARDS, NO FRACTIONAL DATA

082080
POPULATION DOSE COMMITMENTS (MAN-REM)

PATHWAY/ORGAN	DOSE COMMITMENT PERIOD 1 YEARS	50 YEARS
AIR SUBMERSION		
TOTAL BODY	1.2E-03	1.2E-03
INHALATION		
TOTAL BODY	9.1E-01	7.9E+00
BONE	9.7E+00	1.1E+02
LUNGS	1.4E+01	2.8E+01
THYROID	1.7E+02	1.8E+02
TERRESTRIAL (AIR PATHS)		
TOTAL BODY	1.2E+02	5.0E+02
BONE	8.6E+01	1.1E+03
LUNGS	1.5E+00	5.7E+01
THYROID	8.8E+04	1.5E+05
TOTAL DOSES		
TOTAL BODY	1.2E+02	5.1E+02
BONE	9.6E+01	1.2E+03
LUNGS	1.5E+01	8.6E+01
THYROID	8.8E+04	1.5E+05

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY 082080

SOURCE TERM CALCULATION SUMMARY

NUCLIDE	CURIES IN INVENTORY	DF AIR-PLUME	DF AIR-FOOD	DF LIQUID	CURIES AIR-PLUME	CURIES AIR-FOOD	CURIES LIQUID	FRACTIONATION CLASS	NUCLIDE
H 3	1.4+004	1.0-004	1.0-004	1.0-003	1.4+000	1.4+000	1.4+001	H3,C14,I	H 3
C 14	1.7+003	1.0-004	1.0-004	1.0-003	1.7-001	1.7-001	1.7+000	H3,C14,I	C 14
CO60	3.7+004	1.0-006	1.0-006	1.0-003	3.7-002	3.7-002	3.7+001	FP+AP	CO60
NI59	2.5+003	1.0-006	1.0-006	1.0-003	2.5-003	2.5-003	2.5+000	FP+AP	NI59
NI63	2.7+005	1.0-006	1.0-006	1.0-003	2.7-001	2.7-001	2.7+002	FP+AP	NI63
SE79	1.0+003	1.0-006	1.0-006	1.0-003	1.0-003	1.0-003	1.0+000	FP+AP	SE79
SR90	5.7+007	1.0-006	1.0-006	1.0-003	5.7+001	5.7+001	5.7+004	FP+AP	SR90
Y 90	5.7+007	1.0-006	1.0-006	1.0-003	5.7+001	5.7+001	5.7+004	FP+AP	Y 90
Y 91	5.5-003	1.0-006	1.0-006	1.0-003	5.5-009	5.5-009	5.5-006	FP+AP	Y 91
ZR93	8.5+003	1.0-006	1.0-006	1.0-003	8.5-003	8.5-003	8.5+000	FP+AP	ZR93
NB93M	1.9+003	1.0-006	1.0-006	1.0-003	1.9-003	1.9-003	1.9+000	FP+AP	NB93M
ZR95	6.3-002	1.0-006	1.0-006	1.0-003	6.3-008	6.3-008	6.3-005	FP+AP	ZR95
NB95M	1.3-003	1.0-006	1.0-006	1.0-003	1.3-009	1.3-009	1.3-006	FP+AP	NB95M
NB95	1.4-001	1.0-006	1.0-006	1.0-003	1.4-007	1.4-007	1.4-004	FP+AP	NB95
TC99	3.8+004	1.0-006	1.0-006	1.0-003	3.8-002	3.8-002	3.8+001	FP+AP	TC99
RU106	4.4+005	1.0-006	1.0-006	1.0-003	4.4-001	4.4-001	4.4+002	FP+AP	RU106
RH106	4.4+005	1.0-006	1.0-006	1.0-003	4.4-001	4.4-001	4.4+002	FP+AP	RH106
PD107	7.9+001	1.0-006	1.0-006	1.0-003	7.9-005	7.9-005	7.9-002	FP+AP	PD107
AG110M	4.5+002	1.0-006	1.0-006	1.0-003	4.5-004	4.5-004	4.5-001	FP+AP	AG110M
AG110	5.9+001	1.0-006	1.0-006	1.0-003	5.9-005	5.9-005	5.9-002	FP+AP	AG110
SN123	4.3+000	1.0-006	1.0-006	1.0-003	4.3-006	4.3-006	4.3-003	FP+AP	SN123
SB125	2.1+005	1.0-006	1.0-006	1.0-003	2.1-001	2.1-001	2.1+002	FP+AP	SB125
TE125M	8.8+004	1.0-006	1.0-006	1.0-003	8.7-002	8.7-002	8.8+001	FP+AP	TE125M
SN126	8.7+001	1.0-006	1.0-006	1.0-003	8.7-005	8.7-005	8.7-002	FP+AP	SN126
SB126M	8.7+001	1.0-006	1.0-006	1.0-003	8.7-005	8.7-005	8.7-002	FP+AP	SB126M
SB126	8.6+001	1.0-006	1.0-006	1.0-003	8.6-005	8.6-005	8.6-002	FP+AP	SB126
TE127M	1.8+000	1.0-006	1.0-006	1.0-003	1.8-006	1.8-006	1.9-003	FP+AP	TE127M
TE127	1.8+000	1.0-006	1.0-006	1.0-003	1.8-006	1.8-006	1.8-003	FP+AP	TE127
I 129	5.9+001	1.0-004	1.0-004	1.0-003	5.9-003	5.9-003	5.9-002	H3,C14,I	I 129
CS134	8.3+002	1.0-006	1.0-006	1.0-003	8.3-004	8.3-004	8.3-001	FP+AP	CS134
CS135	2.0+002	1.0-006	1.0-006	1.0-003	2.0-004	2.0-004	2.0-001	FP+AP	CS135
CS137	2.1+007	1.0-006	1.0-006	1.0-003	2.1+001	2.1+001	2.1+004	FP+AP	CS137
BA137M	1.9+007	1.0-006	1.0-006	1.0-003	1.9+001	1.9+001	1.9+004	FP+AP	BA137M
CE144	7.7+005	1.0-006	1.0-006	1.0-003	7.7-001	7.7-001	7.7+002	FP+AP	CE144
PR144	7.7+005	1.0-006	1.0-006	1.0-003	7.7-001	7.7-001	7.7+002	FP+AP	PR144
PM147	9.9+006	1.0-006	1.0-006	1.0-003	9.9+000	9.9+000	9.9+003	FP+AP	PM147
SM151	1.5+006	1.0-006	1.0-006	1.0-003	1.5+000	1.5+000	1.5+003	FP+AP	SM151

