SOFTWARE RELEASE NOTICE

1. SRN Number: SRN-PA-303

2. Project Title: TSPA & Technical Integration Code	Project No. 20.06002.01.113
3. SRN Title: TPA Version 5.0r	
4. Originator/Requestor: Gordon Wittmeyer	Date: 11/19/03

5. Summary of Actions

- ☐ Release of new software
- ☐ Change of access software
- ■ Release of modified software:
  - ☐ Enhancements made
  - ■ Corrections made
- ☐ Software Retirement

6. Validation Status

- ■ Validated
- ☐ Limited Validation
- ☐ Not Validated Explain: _____

7. Persons Authorized Access

Name	Read Only/Read-Write	Addition/Change/Delete
Sitakanta Mohanty	RW	
Ron Janetzke	RW	
David Esh (NRC)	RW	
Tim McCartin (NRC)	RW	
Chris Grossman (NRC)	RW	
Others (NRC/CNWRA)	RO	

8. Element Manager Approval: Gordon Wittmeyer Date: 11/24/2003

9. Remarks: An 8mm tape containing FORTRAN source code for the TPA Version 5.0r code.

CNWRA Form TOP-6 (09/01)

SOFTWARE SUMMARY FORM

01. Summary Date: 11/19/03	02. Summary prepared by (Name and phone): Ron Janetzke (210) 522-3318	03. Summary Action: Modified
04. Software Date: 11/19/03	05. Short Title: TPA Version 5.0r	
06. Software Title: TPA - System Performance Assessment Computer Code, Version 5.0		07. Internal Software ID: None

08. Software Type: ☐ Automated Data System ■ Computer Program ☐ Subroutine/Module	09. Processing Mode: ☐ Interactive ■ Batch ☐ Combination	10. Application Area: a. General: ☐ Scientific/Engineering ☐ Auxiliary Analyses ■ Total System PA ☐ Subsystem PA ☐ Other b. Specific:
11. Submitting Organization and Address: CNWRA/SwRI 6220 Culebra Road San Antonio, TX 78228		12. Technical Contact(s) and Phone: Ronald Janetzke (210) 522-3318

13. Software Application: The TPA Code consists of the following modules: UZFLOW, NFENV, EBSREL, UZFT, SZFT, DCAGW, FAULTO, SEISMO2, VOLCANO, ASHPLUMO, ASHRMVO, DCAGS, SNLLHS, EXEC, DSFAIL, MECHFAIL

14. Computer Platform: SUN Workstation PC	15. Computer Operating System: Solaris 5.8	16. Programming Language(s): SUN FORTRAN 77 V4.2	17. Number of Source Program Statements: Approx. 56,000 lines w/o stand alone codes
18. Computer Memory Requirements: 165 Mb	19. Tape Drives: None	20. Disk Units: N/A	21. Graphics: N/A

22. Other Operational Requirements:

Uses system environment variables: TPA_TEST and TPA_DATA.

23. Software Availability: ■ Available ☐ Limited ☐ In-House ONLY	24. Documentation Availability: ☐ Available ☐ Preliminary ■ In-House ONLY

25.

Software Developer: Ron Janetzke Date: 11-19-03

CNWRA Form TOP-4-1 (05/98)

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
QA VERIFICATION REPORT
FOR
→DEVELOPED OR ACQUIRED TO BE MODIFIED SOFTWARE←

Software Title/Name: TPA
Version: 5.0.r
Demonstration workstation: Scratchy 1
Operating System: Solaris 5.9
Developer: R. Janetzke/S. Mohanty

Software Requirements Description (SRD) [TOP-018, Section 5.3]

SRD Version: 5.0
SRD Approval Date: 12/7/01

SRD and any changes thereto reviewed in accordance with QAP-002 requirements?

Yes: ☑ No: ☐ N/A: ☐

Is a Software Change Report(s) (SCR) used for minor modifications (i.e., acquired code), problems or changes to a configured version of software?

Yes: ☐ No: ☐ N/A: ☑

Comments: This is a minor change and SCRs were used to manage and test the changes.

Software Development Plan (SDP) [TOP-018, Section 5.4]

SDP Version: 5.0
SDP (EM) Approval Date: 4/9/02

The SDP addresses applicable sections of TOP-018, Appendix B, SDP Template?

Yes: ☑ No: ☐ N/A: ☐

Is the waiver (if used) in accordance with specified guidelines?

Yes: ☐ No: ☐ N/A: ☑

Comments:

Design and Development [TOP-018, Section 5.5.1 - 5.5.4]

Is code development in accordance with the conventions (i.e., coding conventions)described in the SDP/SCR?

