Appendix F

NUCLEAR WASTE MANAGEMENT PROCEDURE Sandia National Laboratories	**Implementation Document Criteria**	**Form Number: NP 19-1-5** **Page 1 of 1**

1. **Software Name:** NUTS
2. **Software Version:** 2.05C
3. **Document Version:** 2.05C
4. **ERMS #:** 543407

Prior to sign-off of the ID, all items shall be appropriately addressed by the code sponsor so that "**Yes**" or "**N/A**" may be checked. Include this form as part of the ID.

5. Source Code		
• Is the source code provided?	☒ Yes	☐ N/A
• If applicable, is the change documentation in the source code clear and sufficient?	☐ Yes	☒ N/A
Note: If the source code is not controlled in a configuration management tool then a hardcopy of the source is required. (*Check "N/A" for commercially obtained software for which source code was not provided.*)		
6. Coding Standards Are the coding standards and conventions which were adhered to in the development of the software identified?	☒ Yes	☐ N/A
7. Coding Standards Implementation Does the source code adhere to the coding standards and conventions defined in the ID?	☒ Yes	☐ N/A
8. Executable Generation Was the executable generation process documented?	☒ Yes	☐ N/A
9. Implementation Requirements Was the code implemented according to the requirements of the RD and where applicable the DD?	☒ Yes	☐ N/A

Amy Gilkey **10. Code Team/Sponsor's Name** (*print*)	Amy Gilkey Signature	6/6/2006 Date
Sean Dunagan **11. Technical Reviewer's Name** (*print*)	Sean Dunagan Signature	6/6/2006 Date
Dave Kessel **12. Responsible Manager's Name** (*print*)	Dave Kessel Signature	6/6/06 Date
Jennifer Long **13. SCM Coordinator's Name** (*print*)	Jennifer Long Signature	6/6/06 Date

Key for check boxes above:

Check **Yes** for each item reviewed and found acceptable
Check **N/A** for items not applicable

WIPP PA

IMPLEMENTATION DOCUMENT

for

NUTS Version 2.05C

Document Version 2.05C

ERMS #543407

May 24, 2006

TABLE OF CONTENTS

1.0 INTRODUCTION

This document records the creation of the executable for NUTS Version 2.05C. This code is used by the Sandia National Laboratories' Performance Assessment (PA) in support of the performance assessment calculations for the Waste Isolation Pilot Plant (WIPP). Using the information contained in this document, qualified personnel can rebuild the executable for NUTS on the existing platform or install it on a similar platform.

1.1 Software Identifier

Code Name:	NUTS
Version:	2.05C
WIPP Prefix:	NUT
CMS Library:	NUT (WP$CMSROOT:[NUT])
CMS Class:	QA0205C
Executable:	NUTS_QA0205C.EXE
Executable Identification:	"P QA0205C 2.05C"
Link Date/Time:	24-MAY-2006 12:52:14.61
Executable Size:	2366 blocks
Platform:	OpenVMS V8.2 hp AlphaServer ES47 7/1150 (node GNR)
Compiler:	HP Fortran V8.0-104655-48F7C
Linker Identification:	A13-03

1.2 Points of Contact

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2.0 SOURCE INFORMATION

This section provides the source code and subroutine-call hierarchy for NUTS.

2.1 Source Code for NUTS

The source code for NUTS is stored in the Software Configuration Management System (SCMS) in class QA0205C of CMS library NUT.