FIGURE E.1-2. ALLDOS Sample Problem Output

RA224	6.1+000	1.0-008	1.0-008	1.0-006	6.1-008	6.1-008	6.1-006	ACTINIDES	RA224
TH228	6.1+000	1.0-008	1.0-008	1.0-006	6.1-008	6.1-008	6.1-006	ACTINIDES	TH228
TH229	1.9-001	1.0-008	1.0-008	1.0-006	1.9-009	1.9-009	1.9-007	ACTINIDES	TH229
TH230	1.8-002	1.0-008	1.0-008	1.0-006	1.8-010	1.8-010	1.8-008	ACTINIDES	TH230
TH232	1.6+000	1.0-008	1.0-008	1.0-006	1.6-008	1.6-008	1.6-006	ACTINIDES	TH232
PA233	1.3-002	1.0-008	1.0-008	1.0-006	1.3-010	1.3-010	1.3-008	ACTINIDES	PA233
U 232	6.8+000	1.0-008	1.0-008	1.0-006	6.8-008	6.8-008	6.8-006	ACTINIDES	U 232
U 233	4.0+002	1.0-008	1.0-008	1.0-006	4.0-006	4.0-006	4.0-004	ACTINIDES	U 233
U 234	4.2+002	1.0-008	1.0-008	1.0-006	4.2-006	4.2-006	4.2-004	ACTINIDES	U 234
U 235	1.3+001	1.0-008	1.0-008	1.0-006	1.3-007	1.3-007	1.3-005	ACTINIDES	U 235
U 236	9.6-004	1.0-008	1.0-008	1.0-006	9.6-012	9.6-012	9.6-010	ACTINIDES	U 236
U 237	4.6+000	1.0-008	1.0-008	1.0-006	4.6-008	4.6-008	4.6-006	ACTINIDES	U 237
U 238	3.0+002	1.0-008	1.0-008	1.0-006	3.0-006	3.0-006	3.0-004	ACTINIDES	U 238
NP237	1.3+000	1.0-008	1.0-008	1.0-006	1.3-008	1.3-008	1.3-006	ACTINIDES	NP237
NP239	8.1+002	1.0-008	1.0-008	1.0-006	8.1-006	8.1-006	8.1-004	ACTINIDES	NP239
PU238	9.0+002	1.0-008	1.0-008	1.0-006	9.0-006	9.0-006	9.0-004	ACTINIDES	PU238
PU239	2.4+004	1.0-008	1.0-008	1.0-006	2.4-004	2.4-004	2.4-002	ACTINIDES	PU239
PU240	6.6+003	1.0-008	1.0-008	1.0-006	6.6-005	6.6-005	6.6-003	ACTINIDES	PU240
PU241	1.8+005	1.0-008	1.0-008	1.0-006	1.8-003	1.8-003	1.8-001	ACTINIDES	PU241
PU242	2.5+000	1.0-008	1.0-008	1.0-006	2.5-008	2.5-008	2.5-006	ACTINIDES	PU242
AM241	1.7+005	1.0-008	1.0-008	1.0-006	1.7-003	1.7-003	1.7-001	ACTINIDES	AM241
AM242M	1.2+003	1.0-008	1.0-008	1.0-006	1.2-005	1.2-005	1.2-003	ACTINIDES	AM242M
AM242	1.2+003	1.0-008	1.0-008	1.0-006	1.2-005	1.2-005	1.2-003	ACTINIDES	AM242
AM243	8.1+002	1.0-008	1.0-008	1.0-006	8.1-006	8.1-006	8.1-004	ACTINIDES	AM243
CM242	1.0+003	1.0-008	1.0-008	1.0-006	1.0-005	1.0-005	1.0-003	ACTINIDES	CM242
CM244	1.3+004	1.0-008	1.0-008	1.0-006	1.4-004	1.4-004	1.3-002	ACTINIDES	CM244
CM245	1.2+000	1.0-008	1.0-008	1.0-006	1.2-008	1.2-008	1.2-006	ACTINIDES	CM245

ABOVE INVENTORY FROM DATA SET - DECAY FOR 5 YEARS, BASIC INVENTORY 2.
SOURCE LIBRARY - ALLDOS SAMPLE PROBLEM BASIC INVENTORY FILE.

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM OUTPUT

ALLDOS SAMPLE PROBLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY 082080

RELEASE IS CHRONIC (LR= 2)
POPULATION DOSE FACTORS - AIR/FOOD/LIQUID 1.0-003 1.0-003 2.5+000
MAXIMUM INDIVIDUAL X/Q VALUES - AIR/FOOD/LIQUID 2.0-006 2.0-006 8.3-006
POPULATION DOSE* YES
PLANT LIFE= 30.0 YEARS
INHALATION DOSE CALCULATION FOR 4 ORGANS
TOTAL BODY BONE LUNGS THYROID
DOSE TIMES ARE 1 YEARS 70 YEARS
EXTERNAL DOSE CALCULATION FOR TOTAL BODY
FRACTIONAL CONTRIBUTION TABLES* NO
DOSE/NUCLIDE CONTRIBUTION TABLES* YES
MAXIMUM INDIVIDUAL DOSE* YES
PATHWAY INDEX IS 3 FOR AIR AND LIQUID PATHS
NUCLIDE INVENTORY DATA

NUCLIDE	AIR	AIR-FOOD	WATER
H 3	1.4E+00	1.4E+00	1.4E+01
C 14	1.7E-01	1.7E-01	1.7E+00
CO60	3.7E-02	3.7E-02	3.7E+01
NI59	2.5E-03	2.5E-03	2.5E+00
NI63	2.7E-01	2.7E-01	2.7E+02
SE79	1.0E-03	1.0E-03	1.0E+00
SR90	5.7E+01	5.7E+01	5.7E+04
Y 90	5.7E+01	5.7E+01	5.7E+04
Y 91	5.5E-09	5.5E-09	5.5E-06
ZR93	8.5E-03	8.5E-03	8.5E+00
NB93M	1.9E-03	1.9E-03	1.9E+00
ZR95	6.3E-08	6.3E-08	6.3E-05
NB95M	1.3E-09	1.3E-09	1.3E-06
NB95	1.4E-07	1.4E-07	1.4E-04
TC99	5.8E-02	5.8E-02	5.8E+01
RH106	4.4E-01	4.4E-01	4.4E+02
RU106	4.4E-01	4.4E-01	4.4E+02
PD107	7.9E-05	7.9E-05	7.9E-02
AG110	5.9E-05	5.9E-05	5.9E-02
AG110M	4.5E-04	4.5E-04	4.5E-01
SN123	4.3E-06	4.3E-06	4.3E-03
SB125	2.1E-01	2.1E-01	2.1E+02
TE125M	8.7E-02	8.7E-02	8.8E+01
SN126	8.7E-05	8.7E-05	8.7E-02
SB126M	8.7E-05	8.7E-05	8.7E-02
SB126	8.6E-05	8.6E-05	8.6E-02
TE127M	1.8E-06	1.8E-06	1.9E-03
TE127	1.8E-06	1.8E-06	1.8E-03
I 129	5.9E-03	5.9E-03	5.9E-02
CS134	8.3E-04	8.3E-04	8.3E-01
CS135	2.0E-04	2.0E-04	2.0E-01
CS137	2.1E+01	2.1E+01	2.1E+04

FIGURE E.1-2. ALLDOS Sample Problem Output

BA137M	1.9E+01	1.9E+01	1.9E+04
CE144	7.7E-01	7.7E-01	7.7E+02
PR144	7.7E-01	7.7E-01	7.7E+02
PM147	9.9E+00	9.9E+00	9.9E+03
SM151	1.5E+00	1.5E+00	1.5E+03
RA224	6.1E-08	6.1E-08	6.1E-06
TH228	6.1E-08	6.1E-08	6.1E-06
TH229	1.9E-09	1.9E-09	1.9E-07
TH230	1.8E-10	1.8E-10	1.8E-08
TH232	1.6E-08	1.6E-08	1.6E-06
PA233	1.3E-10	1.3E-10	1.3E-08
U 232	6.8E-08	6.8E-08	6.8E-06
U 233	4.0E-06	4.0E-06	4.0E-04
U 234	4.2E-06	4.2E-06	4.2E-04
U 235	1.3E-07	1.3E-07	1.3E-05
U 236	9.6E-12	9.6E-12	9.6E-10
U 237	4.6E-08	4.6E-08	4.6E-06
U 238	3.0E-06	3.0E-06	3.0E-04
NP237	1.3E-08	1.3E-08	1.3E-06
NP239	8.1E-06	8.1E-06	8.1E-04
PU238	9.0E-06	9.0E-06	9.0E-04
PU239	2.4E-04	2.4E-04	2.4E-02
PU240	6.6E-05	6.6E-05	6.6E-03
PU241	1.8E-03	1.8E-03	1.8E-01
PU242	2.5E-08	2.5E-08	2.5E-06
AM241	1.7E-03	1.7E-03	1.7E-01
AM242M	1.2E-05	1.2E-05	1.2E-03
AM242	1.2E-05	1.2E-05	1.2E-03
AM243	8.1E-06	8.1E-06	8.1E-04
CM242	1.0E-05	1.0E-05	1.0E-03
CM244	1.4E-04	1.4E-04	1.3E-02
CM245	1.2E-08	1.2E-08	1.2E-06

INPUT CHECKED BY ********** DATE **********

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY
DECAY FOR 5 YEARS, BASIC INVENTORY 2.
082080
MAXIMUM INDIVIDUAL DOSE COMMITMENTS (REM)