Yes: ☑ No: ☐ N/A: ☐

Module(s) Reviewed: Fortran 77

Comments: dcags; fashromova; ebsrel.f

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Is code internally documented to allow a user to understand the function(s) being performed and to follow the flow of execution of individual routines?

Yes: ☑ No: ☐ N/A: ☐

Module(s) Reviewed:

Comments:

Is development of the code and informal module/subroutine-level testing documented in scientific notebook and/or SCR?

Yes: ☑ No: ☐ N/A: ☐

SCR's and/or Scientific Notebook(s) Reviewed: 472 and 475 apply to this version.

Comments:

Software designed so that individual runs are uniquely identified by date, time, name of software and version?

Yes: ☑ No: ☐ N/A: ☐

Date and Time Displayed: Yes

Name/Version Displayed: Yes

Comments:

Medium and Header Documentation [TOP-018, Section 5.5.6]

A program title block of main program contains: Program Title, Customer Name, Customer Office/Division, Customer Contact(s), Customer Phone Number, Associated Documentation, Software Developer and Phone Number, Date, and Disclaimer Notice?

Yes: ☑ No: ☐ N/A: ☐

Comments: Execute and 2 modules were checked

Source code module headers contain: Program Name, Client Name, Contract reference, Revision Number, Revision History, and Reference to SRD/SCR requirement(s)?

Yes: ☑ No: ☐ N/A: ☐

Module(s) Reviewed: Execute and dcaqs, ashromovo

Comments:

The physical labeling of software medium (tapes, disks, etc.) contains: Program Name, Module/Name/Title, Module Revision, File type (ASCII, OBJ, EXE), Recording Date, and Operating System(s)?

Yes: ☑ No: ☐ N/A: ☐

Comments: 8 mm tape

Code Reviews [TOP-018, Section 5.5.6]

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Are code reviews (if implemented) documented in a scientific notebook or in another format that allows others to understand the code review process and results?

Yes: ☐ No: ☒ N/A: ☐

Documented in Scientific Notebook No.: Documented in SCRs

Comments:

Acceptance and Installation Testing [TOP-018, Section 5.6]

Does *acceptance testing* demonstrate whether or not requirements in the SRD and/or SCR(s) have been fulfilled?

Yes: ☑ No: ☐ N/A: ☐

Has *acceptance testing* been conducted for each intended computer platform and operating system?

Yes: ☑ No: ☐ N/A: ☐

Computer Platforms: Sun Operating Systems: Solaris 5.9

Location of Acceptance Test Results: SCRs

Comments:

Has *installation testing* been conducted for each intended computer platform and operating system?

Yes: ☑ No: ☐ N/A: ☐

Computer Platforms: Sun Operating Systems: Solaris 5.9

Location of Acceptance Test Results: Located on supplied CD.

Comments:

User Documentation [TOP-018, Section 5.5.7]

Is there a Users' Manual for the software and is it up-to-date?

Yes: ☐ No: ☒ N/A: ☐

User's Manual Version and Date: 4.0

Comments: Working on development to 5.0

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Are there basic instructions for the *installation* and *use* of the software?

Yes: ☑ No: ☐ N/A: ☐

Location of Instructions: in v.4.0 User Manual, Chapter 21

Comments:

Configuration Control [TOP-018, Section 5.7, 5.9.3]

Is the Software Summary Form (Form TOP-4-1) completed and signed?

Yes: ☑ No: ☐ N/A: ☐

Date of Approval: 11/19/03

Is the list of files attached to the Software Summary Form complete and accurate?

Yes: ☑ No: ☐ N/A: ☐

Comments:

Is the source code available or, is the executable code available in the case of (acquired/commercial codes)?

Yes: ☑ No: ☐ N/A: ☐

Location of Source Code: Tape (archive) & Scratchey 1

Comments:

Have all the script/make files and executable files been submitted to the Software Custodian?

Yes: ☑ No: ☐ N/A: ☐

Location of script/make files: QA Records

Comments: 8mm tape

Software Release [TOP-018, Section 5.9]

Upon acceptance of the software as verified above, has a Software Release Notice (SRN), Form TOP-6 been issued and does the version number of the software match the documentation?

Yes: ☑ No: ☐ N/A: ☐

SRN Number: SRN-PA-303

Comments:

Software Validation [TOP-018, Section 5.10]

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
QA VERIFICATION REPORT
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Has a Software Validation Test Plan (SVTP) been prepared for the range of application of the software?

Yes: ☑ No: ☐ N/A: ☐

Version and Date of SVTP: 5.0/3/27/02

Date Reviewed and Approved via QAP-002: 3/27/02

Comments:

Has a Software Validation Test Report (SVTR) been prepared that documents the results of the validation cases, interpretation of the results, and determination if the software has been validated?