The source code for NUTS includes the listed routines, contained in order in the following FORTRAN source files:

```
NUT_CDBLIB.FOR:
      SUBROUTINE CDB_OPENFILES
      SUBROUTINE CDB_HEADER
      SUBROUTINE INITIALIZE_CDB
      Subroutine CDBOATTR
      Subroutine CDBOVAR
      REAL FUNCTION CDBPROP
      Subroutine CDB_READ
      SUBROUTINE CDB_MAP
      SUBROUTINE CDB_VARNAMES
      SUBROUTINE CDB_WRITE
NUT_LIB.FOR:
      SUBROUTINE NUTS_STOP
      SUBROUTINE BIN_READ
      SUBROUTINE BIN_WRITE
      SUBROUTINE INOUTFIL
      SUBROUTINE FILE_OPEN
      SUBROUTINE VAX_TIME
NUT_MAIN.FOR:
      PROGRAM NUTS
      SUBROUTINE ADSORP
      SUBROUTINE AREA_INTERFACE
      SUBROUTINE ARRAY13D
      SUBROUTINE ARRAY23D
      SUBROUTINE ASC_WRITE
      SUBROUTINE BANDIT
      SUBROUTINE BONDRY
      SUBROUTINE CONC_MATRIX
      SUBROUTINE CONCMB
      SUBROUTINE CONVERT
      SUBROUTINE CONVTEST
      SUBROUTINE HETRO_CONVTEST
      SUBROUTINE DEBUGSUB
      SUBROUTINE DECAYSOURCE
      SUBROUTINE DECAY_SUM
      SUBROUTINE DSPRSN1
      SUBROUTINE DSPRSN2
      SUBROUTINE DSPRSNMF
      BLOCK DATA UNITSNO
      BLOCK DATA SOMECONST
      SUBROUTINE FLUX1
      SUBROUTINE FLUX2
```

```
SUBROUTINE FLUX3
SUBROUTINE INITIALIZATION
SUBROUTINE OMEGA
SUBROUTINE OMEGAMF
SUBROUTINE ONED3DINDEX
SUBROUTINE OPTIM_DIMENSION
SUBROUTINE PRCIPDCY
SUBROUTINE PRECIPITATE
SUBROUTINE READ_RAD
SUBROUTINE MAT_MAP
SUBROUTINE PHYSPROP
SUBROUTINE ADS_INPUT
SUBROUTINE MATDSP_INPUT
SUBROUTINE FRCDSP_INPUT
SUBROUTINE COMPMOL_DIFFUSION
SUBROUTINE ROCK_DENSITY_INPUT
SUBROUTINE WASTE_MATRIX_INPUT
SUBROUTINE SOURCE_INPUT
SUBROUTINE READ_PROP
SUBROUTINE READ_2D_PROP
SUBROUTINE SOLUBILITYF
SUBROUTINE TCONVERT
SUBROUTINE CONV3DTO1D
SUBROUTINE UPDATE
SUBROUTINE VELAVG
SUBROUTINE ZERO1D
SUBROUTINE ZERO2D
SUBROUTINE ZERO3D
SUBROUTINE CURIES_VALUES
SUBROUTINE XYZCOORD
SUBROUTINE STOTALMAS
SUBROUTINE NTOTALMAS
SUBROUTINE CNTOTALMAS
BLOCK DATA VARDESCRPTN
SUBROUTINE BWR13D
SUBROUTINE BWR23D
SUBROUTINE BWR33D
SUBROUTINE AWR13D
SUBROUTINE AWR23D
SUBROUTINE AWR33D
SUBROUTINE CORSOLUBILITY
REAL*8 FUNCTION CORSOL
SUBROUTINE MOLDIFTEMP
SUBROUTINE SW1_CONC_MATRIX
SUBROUTINE SW2_CONC_MATRIX