PATHWAY/ORGAN	DOSE COMMITMENT PERIOD 1 YEARS	70 YEARS
AIR SUBMERSION		
TOTAL BODY	5.5E-06	1.7E-04
INHALATION		
TOTAL BODY	2.2E-03	1.3E+00
BONE	3.0E-02	2.0E+01
LUNGS	3.9E-02	5.2E+00
THYROID	7.7E-06	3.6E-04
TERRESTRIAL (AIR PATHS)		
TOTAL BODY	1.1E-02	6.1E+01
BONE	3.2E-02	2.3E+02
LUNGS	1.2E-03	7.5E-01
THYROID	2.0E-03	8.9E-01
TERRESTRIAL (LIQUID PATHS)		
TOTAL BODY	8.0E-01	5.7E+02
BONE	1.1E+00	2.0E+03
LUNGS	1.2E-01	1.4E+01
THYROID	8.6E-03	7.9E+00
TOTAL DOSES		
TOTAL BODY	8.1E-01	6.3E+02
BONE	1.1E+00	2.3E+03
LUNGS	1.6E-01	2.0E+01
THYROID	1.1E-02	8.8E+00

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROHLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY
DECAY FOR 5 YEARS, BASIC INVENTORY 2.
082080
POPULATION DOSE COMMITMENTS (MAN-REM)
DOSE COMMITMENT PERIOD

PATHWAY/ORGAN	1 YEARS	70 YEARS
AIR SUBMERSION		
TOTAL BODY	2.8E-03	8.3E-02
INHALATION		
TOTAL BODY	1.1E+00	6.7E+02
BONE	1.5E+01	1.0E+04
LUNGS	2.0E+01	2.6E+03
THYROID	3.8E-03	1.8E-01
TERRESTRIAL (AIR PATHS)		
TOTAL BODY	3.2E+00	1.4E+04
BONE	8.7E+00	5.2E+04
LUNGS	4.1E-01	2.5E+02
THYROID	6.8E-01	2.9E+02
TERRESTRIAL (LIQUID PATHS)		
TOTAL BODY	2.0E+04	7.2E+07
BONE	5.0E+04	2.6E+08
LUNGS	2.6E+03	1.3E+06
THYROID	1.3E+03	1.2E+06
TOTAL DOSES		
TOTAL BODY	2.0E+04	7.2E+07
BONE	5.0E+04	2.6E+08
LUNGS	2.6E+03	1.3E+06
THYROID	1.3E+03	1.2E+06

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY
DECAY FOR 5 YEARS, BASIC INVENTORY 2.
082080

DOSE BY NUCLIDE FOR THE MAXIMUM INDIVIDUAL. DOSE TIME 1 YEARS

NUCLIDE	TOTAL BODY	BONE	LUNGS	THYROID
H 3	5.5E-07	.0	5.5E-07	5.5E-07
C 14	6.5E-05	2.8E-04	6.5E-05	6.5E-05
CO60	6.8E-05	6.2E-05	7.5E-05	6.2E-05
NI59	4.3E-08	2.2E-07	9.9E-09	7.9E-12
NI63	1.3E-05	3.2E-04	2.9E-06	.0
SE79	2.7E-07	4.8E-14	8.3E-09	4.8E-14
SR90	1.1E-01	4.2E-01	3.7E-02	4.3E-08
Y 90	3.1E-05	1.0E-03	7.5E-04	3.9E-06
Y 91	3.7E-14	1.2E-12	6.6E-13	3.2E-15
ZR93	4.6E-09	8.6E-07	1.1E-07	5.1E-20
NB93M	9.1E-09	9.1E-08	3.7E-08	1.6E-10
ZR95	6.8E-13	3.1E-12	7.6E-12	2.2E-14
NB95M	3.9E-17	3.9E-17	3.9E-17	3.9E-17
NB95	1.8E-11	2.4E-11	2.0E-11	1.5E-11
TC99	1.4E-07	3.1E-07	1.9E-06	6.8E-12
RH106	2.0E-09	2.0E-09	2.0E-09	2.0E-09
RU106	5.5E-05	8.3E-05	3.2E-04	5.1E-05
PD107	2.5E-10	.0	3.6E-10	.0
AG110	4.7E-14	4.7E-14	4.7E-14	4.7E-14
AG110M	4.8E-09	7.6E-09	1.5E-07	6.3E-10
SN123	3.3E-09	1.2E-07	7.0E-10	1.7E-09
SB125	6.9E-06	1.3E-05	2.6E-05	5.3E-08
TE125M	5.7E-06	4.0E-05	2.5E-06	1.3E-05
SN126	2.9E-07	5.4E-06	1.3E-07	1.2E-07
SB126M	5.4E-12	5.4E-12	5.4E-12	5.4E-12
SB126	2.9E-09	2.9E-09	3.1E-09	2.9E-09
TE127M	2.9E-10	2.3E-09	1.7E-10	6.3E-10
TE127	1.3E-12	5.5E-12	1.4E-12	4.1E-12
I 129	1.8E-06	1.0E-06	3.3E-07	1.2E-03
CS134	5.1E-05	2.5E-05	6.6E-06	8.9E-07
CS135	7.3E-07	1.6E-06	1.7E-07	1.8E-14
CS137	7.0E-01	7.1E-01	1.2E-01	9.1E-03
BA137M	5.4E-06	5.4E-06	5.4E-06	5.4E-06
CE144	2.2E-05	8.3E-05	4.2E-04	1.7E-05
PR144	2.4E-06	2.4E-06	2.4E-06	2.4E-06
PM147	3.6E-06	6.7E-05	3.2E-04	1.0E-09
SM151	8.0E-06	1.2E-05	4.1E-05	7.7E-06
RA224	5.0E-11	2.5E-10	5.9E-10	2.5E-16
TH228	8.4E-11	2.2E-09	1.2E-08	8.7E-12
TH229	3.9E-12	7.6E-11	4.5E-10	7.7E-14
TH230	5.2E-14	1.9E-12	8.0E-12	2.6E-17
TH232	6.3E-12	1.9E-10	8.4E-10	1.2E-13
PA233	7.7E-16	9.6E-16	3.4E-15	7.3E-16

FIGURE E.1-2. ALLDOS Sample Problem Output

U 232	1.1E-10	7.7E-10	1.2E-08	3.2E-15
U 233	1.1E-09	9.5E-09	1.8E-07	4.2E-13
U 234	1.2E-09	9.7E-09	1.8E-07	5.7E-13
U 235	3.4E-11	2.8E-10	5.3E-09	4.0E-13
U 236	2.6E-15	2.1E-14	4.0E-13	3.7E-20
U 237	1.6E-15	1.6E-15	1.6E-15	1.6E-15
U 238	7.5E-10	6.4E-09	1.2E-07	2.5E-12
NP237	4.4E-12	9.2E-11	5.9E-10	3.5E-13
NP239	2.0E-11	2.3E-11	3.8E-11	2.0E-11
PU238	3.1E-09	6.9E-08	4.7E-07	2.3E-13
PU239	7.7E-08	1.7E-06	1.2E-05	3.7E-12
PU240	2.1E-08	4.8E-07	3.2E-06	1.6E-12
PU241	2.5E-08	7.0E-07	1.7E-07	.0
PU242	7.5E-12	1.7E-10	1.2E-09	5.3E-16
AM241	5.9E-07	1.3E-05	8.8E-05	5.7E-09
AM242M	4.4E-09	1.0E-07	4.4E-07	5.8E-12
AM242	1.8E-11	4.1E-10	3.9E-09	1.6E-14
AM243	2.8E-09	5.9E-08	3.9E-07	1.9E-10
CM242	3.0E-09	6.6E-08	3.8E-07	5.7E-13
CM244	4.6E-08	1.1E-06	7.3E-06	7.2E-12
CM245	4.3E-12	9.2E-11	6.0E-10	2.1E-13

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY DECAY FOR 5 YEARS, BASIC INVENTORY 2.