Yes: ☐ No: ☒ N/A: ☐

Version and Date of SVTR: _____

Date Reviewed and Approved via QAP-002: _____

Comments: At this time the SVTR is in the review process.

Additional Comments:

Ron Janetzke 11-21-03
Software Developer/Date

Mark R. Ehnstrom 11/21/03
Software Custodian/Date

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tpa50r:
CLEANUP                          Makefile
Makefile4.2                      acopy.h
acopy.t                          addbetapdf.h
addbetapdf.t                     addconstantpdf.h
addconstantpdf.t                 addcorrel.h
addcorrel.t                      addexpomentialpdf.h
addexponentialpdf.h              addexponentialpdf.t
addfiniteexponentialpdf.h        addfiniteexponentialpdf.t
addhazardcurve.h                 addhazardcurve.t
addiconstantpdf.h                addiconstantpdf.t
addiuniformpdf.h                 addiuniformpdf.t
addlogbetapdf.h                  addlogbetapdf.t
addlognormalpdf.h                addlognormalpdf.t
addlogtriangularpdf.h            addlogtriangularpdf.t
addloguniformpdf.h               addloguniformpdf.t
addnormalpdf.h                   addnormalpdf.t
addto.h                          addto.t
addtriangularpdf.h               addtriangularpdf.t
adduniformpdf.h                  adduniformpdf.t
adduserdiscreteempirical.h       adduserdiscreteempirical.t
addusersupplieddiscrete.h        addusersupplieddiscrete.t
addusersuppliedpwisecdf.h        addusersuppliedpwisecdf.t
aftnefmks.h                      aftnefmks.t
ainterl.h                        ainterl.t1
ainterl.t2                       allchains.h
allchains.t                      array.f
ashplume.h                       ashplume.t
ashplumo.f                       ashplumo.h
ashplumo.t                       ashrmovo.f
ashrmovo.h                       ashrmovo.t
buildInputFiles.h                buildInputFiles.t
calc_ainit.t                     calc_kd.h
calc_kd.t                        calc_mai.h
calc_mai.t                       calc_rd.h
calc_rd.t                        calc_wp.h
calc_wp.t                        ccdf
ccdfindexed.h                    ccdfindexed.t
chains.h                         chains.t
chainsolver.h                    chainsolver.t
checkforduplicate.h              checkforduplicates.h
checkforduplicates.t             checkin.h
checkin.t                        checkinorder.h
checkinorder.t                   checklhsout.h
checklhsout.t                    checknr.h
checknr.t                        checknsa.h
checknsa.t                       checkspname.h
checkspname.t                    cleanupwd.h
cleanupwd.t                      clearchar.h
clearchar.t                      cleart
clidat_init.h                    clidat_init.t
climate_init.h                   climate_init.t
climato.h                        climato.t
codes                            coefkdeq.i
cond3dxyzt.h                     cond3dxyzt.t
condxyzt.f                       copylines.h
cumfail.h                        cumfail.t
data                             dcags.f
dcagw.f                          dcagw.h
decay43mol.h                     decay43mol.t
decay43molglass.h                decay43molglass.t
decayremove43mol.h               decayremove43mol.t
demij_to_m.h                     demij_to_m.t
dget_from_name.h                 dget_from_name.t1
dget_from_name.t2                driftsa.i
```

dsfail.f
dsfail.h
dsfail.t
ebsfail.f
ebsrel.f
ebsrel1.i
epaccdf.h
epaccdf.t
epaccdf_c.h
epaccdf_c.t
exec.f
execa.i
execb.i
execc.i
execd.i
faulto.f
faulto.h
faulto.t
fcn.h
fcn.t1
fcn.t2
fileunit.f
fileutil.f
findpkmndose.h
findpkmndose.t
fu1.i
fu2.i
gauleg.h
gauleg.t
gentodcf.h
gentpa.h
getThickness.h
getThickness.t1
getThickness.t2
get_climean.h
get_climean.t
get_clinoise_set.h
get_clinoise_set.t
get_data_file.h
get_data_file.t
getelements.h
getelements.t
getvertlayers.h
getvertlayers.t
gnsa.h
gnsa.t
gsamtu.h
gsamtu.t
gsanwp.h
gsanwp.t
gsanwpglass.h
gsanwpglass.t
gsarea.h
gsarea.t
gsaxy.h
gsaxy.t
gsaxym.h
gsaxym.t
ia.i
ia1.i
iabarrier.h
iacomponent.h
iaddconsmv.h
iaddconsmv.t1
iaddconsmv.t2
iafile.h
iaparameter.h
iareader.f
iasetup.h
iavalue.h
icheckforduplicates.h
icheckforduplicates.t
iget_from_name.h
iget_from_name.t1
iget_from_name.t2
igetunitnumber.h
igetunitnumber.t1
igetunitnumber.t2
imvquery.h
imvquery.t1
imvquery.t2
initr.h
initr.t
invent.f
invent_.i
inventa.i
inventb.i
inventc.i
inventd.i
invente.i
inventf.i
inventg.i
inventh.i
inventi.i
inventj.i
inventk.i
inventl.i
inventm.i
inventn.i
invento.i
inventp.i
iranu.h
iranu.t1
iranu.t2
isconstant.h
isconstant.t1
isconstant.t2
isoneofset.h
isoneofset.t
ispquery.h
ispquery.t1
ispquery.t2
ispquerynostop.h
ispquerynostop.t1
ispquerynostop.t2
ivaluesp.h
ivaluesp.t1
ivaluesp.t2
kstr2tok_and_val.h
kstr2tok_and_val.t1
kstr2tok_and_val.t2
leachrate.h
leachrate.t
lhsnew.h
lhsnew.t
linehitline.h
linehitline.t
ljs.h
ljs.t1
ljs.t2