SUBROUTINE ISOTOPID
SUBROUTINE CONCURIES
SUBROUTINE DECAYCONSTANT
SUBROUTINE COMPSLID
SUBROUTINE FLAG
SUBROUTINE SITE_FLAG
SUBROUTINE MATADS_FLAG
SUBROUTINE FRCADS_FLAG
SUBROUTINE KDTEMPDEP_FLAG
SUBROUTINE MATDSP_FLAG
SUBROUTINE FRCDSP_FLAG
SUBROUTINE MATFRCDSP_FLAG
SUBROUTINE MOLDIFTEMDEP_FLAG
SUBROUTINE MATSRC_FLAG
SUBROUTINE FRCSRC_FLAG
```

```
SUBROUTINE  MATPRINT_FLAG
SUBROUTINE  FRCPRINT_FLAG
SUBROUTINE  PRNTFREQ_FLAG
SUBROUTINE  EXTSRC_FLAG
SUBROUTINE ZEROLIMIT
SUBROUTINE INTRUSION_TIME_SUB
SUBROUTINE SNKSRC
SUBROUTINE TRUNCATE
SUBROUTINE MBMAS
SUBROUTINE BLOCKMAS
SUBROUTINE BRAGCONV
SUBROUTINE RENAMECOMP
SUBROUTINE MASSCURIES
SUBROUTINE CONTINUUM
SUBROUTINE PROP_SWITCH
SUBROUTINE UNITCONVERT
SUBROUTINE PRGM_INFORM
SUBROUTINE PRNT_INFORM
SUBROUTINE INBRAG_BIN_WRITE
SUBROUTINE BOUNDJM1_FLUX
SUBROUTINE BOUNDJM2_FLUX
SUBROUTINE BOUNDJM3_FLUX
SUBROUTINE BOUNDJM4_FLUX
SUBROUTINE CONDENSATION
SUBROUTINE SRCMOD_YTOTVEL
SUBROUTINE TIME_PRECIP
SUBROUTINE IND_INTERPOLATE
SUBROUTINE IND_EQUAL_INTERPOLATE
SUBROUTINE STEPWISE_INTERPOLATE
SUBROUTINE SOLB_INTERPOLATE
SUBROUTINE AWRNG13D
SUBROUTINE RANGE13D
SUBROUTINE RANGE23D
SUBROUTINE AWRNG23D
SUBROUTINE RASC_WRITE
SUBROUTINE DSPRSN3
SUBROUTINE BRAG_INPUT_CHECK
SUBROUTINE TEST_INPUT_CHECK
SUBROUTINE NUTSG_INPUT_CHECK
SUBROUTINE NUTSM_INPUT_CHECK
SUBROUTINE NUTSF_INPUT_CHECK
SUBROUTINE INITF_CONC_MAN
SUBROUTINE INITM_CONC_MAN
SUBROUTINE CDB_INITM_CONC_FLAG
SUBROUTINE CONC_INIT_INPUT
SUBROUTINE RESET_INTRUSION_TIME
SUBROUTINE IND1D_INTERPOLATE
SUBROUTINE STEPWISE1D_INTERPOLATE
SUBROUTINE IND1D_EQUAL_INTERPOLATE
SUBROUTINE SCALEUP_COLLOID
SUBROUTINE SCALE_FACT_COLLOID_INPUT
SUBROUTINE SOILBASECON
SUBROUTINE CONC_CHECK
SUBROUTINE CONCMB2
SUBROUTINE RHSEXCONT
SUBROUTINE CRANK1
SUBROUTINE FIRST_CRANK2
SUBROUTINE SECOND_CRANK2
SUBROUTINE TIMESOURCE
REAL*8 FUNCTION GHAT
```

```
SUBROUTINE BOUNDJM5_FLUX
SUBROUTINE FLUXADJUST
SUBROUTINE REALCONV
SUBROUTINE PRC_CONVERGENCE
SUBROUTINE IMPPRSRC1
SUBROUTINE IMPPRSRC2
SUBROUTINE SRC_RHSADJ
SUBROUTINE MRHSADJ
SUBROUTINE GRID_WITH_PRECIP
SUBROUTINE DISSOLVED_MASS
SUBROUTINE DECAY_SUM_IM
SUBROUTINE ALONEDECAY
SUBROUTINE OLDCONCDCY
SUBROUTINE IMP_PRECIP
```