082080

DOSE BY NUCLIDE FOR THE MAXIMUM INDIVIDUAL. DOSE TIME 70 YEARS

NUCLIDE	TOTAL BODY	BONE	LUNGS	THYROID
H 3	1.7E-05	.0	1.7E-05	1.7E-05
C 14	2.0E-03	1.0E-02	2.0E-03	2.0E-03
CO60	1.5E-02	1.5E-02	1.6E-02	1.5E-02
NI59	1.5E-05	8.8E-05	1.4E-06	2.4E-10
NI63	3.9E-03	1.2E-01	4.0E-04	.0
SE79	3.0E-04	1.4E-12	3.1E-07	1.4E-12
SR90	5.9E+02	2.2E+03	5.1E+00	1.3E-06
Y 90	1.2E-02	4.3E-02	3.4E-02	1.2E-02
Y 91	1.4E-12	5.0E-11	2.5E-11	9.8E-14
ZR93	5.6E-07	2.2E-05	1.5E-05	1.5E-18
NB93M	1.7E-06	2.0E-05	4.8E-06	1.4E-07
ZR95	2.6E-11	1.2E-10	2.9E-10	6.5E-13
NB95M	1.2E-15	1.2E-15	1.2E-15	1.2E-15
NB95	5.7E-10	8.0E-10	6.4E-10	4.7E-10
TC99	5.9E-05	1.5E-04	2.7E-04	2.0E-10
RH106	6.0E-08	6.0E-08	6.0E-08	6.0E-08
RU106	3.2E-03	4.1E-03	2.2E-02	3.1E-03
PD107	3.8E-07	.0	5.2E-08	.0
AG110	1.4E-12	1.4E-12	1.4E-12	1.4E-12
AG110M	1.5E-07	2.6E-07	9.4E-06	1.9E-08
SN123	1.1E-07	4.5E-06	3.3E-08	6.4E-08
SB125	6.3E-04	2.0E-03	2.7E-03	1.6E-06
TE125M	2.4E-04	1.7E-03	1.0E-04	5.3E-04
SN126	1.4E-04	3.9E-04	1.4E-04	1.4E-04
SB126M	1.6E-10	1.6E-10	1.6E-10	1.6E-10
SB126	1.9E-05	1.9E-05	1.9E-05	1.9E-05
TE127M	9.5E-09	7.8E-08	7.7E-09	2.0E-08
TE127	4.2E-11	1.7E-10	4.4E-11	1.3E-10
I 129	6.1E-04	4.7E-04	4.0E-04	1.7E-01
CS134	2.4E-03	1.3E-03	3.8E-04	9.4E-05
CS135	3.7E-05	9.1E-05	9.6E-06	5.4E-13
CS137	4.4E+01	4.8E+01	1.5E+01	8.6E+00
BA137M	1.6E-04	1.6E-04	1.6E-04	1.6E-04
CE144	1.2E-03	6.6E-03	2.7E-02	8.8E-04
PR144	3.0E-04	3.0E-04	3.0E-04	3.0E-04
PM147	4.6E-04	1.2E-02	3.2E-02	3.1E-08
SM151	1.0E-02	1.2E-02	1.5E-02	1.0E-02
RA224	1.6E-09	8.2E-09	1.8E-08	7.6E-15
TH228	3.1E-08	5.0E-07	1.1E-06	1.5E-08
TH229	1.3E-08	2.6E-07	6.5E-08	1.3E-10
TH230	1.9E-10	6.1E-09	1.1E-09	4.4E-14
TH232	2.1E-08	5.9E-07	1.2E-07	1.9E-10
PA233	5.3E-12	5.3E-12	5.4E-12	5.3E-12

FIGURE E.1-2. ALLDOS Sample Problem Output

U 232	6.2E-09	8.5E-08	1.6E-06	4.2E-12
U 233	6.9E-08	1.1E-06	2.4E-05	7.0E-10
U 234	7.0E-08	1.1E-06	2.5E-05	9.4E-10
U 235	2.3E-09	2.8E-08	7.3E-07	6.4E-10
U 236	1.6E-13	2.5E-12	5.6E-11	6.2E-17
U 237	4.8E-14	4.8E-14	4.8E-14	4.8E-14
U 238	4.3E-08	6.4E-07	1.6E-05	4.2E-09
NP237	1.4E-08	2.9E-07	8.1E-08	5.8E-10
NP239	2.3E-07	2.3E-07	2.3E-07	2.3E-07
PU238	8.7E-06	1.8E-04	6.5E-05	3.4E-10
PU239	2.7E-04	5.6E-03	1.6E-03	5.8E-09
PU240	7.2E-05	1.6E-03	4.4E-04	2.6E-09
PU241	3.2E-05	8.4E-04	2.2E-05	.0
PU242	2.7E-08	5.4E-07	1.7E-07	8.5E-13
AM241	1.6E-03	4.0E-02	1.2E-02	9.4E-06
AM242M	1.1E-05	2.9E-04	6.0E-05	8.5E-09
AM242	5.4E-10	1.2E-08	1.2E-07	4.9E-13
AM243	7.7E-06	1.9E-04	5.4E-05	3.2E-07
CM242	1.9E-07	4.4E-06	2.0E-05	1.2E-09
CM244	6.4E-05	1.6E-03	9.7E-04	4.9E-09
CM245	1.2E-08	3.0E-07	8.7E-08	3.5E-10

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY
DECAY FOR 5 YEARS, BASIC INVENTORY 2.

082080

DOSE BY NUCLIDE FOR THE POPULATION. DOSE TIME 1 YEARS

NUCLIDE	TOTAL BODY	BONE	LUNGS	THYROID
H 3	2.5E-03	.0	2.5E-03	2.5E-03
C 14	1.1E+01	4.8E+01	1.1E+01	1.1E+01
CO60	9.1E+00	8.7E+00	8.7E+00	8.7E+00
NI59	2.9E-03	1.5E-02	5.2E-06	2.0E-07
NI63	8.5E-01	2.2E+01	1.5E-03	.0
SE79	5.8E-02	1.2E-09	4.1E-06	1.2E-09
SR90	1.1E+04	4.1E+04	1.9E+01	1.1E-03
Y 90	8.9E-02	7.0E-01	4.5E-01	7.3E-02
Y 91	4.9E-10	2.0E-09	7.8E-10	4.5E-10
ZR93	8.1E-06	5.4E-04	5.3E-05	2.6E-17
NB93M	4.3E-05	2.3E-04	4.1E-05	2.3E-05
ZR95	1.0E-09	4.6E-09	3.8E-09	1.1E-11
NB95M	1.9E-14	1.9E-14	1.9E-14	1.9E-14
NB95	1.5E-06	1.5E-06	1.5E-06	1.5E-06
TC99	2.2E-02	5.1E-02	7.8E-03	1.7E-07
RH106	1.0E-06	1.0E-06	1.0E-06	1.0E-06
RU106	7.5E+00	9.9E+00	7.3E+00	7.2E+00
PD107	3.2E-05	.0	1.8E-07	.0
AG110	2.3E-11	2.3E-11	2.3E-11	2.3E-11
AG110M	6.8E-04	1.1E-03	7.3E-05	3.1E-07
SN123	1.6E-05	5.8E-04	3.5E-07	8.6E-06
SB125	7.8E-01	1.5E+00	1.3E-02	1.3E-03
TE125M	1.8E-01	1.3E+00	1.2E-02	4.1E-01
SN126	1.3E-02	4.0E-02	1.2E-02	1.2E-02
SB126M	2.7E-09	2.7E-09	2.7E-09	2.7E-09
SB126	4.7E-05	4.7E-05	4.7E-05	4.7E-05
TE127M	1.2E-05	9.4E-05	8.5E-08	2.6E-05
TE127	1.2E-08	4.7E-08	2.8E-09	3.5E-08
I 129	4.3E-03	2.5E-03	5.3E-04	3.0E+00
CS134	6.8E-01	3.9E-01	1.9E-01	1.3E-01
CS135	8.2E-03	1.8E-02	1.9E-03	4.5E-10
CS137	9.1E+03	9.2E+03	2.5E+03	1.3E+03
BA137M	2.7E-03	2.7E-03	2.7E-03	2.7E-03
CE144	2.5E+00	2.8E+00	2.7E+00	2.5E+00
PR144	2.5E-02	2.5E-02	2.5E-02	2.5E-02
PM147	1.8E-02	3.4E-01	1.6E-01	2.6E-05
SM151	1.1E+00	1.1E+00	1.1E+00	1.1E+00
RA224	1.6E-06	7.8E-06	2.9E-07	1.3E-13
TH228	7.7E-07	3.2E-06	6.7E-06	6.9E-07
TH229	1.0E-08	9.2E-08	2.3E-07	6.2E-09
TH230	6.1E-11	2.1E-09	4.0E-09	2.1E-12
TH232	8.2E-09	2.1E-07	4.2E-07	1.4E-09
PA233	3.2E-11	3.2E-11	3.3E-11	3.2E-11