```
ljs2.h                    ljs2.t1
ljs2.t2                   load1DTBL.t
loadDTBL.t                locadd_vector.h
locadd_vector.t1          locadd_vector.t2
mapDTBL_to_SAs.t          maplist.h
maplist.t                 maptimeofevent.h
maptimeofevent.t          max500yr.i
maxchain.i                maxclchn.i
maxclnuc.i                maxnnucl.i
maxnsuba.i                maxntime.i
mget_from_name.h          mget_from_name.t1
mget_from_name.t2         mv.f
mva.i                     mvb.i
mvc.i                     mvd.i
mve.i                     mvf.i
newinventdb.h             newinventdb.t
newlhssm.h                newlhssm.t
newmvdb.h                 newmvdb.t
newrealization.h          newrealization.t
newspdb.h                 newspdb.t
nextline.h                nfenv.f
nfenvadj.i                nintv.i
notice.i                  numrecip.f
opnfil.h                  opnfil.t
path.i                    peakfind.f
peakfinder.h              peakfinder.t
prenefmks.h               prenefmks.t
printfun.h                printfun.t
printtimesvalue.h         printtimesvalue.t
printtitlesmv.h           printtitlesmv.t
printtitlessp.h           printtitlessp.t
printvaluesmv.h           printvaluesmv.t
printvaluessp.h           printvaluessp.t
putfailwp.h               putfailwp.t
putgwtt.h                 putgwtt.t
qchitsa.h                 qchitsa.t
qlhitsa.h                 qlhitsa.t
qphitsa.h                 qphitsa.t
quadrilateral.h           quadrilateral.t
querystop.t               ran.f
ran1.h                    ran1.t1
ran1.t2                   ran1seis.h
ran1seis.t1               ran1seis.t2
raneseis.h                raneseis.t1
raneseis.t2               reader.f
reader.i                  reader1.i
reader2.i                 reader3.i
reader4.i                 reflux2.i
root.h                    root.t
runnefmks.h               runnefmks.t
samplehazardcurve.h       samplehazardcurve.t
sampler.f                 sampler0.i
sampler1.i                sampler2.i
sampler3.i                sampler4.i
samplera.i                samplerb.i
samplerc.i                samplerd.i
samplere.i                samplerf.i
samplerg.i                samplerh.i
sampleri.i                samplerj.i
samplerk.i                samplerl.i
samplerm.i                samplern.i
samplero.i                samplerp.i
samplerq.i                samplerr.i
samplers.i                samplert.i
sampleru.i                samplerv.i
```

samplerw.i
samplery.i
scale.h
scopy.h
seisadj.i
set_iouzflow.h
setage.h
setconsmv.h
setfiles.h
setran.h
setranseis.h
setupCommons.h
sigfpe_abort.t1
solve2x2.h
solvenxn.h
sortqr.h
ssadb.h
ssadba.h
stop.i
subareaa.i
subareac.i
subareae.i
subareag.i
szft.i
tempgl.t1
touch.t
trapint.h
triangle.h
trim.h
ucljs.h
ucljs.t2
ucljsg.t2
updatelhs.t
uz_climr.i
uz_flowi.i
uz_flowz.i
uzflow.f
uzflow_init.t
uzft.h
uzszft.i
valueconsmv.t1
valuesp.h
valuesp.t2
volcano.h
writedata.h
writeepaccdf.h
writehead.h
writehead2.h
writesnllhsinp.h
writesource.h
writevelocities.h
xgauleg.h
yutok_in_ustr.h
yutok_in_ustr.t2
zero.t
zeroi.t
zportctime.t1
zportderf.h
zportderf.t2
zportfdate.t
zportfdatefun.t1
zportieee_flags.h
zportieee_flags.t2
zportieee_handler.t1
zportparseunixcmdtodos.t
samplerx.i
samplerz.i
scale.t
scopy.t
seismo2.f
set_iouzflow.t
setage.t
setconsmv.t
setfiles.t
setran.t
setranseis.t
setupCommons.t
sigfpe_abort.t2
solve2x2.t
solvenxn.t
sortqr.t
ssadb.t
ssadba.t
subarea.f
subareab.i
subaread.i
subareaf.i
szft.f
tempgl.h
tempgl.t2
tpa.inp
trapint.t
triangle.t
trim.t2
ucljs.t1
ucljsg.h
updatelhs.h
uz_climi.i
uz_climz.i
uz_flowr.i
uz_parms.i
uzflow.t
uzft.f
uzft.t
valueconsmv.h
valueconsmv.t2
valuesp.t1
volcano.f
volcano.t
writedata.t
writeepaccdf.t
writehead.t
writehead2.t
writesnllhsinp.t
writesource.t
writevelocities.t
xgauleg.t
yutok_in_ustr.t1
zero.h
zeroi.h
zportctime.h
zportctime.t2
zportderf.t1
zportfdate.h
zportfdatefun.h
zportfdatefun.t2
zportieee_flags.t1
zportieee_handler.h
zportieee_handler.t2
zportparseunixfilenametodos.h

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zportparseunixfilenametodos.t  zportsh.h
zportsh.t1                     zportsh.t2
zporttime.h                    zporttime.t1
zporttime.t2                   zportunx.f

tpa50r/ccdf:
Makefile  tccdf.f  tccdf.i  tccdf.inp

tpa50r/codes:
Makefile     Makefile4.2  README       SIZES.INC   SIZES2.INC  ashplume.f
corrosn.f    dsfailt.f    ebsfilt.f    failt.f     failtadj.i  gentpa
integrt.f    itym         lhs1.i       lhs2.i      lhs3.i      lhs4.i
lhs5.i       lhs6.i       lhs7.i       lhs8.i      linintrp.f  mechadj.i
mechfail.f   nefmks.f     releaset.f   snllhs.f    srchpos.f   weldfail.f