The source code for NUTS also includes the following FORTRAN INCLUDE files:

```
NUT_CDBXFER.INC
NUT_COMMON.INC
NUT_PARAM.INC
NUT_QA.INC
```

2.2 Subroutine-Call Hierarchy for NUTS

A subroutine-call hierarchy is output by the Software Coverage Analyzer (SCA) that is run as part of the process of building the executable. This hierarchy, listed below, is stored in the SCMS as file NUT_CALLTREE_QA0205C.TXT in class QA0205C of CMS library NUT.

```
NUTS procedure calls
   ADSORP routine calls
   .  DEBUGSUB routine calls
   .  .  AWR13D routine calls
   .  .  .  ARRAY13D routine
   .  .  AWR23D routine calls
   .  .     ARRAY23D routine
   .  DEXP function
   .  ZERO2D routine
   ALONEDECAY routine calls
   .  DEXP function  (See above)
   ASC_WRITE routine calls
   .  AWR13D routine  (See above)
   .  AWR23D routine  (See above)
   .  AWR33D routine
   .  DEBUGSUB routine  (See above)
   .  REALCONV routine
   .  TRUNCATE routine calls
   .  .  INDEX function
   .  .  LEN function
   .  .  MIN0 function
   .  XYZCOORD routine
   BANDIT routine calls
   .  MIN0 function  (See above)
   BIN_WRITE routine calls
   .  CDB_WRITE routine calls
   .     ABS function
```

```
.     CDBOVAR routine calls
.     . DBOVAR routine
.     . SNGL function
.     CDB_HEADER routine calls
.     . CDBOATTR routine calls
.     . . DBOATTR routine
.     . . SNGL function  (See above)
.     . CDB_VARNAMES routine calls
.     . . DBOVRNAM routine
.     . . STRPACK routine
.     . DBOHEAD routine
.     . DBOINFO routine
.     . DFLOAT function
.     . SNGL function  (See above)
.     . STRPACK routine  (See above)
.     DBISTEP routine
.     DBOSTEP routine
.     DBOTIME routine
.     DBOVAR routine  (See above)
.     DEBUGSUB routine  (See above)
.     SNGL function  (See above)
.     STRPACK routine  (See above)
BLOCKMAS routine calls
.  DEBUGSUB routine  (See above)
.  ZERO2D routine  (See above)
BOUNDJM1_FLUX routine calls
.  DSIGN function
.  INT function
.  ZERO2D routine  (See above)
BOUNDJM2_FLUX routine calls
.  DSIGN function  (See above)
.  INT function  (See above)
.  ZERO2D routine  (See above)
BOUNDJM3_FLUX routine
BOUNDJM4_FLUX routine
BOUNDJM5_FLUX routine calls
.  DSIGN function  (See above)
.  INT function  (See above)
.  ZERO2D routine  (See above)
COMPSLID routine calls
.  RENAMECOMP routine
CONCMB routine calls
.  DABS function
.  DMAX1 function
.  ZERO1D routine
.  ZERO2D routine  (See above)
CONCMB2 routine calls
.  DABS function  (See above)
.  DMAX1 function  (See above)
.  ZERO1D routine  (See above)
.  ZERO2D routine  (See above)
CONCURIES routine
CONC_CHECK routine
CONC_MATRIX routine calls
.  DEBUGSUB routine  (See above)
.  MRHSADJ routine
.  SRC_RHSADJ routine
.  SW1_CONC_MATRIX routine calls
.  .  DEBUGSUB routine  (See above)
.  .  ZERO2D routine  (See above)
```

```
.  SW2_CONC_MATRIX routine calls
.  .  DEBUGSUB routine  (See above)
.  .  ZERO2D routine  (See above)
.  ZERO1D routine  (See above)
.  ZERO2D routine  (See above)
CONDENSATION routine calls
.  ZERO2D routine  (See above)
CONVERT routine calls
.  AREA_INTERFACE routine
.  BIN_READ routine calls
.  .  CDB_READ routine calls
.  .     CDB_MAP routine calls
.  .     .  MOD function
.  .     DBISTEP routine  (See above)
.  .     DBIVAR routine
.  .     DBLE function
.  .     INITIALIZE_CDB routine calls
.  .     .  CDBPROP routine calls
.  .     .  .  DBIPROP routine
.  .     .  .  ISTRFIND routine
.  .     .  CDB_MAP routine  (See above)
.  .     .  DBIATTR routine
.  .     .  DBIELBLK routine
.  .     .  DBIINFO routine
.  .     .  DBIMAP routine
.  .     .  DBINELB routine
.  .     .  DBINVAR routine
.  .     .  DBIPROP routine  (See above)
.  .     .  DBIQAREC routine
.  .     .  DBISIZES routine
.  .     .  DBITITLE routine