FIGURE E.1-2. ALLDOS Sample Problem Output

U 232	4.1E-06	2.9E-05	5.8E-06	2.6E-10
U 233	4.3E-05	3.6E-04	9.1E-05	3.4E-08
U 234	4.4E-05	3.6E-04	9.2E-05	4.6E-08
U 235	1.2E-06	1.0E-05	2.7E-06	4.1E-09
U 236	9.7E-11	8.0E-10	2.0E-10	3.0E-15
U 237	8.0E-13	8.0E-13	8.0E-13	8.0E-13
U 238	2.8E-05	2.4E-04	6.1E-05	2.6E-08
NP237	3.3E-08	1.3E-07	3.2E-07	2.8E-08
NP239	3.0E-07	3.0E-07	3.1E-07	3.0E-07
PU238	2.1E-06	4.7E-05	2.3E-04	1.7E-08
PU239	5.3E-05	1.2E-03	5.8E-03	2.8E-07
PU240	1.5E-05	3.3E-04	1.6E-03	1.3E-07
PU241	1.7E-05	4.8E-04	8.5E-05	.0
PU242	5.2E-09	1.2E-07	5.8E-07	4.1E-11
AM241	1.1E-03	1.5E-02	4.5E-02	4.6E-04
AM242M	5.4E-06	1.1E-04	2.2E-04	4.7E-07
AM242	1.1E-08	2.5E-07	1.9E-06	8.2E-12
AM243	1.9E-05	8.2E-05	2.1E-04	1.6E-05
CM242	3.3E-06	7.3E-05	1.9E-04	4.2E-08
CM244	5.3E-05	1.2E-03	3.6E-03	5.7E-07
CM245	2.2E-08	1.2E-07	3.2E-07	1.7E-08

FIGURE E.1-2. ALLDOS Sample Problem Output

ALLDOS SAMPLE PROBLEM CASE 2. RELEASE INPUT USING FILE 15 BASIC INVENTORY
DECAY FOR 5 YEARS, BASIC INVENTORY 2.

082080

DOSE BY NUCLIDE FOR THE POPULATION, DOSE TIME 70 YEARS

NUCLIDE	TOTAL BODY	BONE	LUNGS	THYROID
H 3	7.8E-02	.0	7.8E-02	7.8E-02
C 14	3.5E+02	1.7E+03	3.5E+02	3.5E+02
CO60	2.1E+03	2.1E+03	2.1E+03	2.1E+03
NI59	1.4E+00	8.4E+00	6.9E-04	6.0E-06
NI63	3.7E+02	1.1E+04	2.0E-01	.0
SE79	6.9E+01	3.6E-08	1.5E-04	3.6E-08
SR90	7.0E+07	2.6E+08	2.6E+03	3.2E-02
Y 90	1.6E+03	1.7E+03	1.6E+03	1.6E+03
Y 91	1.5E-08	7.6E-08	2.6E-08	1.4E-08
ZR93	1.0E-03	4.0E-02	7.3E-03	7.7E-16
NB93M	2.3E-02	6.6E-02	2.2E-02	1.9E-02
ZR95	3.9E-08	1.8E-07	1.5E-07	3.3E-10
NB95M	5.8E-13	5.8E-13	5.8E-13	5.8E-13
NB95	4.9E-05	4.9E-05	4.8E-05	4.8E-05
TC99	8.4E+00	2.1E+01	2.7E+00	5.1E-06
RH106	3.0E-05	3.0E-05	3.0E-05	3.0E-05
RU106	4.4E+02	5.2E+02	4.4E+02	4.3E+02
PD107	4.9E-02	.0	2.6E-05	.0
AG110	7.0E-10	7.0E-10	7.0E-10	7.0E-10
AG110M	2.2E-02	3.9E-02	4.7E-03	9.4E-06
SN123	5.5E-04	2.2E-02	1.7E-05	3.1E-04
SB125	7.3E+01	2.2E+02	1.3E+00	4.2E-02
TE125M	1.4E+01	9.5E+01	1.4E+00	3.0E+01
SN126	2.0E+01	2.1E+01	1.9E+01	1.9E+01
SB126M	8.1E-08	8.1E-08	8.1E-08	8.1E-08
SB126	2.6E+00	2.6E+00	2.6E+00	2.6E+00
TE127M	4.0E-04	3.3E-03	3.8E-06	8.4E-04
TE127	7.0E-07	1.7E-06	4.2E-07	1.4E-06
I 129	1.2E+00	9.4E-01	8.0E-01	3.2E+02
CS134	3.9E+01	2.7E+01	1.6E+01	1.3E+01
CS135	4.7E-01	1.1E+00	1.2E-01	1.4E-08
CS137	1.6E+06	1.7E+06	1.3E+06	1.2E+06
BA137M	8.1E-02	8.1E-02	8.1E-02	8.1E-02
CE144	1.3E+02	1.5E+02	1.4E+02	1.2E+02
PR144	3.3E+01	3.3E+01	3.3E+01	3.3E+01
PM147	2.1E+00	5.6E+01	1.6E+01	7.8E-04
SM151	1.5E+03	1.5E+03	1.5E+03	1.5E+03
RA224	4.9E-05	2.4E-04	9.0E-06	3.8E-12
TH228	1.1E-03	1.7E-03	1.6E-03	1.1E-03
TH229	2.6E-05	3.2E-04	4.3E-05	1.0E-05
TH230	2.2E-07	7.2E-06	5.5E-07	3.5E-09
TH232	2.3E-05	6.1E-04	6.0E-05	1.9E-06
PA233	4.3E-07	4.3E-07	4.3E-07	4.3E-07

FIGURE E.1-2. ALLDOS Sample Problem Output

```
    U 232        2.4E-04      3.3E-03      7.9E-04      3.4E-07
    U 233        2.7E-03      4.3E-02      1.2E-02      5.6E-05
    U 234        2.8E-03      4.4E-02      1.3E-02      7.6E-05
    U 235        6.5E-05      9.7E-04      3.7E-04      6.6E-06
    U 236        5.9E-09      9.5E-08      2.8E-08      5.0E-12
    U 237        2.4E-11      2.4E-11      2.4E-11      2.4E-11
    U 238        1.4E-03      2.2E-02      8.3E-03      4.3E-05
    NP237        6.2E-05      3.8E-04      8.8E-05      4.7E-05
    NP239        1.9E-02      1.9E-02      1.9E-02      1.9E-02
    PU238        5.8E-03      1.2E-01      3.2E-02      2.8E-05
    PU239        1.8E-01      3.7E+00      7.9E-01      4.7E-04
    PU240        4.8E-02      1.0E+00      2.2E-01      2.1E-04
    PU241        2.1E-02      5.6E-01      1.1E-02       .0
    PU242        1.8E-05      3.6E-04      8.3E-05      6.9E-08
    AM241        2.4E+00      4.2E+01      6.9E+00      7.6E-01
    AM242M       1.2E-02      3.0E-01      3.1E-02      6.9E-04
    AM242        3.2E-07      7.4E-06      5.8E-05      2.4E-10
    AM243        3.4E-02      2.2E-01      5.3E-02      2.6E-02
    CM242        3.3E-04      5.3E-03      1.0E-02      9.9E-05
    CM244        7.0E-02      1.7E+00      4.9E-01      4.0E-04
    CM245        4.2E-05      3.6E-04      7.2E-05      2.8E-05
END OF FILE ON INPUT IEND =    3
```

FIGURE E.1-2. ALLDOS Sample Problem Output

E.2 File 10 Inhalation Dose Factors

The sample problem uses the File 10 data library shown in Appendix C (Figure C.0-2). In addition to master radionuclide identification data, this library contains external and inhalation dose conversion factors. The external dose conversion factors were calculated as described in Section 3.1 using the computer program SUBDOSA* with input modified to represent a semi-infinite plume calculation. The calculation of these factors is relatively simple and will not be discussed further.

Inhalation dose factors were calculated using the computer program DACRIN (described in Section 3.2). A sample input deck for execution of DACRIN is presented here. The sample DACRIN problem will create inhalation dose conversion factors for the File 10 library. The organs considered (and organ index values) are listed in Table E.2-1.