tpa50r/codes/gentpa:
AFPPAR.CMN   AIRPAR.CMN   ANMPAR.CMN   AQUPAR.CMN   CONC.CMN     DAYPC.CMN
DECAY.CMN    DFPAR.CMN    DOSALL.CMN   ENVPAR.CMN   EXPALL.CMN   EXTPAR.CMN
FILES.CMN    FODPAR.CMN   INVIN.CMN    LABELS.CMN   MTBPAR.CMN   Make.bat
Makefile     Makefile4.2  Mkenv.fig    Mkenvin.fig  OPT.CMN      ORGMAS.CMN
ORGPAR.CMN   RAD.CMN      RADIN.CMN    RMD.CMN      RMD2.CMN     SOLPAR.CMN
SWPAR.CMN    TIMES.CMN    TITL.CMN     accmod.f     acute1.f     acutea.f
acutec.f     aircal.f     anmcal.f     aqucal.f     biocal.f     blockd.f
bsort.f      candh.f      chain.f      check.f      cronmod.f    crpcal.f
dkharv.f     dose.f       drfbiv.f     drfsec.f     drkcal.f     dumred.f
edranm.f     edrcrp.f     edrnon.f     edrres.f     env.f        envin.f
envlib.f     exposr.f     extcal.f     filerr.f     fntdrf.f     headng.f
idnuc.f      inhcal.f     initnv.f     intpol.f     invmol.f     makda2.f
opnfil.f     order.f      packag.f     plmriz.f     prior.f      prob.f
profile.f    readin.f     redcas.f     redcha.f     redflt.f     redist.f
ritenv.f     ritexp.f     ritmed.f     ritqa.f      rlibin.f     rwake.f
sigma.f      swcal.f      trnspt.f     ustar.f      xqcal.f      xqin.f

tpa50r/codes/itym:
makefile  src

tpa50r/codes/itym/src:
array.f      check_valid.f  estimator.f  init_itym.f  itym.f        itym.i
itymutils.f  path.i         preuzf.i     ran.f        strtokfunc.f  uncertain.f
uncertain.i  unctab.i       zportunx.f

tpa50r/data:
FILENAME.DAT  basecase.inp  bunitdem.dat     burnup.dat     careadem.dat
cdepdem.dat   climato1.dat  climato2.dat     coefkdeq.dat   coefkdeqr.dat
dilution.dat  drythick.dat  dsfailt.def      ebsfail.def    ebsfilt.def
ebsrel.def    elevdem.dat   fluoride.dat     gbioac1.dat    gdefauls.def
gdefault.def  gdosinc2.dat  gftrans.def      gftranss.def   ggamen.dat
ggenii.def    ggeniis.def   ggrdf.dat        gnewdf.dat     grmdlib.dat
ia.dat        itym.dat      maidtbl.dat      maswtbl.dat    maydtbl.dat
mechfail.def  multifaf.dat  multifbe.dat     multiflo.dat   nuclides.dat
organdf.dat   repdes.dat    reversibles.inp  seisbs1.dis    seisbs2.dis
smaydtbl.dat  soildem.dat   strmtube.dat     sunitdem.dat   tefkti.inp
tpa.inp       tpanames.dbs  winddem.dat      wpflow.def
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SOFTWARE CHANGE REPORT

SOFTWARE CHANGE REPORT (SCR)

1. SCR No. (*Software Developer Assigns*): 472	2. Software Title and Version: TPA5.0p	3. Project No: 20.06002.01.113

4. Affected Software Module(s), Description of Problem(s):

A problem was discovered with the DCAGS module during software acceptance testing by NRC for TPA5.0o. The peak direct release doses were found to increase when the initial ash deposits were thinner. Investigation found that this was the result of some equations in DCAGS not being updated to correspond with the addition of the ash redistribution model in ASHRMOVO (i.e. some values for mass of ash in the DCAGS module that were constant were not updated to be time dependent). In the offending equations for *dcf(it,k)*, a constant ash deposit in the denominator was matched up with a time-dependent (and increasing) ash mass load in the numerator, resulting in a large dose for realizations with an initially very thin ash deposit. The fix makes both the ash mass and ash mass load time- dependent, as they should be, resulting in a reasonable direct release dose (i.e. thicker initial ash deposits correspond with increasing doses). Another fix is made to the calculation of *resuspendablefraction(it)*, to correct a similar problem with DCAGS not corresponding to time-dependent updates made to ASHRMOVO. This second change does not affect the peak dose results, but will slightly increase doses from very thin ash deposits when compared to previous versions of TPA.

5. Change Requested by:	6. Change Authorized by (*Software Developer*):
Michael A. Smith Date: 18 August 2003	Ron Janetzke Date: 8-19-03

7. Description of Change(s) or Problem Resolution (*If changes not implemented, please justify*):

See Attachment.

Affected automated test files:
None

8. Implemented by:	Date:
M. Smith	8-20-03

9. Description of Acceptance Tests: The software was tested in accordance with the Test Plan for TPA SCR #472. The software, test directories, and test results are contained on a CD labeled "TPA SCR #472 - Test Directories." All tests passed.

10. Tested by:	Date:
C. Scherer	11-21-03

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ATTACHMENT

Change 1. As listed in (i) of SCR 472, modify equations on lines 776, 838, 906, and 967 of DCAGS by replacing:

```
&      +dcfinh(k)/(gramsashpercm2*1.d+04)
```

with:

```
&      +dcfinh(k)/ amassash(it)
```

Note that the DCAGS and ASHRMOVO source code will be checked for whether "gramsashpercm2" is used appropriately and the source code modified is needed.

Also, "gramsashpercm2" will be removed from the call to DCAGS in EXEC and from the DCAGS argument list since it is no longer used in DCAGS.

JUSTIFICATION: Allow for the time-varying redistribution of ash introduced in ASHRMOVO

Change 2. As listed in (ii) of SCR 472, modify equation on line 533 of DCAGS by replacing:

```
resuspendablefraction(it)=thickness*100
     &                          *dexp(-dlbr*(tim(it)-tim(itoe)))/
     &                          resuspendabledepth
```

with:

```
      resuspendablefraction(it)=thickness*100/
     &                          resuspendabledepth
```

JUSTIFICATION: Allow for the time-varying redistribution of ash introduced in ASHRMOVO

Change 3. Delete on lines 1209-1211 of ASHRMOVO:

```
if (amassasht(itoe+i).le.0.d0) then
  amassasht(itoe+i) = 1.d-99
end if
```

Modify lines 1223 - 4 of ASHRMOVO:

```
   dladd(itoe+i,m)=log(amassasht(itoe+i)/amassasht(itoe+i-1))
&          /(time(itoe+i)-time(itoe+i-1))
```

This modification will set `dladd(itoe+i,m)` equal to zero, if `amassasht()` is zero (i.e., no ash). Otherwise, the calculation in lines 1223-4 will be performed.

JUSTIFICATION: Eliminate problems (e.g., division by zero) caused by zero ash which can be introduced by a wind direction of 0 to 180 degrees (instead of the -90 degree value in the TPA default *tpa.inp* file that will not give zero ash)

Change 4. Modify lines 525-7 of DCAGS by deleting :

```
if (amassash(it).lt.amassash(it-1)) then
  ipeak = it
endif
```

JUSTIFICATION: Eliminate potential problems caused by array out-of-bounds, also ipeak is not used.

Change 5. Copy lines 1189-1207 of ASHRMOVO, which are:

```
   bterm1 =(-erosratediswind-erosratedisfl+erosrateund*areaasht*
&          depfracairash/CGareainm2-erosrateund*areaasht*
&          depositfractionCG/CGareainm2)*(time(itoe+i)-time(itoe))
```

```
      bterm2 = (depositfractionCG*frashq*amassashred/CGareainm2 +
&              erosrateund*areaasht*frashq*depositfractionCG/
&              CGareainm2/rlq)*(1-exp(-rlq*(time(itoe+i)-time(itoe))))

      bterm3 = (depositfractionCG*frashm*amassashred/CGareainm2 +
&              erosrateund*areaasht*frashm*depositfractionCG/
&              CGareainm2/rlm)*(1-exp(-rlm*(time(itoe+i)-time(itoe))))

      bterm4 = (depositfractionCG*frashL*amassashred/CGareainm2 +
&              erosrateund*areaasht*frashL*depositfractionCG/
&              CGareainm2/rlL)*(1-exp(-rlL*(time(itoe+i)-time(itoe))))

      bterm5 = amassash(itoe)

      amassasht(itoe+i) = bterm1+bterm2+bterm3+bterm4+bterm5
```

and paste these lines just after line 1207. These lines will need to be modified slightly to accomplish the following. Place these lines inside of a "do-loop" that steps in time from "time(itoe)" to "time(nt)" using **time steps of 1 year**. Modify the last line in this section to compute "amassasht_new" and to save the largest value as "amassasht_largest" and the corresponding time as "amassasht_largest_time." Determine the "left-hand" TPA time that corresponds to "amassasht_largest_time" and then modify the "amassasht()" array at this time to be the value for "amassasht_largest".