.  .     .  DBLE function  (See above)
.  .     .  DBOQAREC routine
.  .     .  DBOTITLE routine
.  .     .  EXDATE routine
.  .     .  EXTIME routine
.  .     .  INDEX function  (See above)
.  .     .  ISTRLEN routine
.  .     .  MAT_MAP routine calls
.  .     .  .  MAX function
.  .     .  MAX function  (See above)
.  .     .  QAABORT routine
.  .     .  XYZCOORD routine  (See above)
.  .     STRPACK routine  (See above)
.  BONDRY routine calls
.  .  INT function  (See above)
.  .  MOD function  (See above)
.  BRAG_INPUT_CHECK routine calls
.  .  ABS function  (See above)
.  .  INDEX function  (See above)
.  CONV3DTO1D routine
.  DEBUGSUB routine  (See above)
.  DEXP function  (See above)
.  OPTIM_DIMENSION routine calls
.  .  CHAR function
.  .  INDEX function  (See above)
.  .  MAX0 function
.  ZERO1D routine  (See above)
CONVTEST routine calls
.  AREA_INTERFACE routine  (See above)
```

```
.  BONDRY routine  (See above)
.  DEBUGSUB routine  (See above)
.  OPTIM_DIMENSION routine  (See above)
.  ZERO1D routine  (See above)
CORSOLUBILITY routine calls
.  CORSOL routine calls
.  .  DEXP function  (See above)
.  .  DLOG function
.  DEBUGSUB routine  (See above)
CRANK1 routine
DEBUGSUB routine  (See above)
DECAYCONSTANT routine calls
.  DLOG function  (See above)
DECAYSOURCE routine calls
.  DEBUGSUB routine  (See above)
DECAY_SUM routine calls
.  DEBUGSUB routine  (See above)
DECAY_SUM_IM routine
DISSOLVED_MASS routine
DSPRSN1 routine calls
.  DEBUGSUB routine  (See above)
.  DSPRSN2 routine calls
.  .  SQRT function
.  .  VELAVG routine calls
.  .     DABS function  (See above)
.  ZERO2D routine  (See above)
DSPRSN3 routine
DSPRSNMF routine calls
.  DABS function  (See above)
.  DEBUGSUB routine  (See above)
.  ZERO2D routine  (See above)
FILE_OPEN routine
FIRST_CRANK2 routine
FLUX1 routine calls
.  DEBUGSUB routine  (See above)
.  ZERO1D routine  (See above)
FLUX2 routine calls
.  DEBUGSUB routine  (See above)
.  ZERO1D routine  (See above)
FLUX3 routine calls
.  DEBUGSUB routine  (See above)
.  ZERO1D routine  (See above)
FLUXADJUST routine
GHAT routine calls
.  MAX function  (See above)
GRID_WITH_PRECIP routine
HETRO_CONVTEST routine calls
.  AREA_INTERFACE routine  (See above)
.  BONDRY routine  (See above)
.  CONV3DTO1D routine  (See above)
.  OPTIM_DIMENSION routine  (See above)
.  ZERO1D routine  (See above)
IMPPRSRC1 routine calls
.  ZERO1D routine  (See above)
IMPPRSRC2 routine calls
.  SOLUBILITYF routine calls
.  .  DEBUGSUB routine  (See above)
.  .  ZERO2D routine  (See above)
.  ZERO1D routine  (See above)
IMP_PRECIP routine
```

```
INBRAG_BIN_WRITE routine calls
.  BWR13D routine calls
.  .  ARRAY13D routine  (See above)
.  BWR23D routine calls
.  .  ARRAY23D routine  (See above)
.  REAL function
INITIALIZATION routine calls
.  BLOCKMAS routine  (See above)
.  CONV3DTO1D routine  (See above)
.  CORSOLUBILITY routine  (See above)
.  DEBUGSUB routine  (See above)
.  IND1D_EQUAL_INTERPOLATE routine calls
.  .  DMIN1 function
.  IND_EQUAL_INTERPOLATE routine calls
.  .  DMIN1 function  (See above)
.  PRECIPITATE routine calls
.  .  DEBUGSUB routine  (See above)
.  .  SOLUBILITYF routine  (See above)
.  .  ZERO2D routine  (See above)
.  SOLB_INTERPOLATE routine calls
.  .  IND1D_INTERPOLATE routine
.  .  IND_INTERPOLATE routine
.  .  STEPWISE1D_INTERPOLATE routine
.  .  STEPWISE_INTERPOLATE routine
.  .  ZERO2D routine  (See above)
.  TIME_PRECIP routine calls
.  .  ZERO2D routine  (See above)
.  ZERO1D routine  (See above)
.  ZERO2D routine  (See above)
INOUTFIL routine calls
.  CDB_OPENFILES routine calls
.     CONTINUUM routine
.     DBERRUNI routine
.     DBIOPEN routine
.     DBOOPEN routine
.     DBSETUP routine
.     FILCMDLIN routine
.     FILDFNAM routine
.     FILOPEN routine