Six cases are required for calculation of necessary inhalation dose factors. The factors represent the highest value calculated based on consideration of soluble and insoluble material. For all organs except the lungs and lower large intestine (LLI) the soluble form gives the highest values. The parameters for the six cases are as indicated in Table E.2-2. Details of other parameters are described in the DACRIN users manual (Section 4.0 References, Houston, Strenge and Watson 1976 and Strenge 1975). A listing of the DACRIN sample problem input deck is given in Figure E.2-1. The DACRIN output listing is not presented here because of space limitation. However, the dose factors calculated are given in the File 10 library listing.

---

* Strenge, D. L., E. C. Watson and J. R. Houston. 1975. SUBDOSA - A Computer Program for Calculating Individual External Doses from Accidental Atmospheric Releases of Radionuclides. BNWL-B-351, Pacific Northwest Laboratory, Richland, WA.

TABLE E.2-1 DACRIN Sample Problem Organs

Organs	Index
Total body	1
Kidney	3
Liver	4
Bone	6
Lungs	8
Thyroid	16
LLI	23

TABLE E.2-2 DACRIN Sample Problem Input Parameters

Parameter	Soluble Material			Insoluble Material		
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Release type	Acute	Chronic	Prolonged	Acute	Chronic	Prolonged
Uptake time	1 day	1 yr	30 yr	1 day	1 yr	30 yr
Dose time 1	1 yr	0	40 yr	1 yr	0	40 yr
Dose time 2	50 yr	49 yr	-	50 yr	49 yr	-
Ventilation rate (cm^3/sec)	350.	230.	230.	350.	230.	230.
Particle size (μm)	1.0	1.0	1.0	1.0	1.0	1.0

```
 $INPUT NEXT=1,MET=10,DIAM=1.,ISLT=1,BRATE(1)=350.,UPTIME(1)=86400.,
 DOSTIM(1)=3.156E7,1.578E9,ORGANS(1)=1,3,4,6,8,16,23,URAR=1.,R(1)=1. $END
100      1.
H 3       1    1.0
BE10      1    1.0
C 14      1    1.0
CA41      1    1.0
CR51      1    1.0
MN54      1    1.0
FE55      1    1.0
FE59      1    1.0
CO58      1    1.0
CO60      1    1.0
NI59      1    1.0
NI63      1    1.0
SE79      1    1.0
KR85      1    1.0
RB87      1    1.0
SR90      1    1.0
Y 90      1    1.0
Y 91      1    1.0
ZR93      1    1.0
NB93M     1    1.0
MO93      1    1.0
ZR95      1    1.0
NB95M     1    1.0
NB95      1    1.0
TC99      1    1.0
RH106     1    1.0
RU106     1    1.0
PD107     1    1.0
AG110     1    1.0
AG110M    1    1.0
CD113M    1    1.0
SN123     1    1.0
SB125     1    1.0
TE125M    1    1.0
SN126     1    1.0
SB126M    1    1.0
SB126     1    1.0
TE127M    1    1.0
TE127     1    1.0
I 129     1    1.0
CS134     1    1.0
CS135     1    1.0
CS137     1    1.0
BA137M    1    1.0
CE144     2    1.0
PR144     2    1.0
PM147     2    1.0
SM147     2    1.0
SM151     2    1.0
EU152     2    1.0
EU154     2    1.0
EU155     2    1.0
HO166M    2    1.0
W 185     2    1.0
PB210     2    1.0
BI210     2    1.0
PO210     2    1.0
RA223     2    1.0
RA224     2    1.0
RA225     2    1.0
RA226     2    1.0
RA228     2    1.0
AC225     2    1.0
AC227     2    1.0
TH227     2    1.0
TH228     2    1.0
TH229     2    1.0
TH230     2    1.0
TH232     2    1.0
PA231     2    1.0
```

FIGURE E.2-1. DACRIN Sample Problem Input

```
PA233     2    1.0
U 232     2    1.0
U 233     2    1.0
U 234     2    1.0
U 235     2    1.0
U 236     2    1.0
U 237     2    1.0
U 238     2    1.0
U 240     2    1.0
NP237     2    1.0
NP238     2    1.0
NP239     2    1.0
PU238     2    1.0
PU239     2    1.0
PU240     2    1.0
PU241     2    1.0
PU242     2    1.0
PU243     2    1.0
PU244     2    1.0
AM241     2    1.0
AM242M    2    1.0
AM242     2    1.0
AM243     2    1.0
CM242     2    1.0
CM243     2    1.0
CM244     2    1.0
CM245     2    1.0
CM246     2    1.0
CM247     2    1.0
CM248     2    1.0
  1.0
DACRIN SAMPLE PROBLEM FOR ALLDOS, CASE 2.  CHRONIC, SOLUBLE
 $INPUT NEXT=3,ISLT=1,BRATE(1)=230.,UPTIME(1)=3.156E7,DOSTIM(1)=60.,1.547E9
 $END
  1.0
DACRIN SAMPLE PROBLEM FOR ALLDOS, CASE 3.  PROLONGED, SOLUBLE
 $INPUT NEXT=3,ISLT=1,UPTIME(1)=9.47E8,DOSTIM(1)=1.26E9 $END
  1.0
DACRIN SAMPLE PROBLEM FOR ALLDOS, CASE 4.  ACUTE, INSOLUBLE
 $INPUT NEXT=2,ISLT=2,BRATE(1)=350.,UPTIME(1)=86400.,DOSTIM(1)=3.156E7,
 1.578E8 $END
100     1.
H 3       1    1.0
BE10      2    1.0
C 14      2    1.0
CA41      2    1.0
CR51      3    1.0
MN54      3    1.0
FE55      3    1.0
FE59      3    1.0
CO58      3    1.0
CO60      3    1.0
NI59      3    1.0
NI63      3    1.0
SE79      2    1.0
KR85      1    1.0
RB87      1    1.0
SR90      3    1.0
Y 90      3    1.0
Y 91      3    1.0
ZR93      3    1.0
NB93M     3    1.0
MO93      3    1.0
ZR95      3    1.0
NB95M     3    1.0
NB95      3    1.0
TC99      3    1.0
RH106     3    1.0
RU106     3    1.0
PD107     3    1.0
AG110     3    1.0
AG110M    3    1.0
CD113M    3    1.0
```

FIGURE E.2-1. DACRIN Sample Problem Input

```
SN123     3    1.0
SB125     3    1.0
TE125M    3    1.0
SN126     3    1.0
SB126M    3    1.0
SB126     3    1.0
TE127M    3    1.0
TE127     3    1.0
I 129     2    1.0
CS134     1    1.0
CS135     1    1.0
CS137     1    1.0
BA137M    3    1.0
CE144     3    1.0
PR144     3    1.0
PM147     3    1.0
SM147     3    1.0
 M151     3    1.0
EU152     3    1.0
EU154     3    1.0
EU155     3    1.0
HO166M    3    1.0
W 185     3    1.0
PB210     3    1.0
BI210     3    1.0
PO210     3    1.0
RA223     3    1.0
RA224     3    1.0
RA225     3    1.0
RA226     3    1.0
RA228     3    1.0
AC225     3    1.0
AC227     3    1.0
TH227     3    1.0
TH228     3    1.0
TH229     3    1.0
TH230     3    1.0
TH232     3    1.0
PA231     3    1.0
PA233     3    1.0
U 232     3    1.0
U 233     3    1.0
U 234     3    1.0
U 235     3    1.0
U 236     3    1.0
U 237     3    1.0
U 238     3    1.0
U 240     3    1.0
NP237     3    1.0
NP238     3    1.0
NP239     3    1.0
PU238     3    1.0
PU239     3    1.0
PU240     3    1.0
PU241     3    1.0
PU242     3    1.0
PU243     3    1.0
PU244     3    1.0
AM241     3    1.0
AM242M    3    1.0
AM242     3    1.0
AM243     3    1.0
CM242     3    1.0
CM243     3    1.0
CM244     3    1.0
CM245     3    1.0
CM246     3    1.0
CM247     3    1.0
CM248     3    1.0
  1.0
DACRIN SAMPLE PROBLEM FOR ALLDOS, CASE 5.  CHRONIC, INSOLUBLE
 $INPUT NEXT=3,ISLT=2,PRATE(1)=230.,UPTIME(1)=3.156E7,DOSTIM(1)=60.,1.547E9
 $END
```

FIGURE E.2-1. DACRIN Sample Problem Input

```
  1.0
DACRIN SAMPLE PROBLEM FOR ALLDOS, CASE 6.  PROLONGED, INSOLUBLE
 $INPUT NEXT=3,ISLT=2,UPTIME(1)=9.47E8,DOSTIM(1)=1.26E9 $END
  1.0
 END OF RUN
 $INPUT NEXT=4 $END
```

FIGURE E.2-1. DACRIN Sample Problem Input

E.3 File 12 Dose Conversion Factors

The terrestrial dose factor file (File 12) must be established on a site-specific basis. Implicit in the data contained in this file are many of the demography and lifestyle assumptions that must be made for each site. The computer program PABLM (Napier 1980) is presently used to generate this file

The normal use of PABLM is to calculate accumulated radiation doses to individuals and populations from radionuclides in the environment. Doses can be calculated for up to five organs of reference for up to one hundred radionuclides per run. The program can calculate doses from nine food crop exposure pathways, five farm animal product exposure pathways, four external direct irradiation exposure pathways, the drinking water pathway, and four aquatic food product pathways. Any or all of the exposure pathways in PABLM may be utilized, depending on the modes of exposure possible at any particular location.