Also, include by copying (and modifying if needed) the appropriate portion of computations for "amassash()" array values to capture this peak.

JUSTIFICATION: **Capture the peak amount of redistributed ash at a TPA time step (previously the amount of redistributed ash was determined only at TPA time steps and the peak was most often-times not captured)**

SOFTWARE CHANGE REPORT (SCR)

1. SCR No. PA-SCR-475	2. Software Title and Version: TPA 5.0q	3. Project No: 20.06002.01.113

4. Affected Software Module(s), Description of Problem(s):
ebsrel.f, and *releaset.f*, *tpanames,dbs*, *tpa.inp*, *ia.dat*, *ebsrel.def.*

Add parameter **WasteFormDissolutionEnhancementFactor[]** to *tpa.inp*.

5. Change Requested by:	6. Change Authorized by (*Software Developer*):
S. Mohanty Date:10-10-2003	R. Janetzke Date: 10-10-2003

7. Description of Change(s) or Problem Resolution (*If changes not implemented, please justify*):

This parameter was added to *tpa.inp*, *tpanames.dbs*, and *ia.dat*, and a template for it was added to *ebsrel.def.* The *ebsrel.f* and *releaset.f* modules were changed to query and use this value for the waste form dissolution calculations.

8. Implemented by:	Date:
R. Janetzke	10-17-2003

9. Description of Acceptance Tests:

Verify that the value for the new parameter dissolution enhancement factor gets written to *ebsrel.inp.*

Verify that changing the value of the ratefactor WasteFormDissolutionEnhancementFactor[] in *tpa.inp* causes the appropriate change in the release values in the output file *trelease.out.*

For more detailed explanation, see the Test Plan for SCR475.

10. Tested by:	Date:
Brandi L. Winfrey	11-17-2003

Test Plan for TPA SCR # 475

Test Plan Name: SCR 475 Test Plan

Tested By: Brandi L. Winfrey

Date: November 17, 2003

Host Machine: SUN Ultra-4 Server: spock

Host OS: Solaris 5.8

Baseline Version: 5.0q

Test Version: 5.0r

System Level Tests

The system level tests are designed to verify that changes to the value of the new *tpa.inp* parameter WasteFormDissolutionEnhancementFactor[], added by this SCR causes the desired change to the release values.

SL-1 Data Files Contain the Correct Information

1.0 Path for Data File Inspection Directory

<<TPA.INP Directory>> = $HOME/PA-SCR-475

2.0 Path for Archived Results

$HOME/PA-SCR-475

3.0 Environment Variables

TPA_TEST = $HOME/PA-SCR-475/tpa50r

TPA_DATA = $HOME/PA-SCR-475/tpa50r

4.0 Special Input Files or Modifications to Input Files Required

None

5.0 Special Diagnostic Code Modifications Required

None

6.0 Program Modes to be Used

None

7.0 Utility Scripts Needed to Perform the Test

None

8.0 Test Description

8.1 Objective: This test is designed to verify that the following files contain the updated information in accordance with this SCR and changes to the value of WasteFormDissolutionEnhancementFactor[] have the appropriate affect on output release values: *tpa.inp*, *tpanames.dbs*, *ia.dat*, and *ebsrel.def.*

8.2 Assumptions: none

8.3 Constraints: none

8.5 Procedure:

1.Verify that the parameter WasteFormDissolutionEnhancementFactor[] has been added to the files *tpa.inp*, *tpanames.dbs*, *ia.dat*, and *ebsrel.def.* Note: in ebsrel.def, the parameter name is not listed, only the value and a comment "ratefactor: waste dissolution enhancement factor". The lines in ia.dat should be listed under the subsystem SubsystemEngineeredStudy and look like the following:

```
BARRIER    = 'BarrierWasteFormDissolutionStudy'
**
```

```
  Component = 'ComponentWasteFormDissolutionStudy'
  parameter = 'WasteFormDissolutionEnhancementFactor[]'
  value     = 1.0
**
```

2.In *tpa.inp* set DefectiveFractionOfWPs/cell to constant 1.0e-2.

3.Run TPA with the command tpa.e > PA-SCR-475a.out.

4.Open the file *ebsrel.inp* (the input data file for release for glass, diffusion and clad) and verify that the waste dissolution enhancement factor was written to this file. The value (on line 42) should be 1.000E+00. This means that the value was read from *tpa.inp* by *ebsrel.f* and written to *ebsrel.inp* correctly.

5. Rename the file *trelease.out* to *trelease1.out* for comparison with a second run.

6.In *tpa.inp*, set WasteFormDissolutionEnhancementFactor[] to 0.005 and re-run TPA with the command tpa.e > PA-SCR-475b.out.

7.Open the file *ebsrel.inp* (the input data file for release for glass, diffusion and clad) and verify that the waste dissolution enhancement factor was written to this file. The value (on line 42) should be 5.000E-03 This means that the value was read from *tpa.inp* by *ebsrel.f* and written to *ebsrel.inp* correctly.

8.Rename the file *trelease.out* to *trelease005.out* for comparison with the first run.

9.In *tpa.inp*, set WasteFormDissolutionEnhancementFactor[] to 10.0 and re-run TPA with the command tpa.e > PA-SCR-475c.out.

10.Open the file *ebsrel.inp* (the input data file for release for glass, diffusion and clad) and verify that the waste dissolution enhancement factor was written to this file. The value (on line 42) should be 1.000E+01 This means that the value was read from *tpa.inp* by *ebsrel.f* and written to *ebsrel.inp* correctly.

11.Rename the file *trelease.out* to *trelease10.out* for comparison with the first two runs.

12.Look at the files *trelease1.out, trelease005.out, and trelease10.out* and compare release values for TC99. Compare the values which are greater than zero. The majority of values in *trelease005.out* should be smaller than the corresponding values in *trelease1.out* and the majority of values in *trelease10.out* should be larger than the corresponding values in the other two files. If this is so, then releaset.f read the ratefactor (waste dissolution enhancement factor) correctly from *ebsrel.inp* for its calculations.

8.6 Pass/Fail Criteria: The updated files identified in Section 8.5 step 1 contain the required information in accordance with Section 8.5 step 1 and the output files created by each of the three runs made should contain the appropriate information in accordance with Section 8.5 steps 4, 7, 10, and 12.

9.0 Test Results

9.1 Output and Supporting Files: All files are archived to a CD labeled, "Test Plan and Test Results for TPA SCR #475."

9.2 Criterion 1: The parameter and or value should be listed in the appropriate files per section 8.5 step 1.

13.3 Criterion 2: The values for waste dissolution enhancement factor found in the file *ebsrel.inp* are as expected in section 8.5 steps 4, 7, and 10.

9.4 Criterion 3: The comparisons made between the two output files *trelease1.out* and *trelease005.out* are in accordance with expected results in section 8.5 step 12.

9.3 Overall Test Status:

This test successfully **PASSED** the criterion above for test SL-1.