.     FILPARSE routine
.     FILRDNAMS routine
.     FILWRNAMS routine
.     FLAG routine calls
.     .  CDB_INITM_CONC_FLAG routine
.     .  EXTSRC_FLAG routine
.     .  FRCADS_FLAG routine
.     .  FRCDSP_FLAG routine
.     .  FRCPRINT_FLAG routine
.     .  FRCSRC_FLAG routine
.     .  INITF_CONC_MAN routine
.     .  INITM_CONC_MAN routine
.     .  KDTEMPDEP_FLAG routine
.     .  MATADS_FLAG routine
.     .  MATDSP_FLAG routine
.     .  MATFRCDSP_FLAG routine
.     .  MATPRINT_FLAG routine
.     .  MATSRC_FLAG routine
.     .  MOLDIFTEMDEP_FLAG routine
.     .  PRNTFREQ_FLAG routine
.     .  SITE_FLAG routine
```

```
.      .  ZEROLIMIT routine
.      INDEX function  (See above)
.      IQAERRUNI routine
.      ISTRLEN routine  (See above)
.      MCINIT routine
.      MDINIT routine
.      QAABORT routine  (See above)
.      QABANNER routine
.      QADOEDIS routine
.      QAPAGE routine
.      QASETUP routine
.      RENAMECOMP routine  (See above)
.      STRPACK routine  (See above)
.      STRUPCASE routine
ISOTOPID routine calls
.  RENAMECOMP routine  (See above)
MASSCURIES routine calls
.  CNTOTALMAS routine calls
.  .  DEBUGSUB routine  (See above)
.  .  ZERO1D routine  (See above)
.  CURIES_VALUES routine calls
.  .  DEBUGSUB routine  (See above)
.  NTOTALMAS routine calls
.  .  DEBUGSUB routine  (See above)
.  .  ZERO1D routine  (See above)
.  STOTALMAS routine calls
.      DEBUGSUB routine  (See above)
.      ZERO2D routine  (See above)
MBMAS routine calls
.  DEBUGSUB routine  (See above)
MOD function  (See above)
MOLDIFTEMP routine
OLDCONCDCY routine
OMEGA routine calls
.  DEBUGSUB routine  (See above)
.  DSIGN function  (See above)
.  INT function  (See above)
OMEGAMF routine calls
.  DEBUGSUB routine  (See above)
.  DSIGN function  (See above)
.  INT function  (See above)
ONED3DINDEX routine calls
.  DEBUGSUB routine  (See above)
PRCIPDCY routine calls
.  DEBUGSUB routine  (See above)
PRC_CONVERGENCE routine calls
.  DABS function  (See above)
PRECIPITATE routine  (See above)
PRGM_INFORM routine calls
.  VAX_TIME routine calls
.      DBLE function  (See above)
.      DMOD function
.      EXCPUS routine
.      EXDATE routine  (See above)
.      EXTIME routine  (See above)
.      INT function  (See above)
PRNT_INFORM routine calls
.  RENAMECOMP routine  (See above)
.  TRUNCATE routine  (See above)
PROP_SWITCH routine calls
```

```
.  CONV3DTO1D routine  (See above)
.  ZERO1D routine  (See above)
RASC_WRITE routine calls
.  AWRNG13D routine calls
.  .  RANGE13D routine
.  .  REAL function  (See above)
.  AWRNG23D routine calls
.     RANGE23D routine
READ_RAD routine
RENAMECOMP routine  (See above)
RESET_INTRUSION_TIME routine calls
.  BIN_READ routine  (See above)
.  BLOCKMAS routine  (See above)
.  BRAG_INPUT_CHECK routine  (See above)
.  CONV3DTO1D routine  (See above)
.  DEXP function  (See above)
.  PRECIPITATE routine  (See above)
.  SOLB_INTERPOLATE routine  (See above)
.  TIME_PRECIP routine  (See above)
.  ZERO1D routine  (See above)
RHSEXCONT routine
SCALEUP_COLLOID routine
SECOND_CRANK2 routine
SNKSRC routine calls
.  DEBUGSUB routine  (See above)
SOILBASECON routine
SOLB_INTERPOLATE routine  (See above)
SOLUBILITYF routine  (See above)
TCONVERT routine calls
.  ASC_WRITE routine  (See above)
.  BIN_READ routine  (See above)
.  BRAG_INPUT_CHECK routine  (See above)
.  CONV3DTO1D routine  (See above)
.  DEXP function  (See above)
.  VAX_TIME routine  (See above)
.  ZERO1D routine  (See above)
TEST_INPUT_CHECK routine calls
.  ABS function  (See above)
.  INDEX function  (See above)
.  LEN function  (See above)
TIME_PRECIP routine  (See above)
UNITCONVERT routine calls
.  ZERO1D routine  (See above)
UPDATE routine
VAX_TIME routine  (See above)
ZERO2D routine  (See above)
```