When run for ALLDOS, the radionuclide release inventory input to PABLM is set to one curie of each radionuclide for acute releases, and one curie per year for chronic releases. Thus, the resultant dose factors are in units of rem/Ci for acute releases, and rem/Ci-yr for chronic releases.

All sixteen required sets of dose factors may be created in a single PABLM run. Setting the NINEON control integer in the PABLM namelist to a positive value enables PABLM to print results to a permanent file that will become the ALLDOS File 12, with minimal interactive editing to add a title card. The individual sets of PABLM input should correspond in order with the definitions shown in Table B.2-1 in Appendix B.

The sample problem uses the File 12 data library shown in Appendix C (Figure C.0-3). This data library was created using the program PABLM and the input deck shown in Figure E.3-1. Important parameters used in the sample problem are listed in Table E.3-1. Other program control parameters are described in the PABLM manual (Napier 1980). The PABLM sample output listing is not presented here because of space limitations.

```
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX. IND., AIR RELEASE, 1/1 DOSE
 $INPUT NEXT=2, IDEP=1, IOUT=0, IAC=1, NIMSON=1,
  IHKFRC=1,
  PLIFE=1.0, T2=1, IPOP=0, POP=1.0, IPEC=1,
  KORG(1)=1,6,8,16,
  KBDTYP(1)=1,2,4,7,9,10,11,12,13,14,15,
  XC(1)=11*1.0,
  RIRR(1)=11*0.0,
  GRWP(1)=90.,60.,4*90.,30.,3*90.,
  YELD(1)=1.5,0.7,4.0,2.0,1.0,0.84,1.1,0.84,0.84,0.84,
  HLDUP1(1)=1.,1.,10.,10.,3*1.,2*15.,1.,
  CON(1)=30.,30.,182.,335.,88.,30.,274.,40.,40.,18.,
  TRNS(1)=1.0,5*0.1,1.0,3*0.1,
  EXTIM=4383.,
 $END
 64  1.0
H 3             1.0
C 14            1.0
CO60            1.0
NI59            1.0
NI63            1.0
SE79            1.0
SR90            1.0
Y 90            1.0
Y 91            1.0
ZR93            1.0
NB93M           1.0
ZR95            1.0
NB95M           1.0
NB95            1.0
TC99            1.0
RU106           1.0
RH106           1.0
PD107           1.0
AG110M          1.0
AG110           1.0
SN123           1.0
SB125           1.0
TE125M          1.0
SN126           1.0
SB126M          1.0
SB125           1.0
TE127M          1.0
TE127           1.0
I 129           1.0
CS134           1.0
CS135           1.0
CS137           1.0
BA137M          1.0
CE144           1.0
PR144           1.0
PM147           1.0
SM151           1.0
RA224           1.0
TH228           1.0
TH229           1.0
TH230           1.0
TH232           1.0
PA233           1.0
U 232           1.0
U 233           1.0
U 234           1.0
U 235           1.0
U 236           1.0
U 237           1.0
U 238           1.0
NP237           1.0
NP239           1.0
PU238           1.0
PU239           1.0
PU240           1.0
PU241           1.0
PU242           1.0
```

FIGURE E.3-1. PABLM Sample Problem Input

```
AM241          1.0
AM242M         1.0
AM242          1.0
AM243          1.0
CM242          1.0
CM244          1.0
CM245          1.0
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX.IND., AIR RELEASE, 1/70 DOSE
 $INPUT NEXT=3, T2=70, $END
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, AIR RELEASE, 1/1 DOSE
 $INPUT T2=1, IPOP=1,
  HLDUP1(1)=5*14.,18.,4.,3*34.,
  CON(1)=15.,15.,117.,64.,80.,20.,230.,40.,30.,8.5,
  EXTIM=2920.,
 $END
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, AIR RELEASE, 1/70 DOSE
 $INPUT T2=70, $END
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX. IND., WATER RELEASE, 1/1 DOSE
 $INPUT IDEP=2, T2=1, IPOP=0, ISALT=0, CFLO=1.0, SW=0.2,
  RIRR(1)=150.,160.,5*150.,3*140.,150.,
  XC(1)=11*0.0,
  HLDUP1(1)=1.,1.,10.,10.,3*1.,2*15.,1.,
  CON(1)=30.,30.,182.,335.,88.,30.,274.,40.,40.,18.,
  EXTIM=4383., RM=1.0,
  KPTHWY(1)=1,5,6,7,8,
  USAGE(1)=40.,730.,500.,100.,100.,
  HLDUP2(1)=1.0,1.0,3*0.333,
  RM2(1)=5*1.0,
 $END
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, MAX. IND., WATER RELEASE, 1/70 DOSE
 $INPUT T2=70, $END
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, WATER RELEASE, 1/1 DOSE
 $INPUT IPOP=1, T2=1,
  HLDUP1(1)=5*14.,18.,4.,3*34.,
  CON(1)=15.,15.,117.,64.,80.,20.,230.,40.,30.,8.5,
  EXTIM=2920.,
  USAGE(1)=0.3,439.,17.,10.,5.,
 $END
ALLDOS/PABLM DOSE FACTOR CREATION- ACUTE, POPULATION, WATER RELEASE, 1/70 DOSE
 $INPUT T2=70, $END
ALLDOS/PABLM DOSE FACTOR CREATION, CHRONIC, MAX. IND., AIR RELEASE, 1/1 DOSE
 $INPUT I4C=0, IDEP=1, IPOP=0, PLIFE=30., T2=1,
  XC(1)=11*1.0,
  RIRR(1)=11*0.0,
  KPTHWY(1)=5*0,
  HLDUP1(1)=1.,1.,10.,10.,3*1.,2*15.,1.,
  CON(1)=30.,30.,182.,335.,88.,30.,274.,40.,40.,18.,
  EXTIM=4383.,
 $END
ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, MAX. IND., AIR RELEASE, 30/70 DOSE
 $INPUT T2=70, $END
ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, POPULATION, AIR RELEASE, 1/1 DOSE
 $INPUT IPOP=1, T2=1,
  HLDUP1(1)=5*14.,18.,4.,3*34.,
  CON(1)=15.,15.,117.,64.,80.,20.,230.,40.,30.,8.5,
  EXTIM=2920.,
 $END
ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, POPULATION, AIR RELEASE, 30/70 DOSE
 $INPUT T2=70, $END
ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, MAX. IND., WATER RELEASE, 1/1 DOSE
 $INPUT IPOP=0, T2=1, IDEP=2,
  XC(1)=11*0.0,
  RIRR(1)=150.,160.,5*150.,3*140.,150.,
  HLDUP1(1)=1.,1.,10.,10.,3*1.,2*15.,1.,
  CON(1)=30.,30.,182.,335.,88.,30.,274.,40.,40.,18.,
  EXTIM=4383.,
  KPTHWY(1)=1,5,6,7,8,
  USAGE(1)=40.,730.,500.,100.,100.,
 $END
ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, MAX. IND., WATER RELEASE, 30/70 DOSE
 $INPUT T2=70, $END
ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, POPULATION, WATER RELEASE, 1/1 DOSE
 $INPUT T2=1, IPOP=1,
```