Note: The notation "(See above)" that follows some routines and/or functions means that the indicated routine/function appears earlier in the call tree. If an expansion of the call tree is associated with that routine/function, the expansion is presented only with its first occurrence.

All routines listed in Section 2.1 should be listed in the subroutine-call hierarchy, with the exception of routines that are never referenced. A list of routines that are never referenced is output by SCA. This list, summarized below, is stored in the SCMS as file NUT_SCA_MOD_NOT_REF_QA0205C.TXT in class QA0205C of CMS library NUT. SCA identified the following routines as never referenced:

```
ADS_INPUT procedure
BRAGCONV procedure
BWR33D procedure
COMPMOL_DIFFUSION procedure
CONC_INIT_INPUT procedure
FRCDSP_INPUT procedure
INTRUSION_TIME_SUB procedure
MATDSP_INPUT procedure
NUTSF_INPUT_CHECK procedure
NUTSG_INPUT_CHECK procedure
NUTSM_INPUT_CHECK procedure
NUTS_STOP procedure
PHYSPROP procedure
ROCK_DENSITY_INPUT procedure
SCALE_FACT_COLLOID_INPUT procedure
SOURCE_INPUT procedure
SRCMOD_YTOTVEL procedure
TIMESOURCE procedure
WASTE_MATRIX_INPUT procedure
```

The subroutine-call hierarchy includes routines that are not listed in Section 2.1, as follows.

- Intrinsic FORTRAN functions that are called from NUTS are included in the hierarchy. They are identified as "functions" rather than "routines".

- WIPP PA standard library routines that are called from NUTS are included in the hierarchy. The source code for these libraries (described in Section 2.3) can be found in the related Implementation Documents, which are on file in the Sandia WIPP Central Files. CAMDAT_LIB [1] routines begin with "DB". CAMCON_LIB [2] routines begin with "QA", "IQA", "FF", "FIL", "FE", "STR", or "ISTR". CAMSUPES_LIB [3] routines begin with "EX", "IX", "MD", or "MC".

2.3 Coding Standards and Conventions

Formal software standards were not invoked in developing this software. However, by convention, WIPP PA software that is written in FORTRAN to run on the Compaq Alpha should use software libraries to perform specific functions. Each library is documented in the related User's Manual, which is on file in the Sandia WIPP Central Files. NUTS uses three of these libraries:

- CAMDAT_LIB [4] reads and writes information to CAMDAT files.

- CAMCON_LIB [5] provides general-use functions, such as the display of standardized output and the free-field parsing of input.

- CAMSUPES_LIB [6] provides machine-dependent functions, especially dynamic memory manipulation.

3.0 GENERATION OF EXECUTABLE

This section provides the necessary files for generating the executable for this version of NUTS. This process is referred to as a "build". For step-by-step instructions regarding how the build is accomplished, please consult the WIPP PA SCMS Plan [7]. See the SCMS Build Consultant for more information.

3.1 Build Script

The build script is invoked to generate the executable for NUTS. The build script is stored in the SCMS as file WP_BUILD.COM in class QA0205C of CMS library WP. For the NUTS build described in this document, WP_BUILD.COM was invoked as follows:

```
$ @WP_BUILD
Code Prefix : NUT
Build type (P=prod, T=test, D=local) : P
Class name (blank for latest generations) : QA0205C
Build for SCA? (Y or N) [N] : Y
```

Note that SCA (described in Section 2.2) is run as part of the build.

3.2 Build Data File

The build script reads certain code-specific parameters, such as the compile options and the code version number, from a build data file. The build data file is stored in the SCMS as file WP_BUILD.DAT in class QA0205C of CMS library WP. The following portion of the file is specific to NUTS:

```
NUT       1NUTS                                NUT
NUT       2/obj=wp_olb:/list/show=include/separate/assume=dummy
NUT       32.05C                               CDB-NUTS
```

3.3 Compile and Link Commands for NUTS Build

The Module Management System (MMS) is invoked by the build script to compile and link NUTS. The MMS description file defines MMS actions and dependencies for NUTS. It is stored in the SCMS as file NUT.MMS in class QA0205C of CMS library NUT.

The default MMS rules that apply to all WIPP builds are stored in the SCMS as file WP_MMS$DEFAULT_RULES.MMS in class QA0205C of CMS library WP.

3.4 Log Files from NUTS Build

The log files from the NUTS build are stored in the SCMS as files NUT_BUILD_QA0205C.LOG and NUT_MMS_QA0205C.LOG in class QA0205C of CMS library NUT.

3.5 PCA Build

Verification and validation of NUTS may involve coverage testing using the Performance Coverage Analyzer (PCA). PCA output is used to identify modules that are not exercised by the test set. To run PCA, a unique PCA executable must be generated.

The PCA executable, NUTS_TEST_PCA_QA0205C.EXE, can be generated using the build script described in Section 3.1. To build the PCA executable, WP_BUILD.COM would be invoked as follows:

```
$ @WP_BUILD
Code Prefix : NUT
Build type (P=prod, T=test, D=local) : T
Class name (blank for latest generations) : QA0205C
Build from CMS sources? (Y or N) [N] : Y
Build for SCA? (Y or N) [N] : N
Build for PCA? (Y or N) [N] : Y
```

4.0 REFERENCES

1. WIPP PA (Performance Assessment). 2006. Implementation Document for CAMDAT_LIB Version 1.26. Sandia National Laboratories. Sandia WIPP Central Files ERMS #543021.

2. WIPP PA (Performance Assessment). 2006. Implementation Document for CAMCON_LIB Version 2.21. Sandia National Laboratories. Sandia WIPP Central Files ERMS #543029.

3. WIPP PA (Performance Assessment). 2006. Implementation Document for CAMSUPES_LIB Version 2.23. Sandia National Laboratories. Sandia WIPP Central Files ERMS #543023.

4. WIPP PA (Performance Assessment). 1995. User's Manual for CAMDAT_LIB Version 1.22. Sandia National Laboratories. Sandia WIPP Central Files ERMS #227727.

5. WIPP PA (Performance Assessment). 1995. User's Manual for CAMCON_LIB Version 2.16. Sandia National Laboratories. Sandia WIPP Central Files ERMS #227738.

6. WIPP PA (Performance Assessment). 1995. User's Manual for CAMSUPES_LIB Version 2.18. Sandia National Laboratories. Sandia WIPP Central Files ERMS #227745.

7. Long, J. 2003. WIPP Performance Assessment (PA) Software Configuration Management System (SCMS) Plan, Revision 2. Sandia National Laboratories. Sandia WIPP Central Files ERMS #524707.