FIGURE E.3-1. PABLM Sample Problem Input

```
 MLOUP1(1)=5*14.,19.,4.,3*34.,
 CON(1)=15.,15.,117.,64.,90.,20.,230.,40.,30.,8.5,
 EXTIM=2920.,
 USAGE(1)=0.3,438.,17.,10.,5.,
 $END
ALLDOS/PABLM DOSE FACTOR CREATION- CHRONIC, POPULATION, WATER RELEASE, 30/70 DOS
 $INPUT T2=70, $END
 END OF RUN
 $INPUT NEXT=4, $END
```

FIGURE E.3-1. PABLM Sample Problem Input

TABLE E.3-1 PABLM Sample Problem Input Parameters

A. Site Specific Exposure Pathway Parameters

Exposure Pathway	Growing Period (Days)	Yield (kg/m^2)	Translation Parameter	Irrigation Rate** (L/m^2/month)
Leafy vegetables	90	1.5	1.0	150
Other vegetables	60	0.7	0.1	160
Root vegetables	90	4.0	0.1	150
Orchard fruit	90	2.0	0.1	150
Grain	90	1.0	0.1	150
Eggs	90*	0.84*	0.1*	150*
Milk	30*	1.3*	1.0*	150*
Beef	90*	0.84*	0.1*	140*
Pork	90*	0.84*	0.1*	140*
Poultry	90*	0.84*	0.1*	140*

* Parameters for the feed and forage eaten by farm animals
** Used with liquid release pathways only

B. Site Specific Holdup and Consumption Rates

Exposure Pathways	Maximum Holdup (Days)	Individual Comsumption (kg/yr)	Average Holdup (Days)	Individual Consumption (kg/yr)
Leafy vegetables	1	30	14	15
Other vegetables	1	30	14	15
Root vegetables	10	182	14	117
Orchard fruit	10	335	14	64
Grain	1	88	14	80
Eggs	1	30	18	20
Milk	1	274	4	230
Beef	15	40	34	40
Pork	15	40	34	30
Poultry	1	18	34	8.5
Fish*	1	40	1	0.3
Drinking water*	1	730	1	438

* For liquid release analysis only.

C. Other Required Parameters

	Maximum Individual	Average Individual
Exposure to contaminated ground	4383 hr/yr	2920 hr/yr
Exposure to contaminated sediment	500 hr/yr	17 hr/yr
Swimming	100 hr/yr	10 hr/yr
Boating	100 hr/yr	5 hr/yr
X/Q'	1.0 sec/m^3	1.0 sec/m^3
River flow rate	1.0 ft^3/sec	1.0 ft^3/sec

The computer program PABLM determines daughter radionuclide buildup in the environment. As a result the output from PABLM may contain more radionuclides than the number supplied as input. For example the PABLM sample problem gives 64 radionuclides as input but 87 radionuclides are supplied in the output file (see Figure C.0-3). The 23 additional radionuclides give environmental dose conversion factors per initial unit activity of parent. When the daughter is in equilibrium with the parent the dose factor is appropriate when the equilibrium activity of the daughter is given as input to ALLDOS. However, these factors are not of the proper form for long lived daughters and should not be used. The sample problem output not be used. The sample problem output indicates some of these added radionuclides as unidentified "food library" radionuclides.

E.4 File 15 Sample Problem Inventory

To illustrate use of File 15 for radionuclide inventory specification a sample basic inventory library has been created. The title of the library is:

"ALLDOS Sample Problem Basic Inventory File"

This library contains two radionuclide inventory sets labeled:

"Decay for 1 year, Basic Inventory 1", and

"Decay for 5 years, Basic Inventory 2".

A listing of this data library is given in Figure E.4-1. Three radionuclide classes are defined for specification of release factors:

1. ^{3}H, ^{14}C and iodines
2. Fission and activation products
3. Actinides (including radionuclides ^{224}Ra and above)

These classes apply to specification of releases for all three release pathways (card type 4). The parameter NCL on card Type 3 sould be set to 3. The sample problem will use the second inventory set which is indicated by setting the parameter INV to 5 (= 3 + 2).

```
  2         ALLDOS SAMPLE PROBLEM BASIC INVENTORY FILE.
  1        H3,C14,I
  2        FP+AP
  3        ACTINIDES
 64        DECAY FOR 1 YEAR, BASIC INVENTORY 1.
H 3       1  1.79+004
C 14      1  1.74+003
CO60      2  6.20+004
NI59      2  2.48+003
NI63      2  3.05+005
SE79      2  1.01+003
SR90      2  6.26+007
Y 90      2  6.26+007
Y 91      2  1.65+005
ZR93      2  8.47+003
NB93M     2  4.20+002
ZR95      2  3.65+005
NB95M     2  7.75+003
NB95      2  7.83+005
TC99      2  3.76+004
RU106     2  6.95+006
RH106     2  6.95+006
PD107     2  7.92+001
AG110M    2  2.49+004
AG110     2  3.23+003
SN123     2  1.41+004
SB125     2  5.89+005
TE125M    2  2.41+005
SN126     2  8.69+001
SB126M    2  8.69+001
SB126     2  8.60+001
TE127M    2  2.00+004
TE127     2  1.98+004
I 129     1  5.89+001
CS134     2  3.20+004
CS135     2  1.97+002
CS137     2  2.28+007
BA137M    2  2.13+007
CE144     2  2.74+007
PR144     2  2.74+007
PM147     2  2.86+007
SM151     2  1.57+006
RA224     3  2.18+000
TH228     3  2.18+000
TH229     3  3.77-002
TH230     3  3.64-003
TH232     3  1.61+000
PA233     3  1.33+002
U 232     3  7.04+000
U 233     3  3.97+002
U 234     3  4.20+002
U 235     3  1.26+001
U 236     3  1.92-004
U 237     3  5.54+000
U 238     3  3.04+002
NP237     3  1.33+002
NP239     3  8.09+002
PU238     3  8.97+002
PU239     3  2.40+004
PU240     3  6.61+003
PU241     3  2.21+005
PU242     3  2.50+000
AM241     3  1.69+005
AM242M    3  1.24+003
AM242     3  1.24+003
AM243     3  8.09+002
CM242     3  1.01+005
CM244     3  1.58+004
CM245     3  1.20+000
 64        DECAY FOR 5  EARS, BASIC INVENTORY 2.
H 3       1  1.43+004
C 14      1  1.74+003
CO60      2  3.66+004
```

FIGURE E.4-1. File 15 Sample Basic Inventory

NI59	2	2.48+003
NI63	2	2.69+005
SE79	2	1.01+003
SR90	2	5.67+007
Y 90	2	5.67+007
Y 91	2	5.51-003
ZR93	2	8.47+003
NB93M	2	1.91+003
ZR95	2	6.31-002
NB95M	2	1.34-003
NB95	2	1.37-001
TC99	2	3.76+004
RU106	2	4.41+005
RH106	2	4.41+005
PD107	2	7.92+001
AG110M	2	4.55+002
AG110	2	5.92+001
SN123	2	4.29+000
SB125	2	2.12+005
TE125M	2	8.75+004
SN126	2	8.69+001
SB126M	2	8.69+001
SB126	2	8.60+001
TE127M	2	1.85+000
TE127	2	1.83+000
I 129	1	5.89+001
CS134	2	8.28+002
CS135	2	1.97+002
CS137	2	2.08+007
BA137M	2	1.95+007
CE144	2	7.75+005
PR144	2	7.75+005
PM147	2	9.93+006
SM151	2	1.52+006
RA224	3	6.14+000
TH228	3	6.14+000
TH229	3	1.89-001
TH230	3	1.82-002
TH232	3	1.61+000
PA233	3	1.34-002
U 232	3	6.77+000
U 233	3	3.97+002
U 234	3	4.20+002
U 235	3	1.25+001
U 236	3	9.59-004
U 237	3	4.60+000
U 238	3	3.04+002
NP237	3	1.343002
NP239	3	8.08+002
PU238	3	9.00+002
PU239	3	2.40+004
PU240	3	6.62+003
PU241	3	1.84+005
PU242	3	2.50+000
AM241	3	1.70+005
AM242M	3	1.21+003
AM242	3	1.21+003
AM243	3	8.08+002
CM242	3	9.98+002
CM244	3	1.35+004
CM245	3	1.20+000

FIGURE E.4-1. File 15 Sample Basic Inventory

PNL-3524
UC-11

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