ATTACHMENT I LISTS OF ELECTRONIC FILES USED FOR EBS PHYSICAL AND CHEMICAL ENVIRONMENT MODEL DEVELOPMENT AND IMPLEMENTATION

This Attachment contains a listing of the electronic files which are submitted as CD-ROM with the Engineered Barrier System Physical and Chemical Environment Analysis/Model Report. The listing is organized according to the directory tree structure of the electronic submittal. Each folder (and sub-folder) in the directory is listed in boldface, and the files contained there are listed below it.

Cement Archive/PHREEQC input files

grout301.txt
grout302.txt
grout303.txt
grout501.txt
grout502.txt
grout503.txt
grout51.txt
grout51e.txt
grout701.txt
grout702.txt
grout703.txt
grout79.txt
grout79e.txt
grout88.txt
grout90.txt
grout901.txt
grout902.txt
grout903.txt
wateqcem.txt

Cement Archive/ PHREEQC output files

grout301.out
grout302.out
grout303.out
grout501.out
grout502.out
grout503.out
grout51.out
grout51e.out
grout701.out
grout702.out
grout703.out
grout79.out
grout79e.out
grout88.out

grout90.out
grout901.out
grout902.out
grout903.out

Chem.Sys. Archive/Chem.Sys. spreadsheets
CO2balanceV1.2.xls
OvertonSandAreaV1.2.xls

Chem.Sys. Archive/EQ36 input and output
Data0.com
Data0.elh
Data0.sup
Filelist.txt

Chem.Sys. Archive/EQ36 input and output/_zone0
Z0-1.3i
z0-1.3o
z0-1.3p
Z0-2.3i
z0-2.3o
z0-2.3p
Z0-3.3i
z0-3.3o
z0-3.3p
Z0-4.3i
z0-4.3o
z0-4.3p
Z0-5.3i
z0-5.3o
z0-5.3p

Chem.Sys. Archive/EQ36 input and output/_zone12
Z1-1.3i
z1-1.3o
z1-1.3p
Z1-2.3i
z1-2.3o
z1-2.3p
Z1-3.3i
z1-3.3o
z1-3.3p
Z1-4.3i
z1-4.3o
z1-4.3p
Z1-5.3i

z1-5.3o
z1-5.3p

Chem.Sys. Archive/EQ36 input and output/_zone34
Z3-3a-ka.6i
z3-3a-ka.6o
z3-3a-ka.6p
z3-3a-ka.6t
Z3-3a-qt.6i
z3-3a-qt.6o
z3-3a-qt.6p
z3-3a-qt.6t
Z3-3a-xx.6i
z3-3a-xx.6o
z3-3a-xx.6p
z3-3a-xx.6t
Z3-3b-qt.6i
z3-3b-qt.6o
z3-3b-qt.6p
z3-3b-qt.6t
Z3-4-qt.6i
z3-4-qt.6o
z3-4-qt.6p
z3-4-qt.6t
Z3-5-qt.6i
z3-5-qt.6o
z3-5-qt.6p
z3-5-qt.6t

Chem.Sys. Archive/EQ36 input and output/ _zone56
Z5-4a-qt.6i
z5-4a-qt.6o
z5-4a-qt.6p
z5-4a-qt.6t
Z5-4b-qt.6i
z5-4b-qt.6o
z5-4b-qt.6p
z5-4b-qt.6t
Z5-4-in.3i
z5-4-in.3o
z5-4-in.3p
Z5-5-in.3i
z5-5-in.3o
z5-5-in.3p
Z5-5-qt.6i
z5-5-qt.6o

z5-5-qt.6p
z5-5-qt.6t

Chem.Sys. Archive/reformatted EQ36 output/ old model (Rev. 00A)
Rev00Awater34_3A_qtz.xls
Rev00Awater34_3B_qtz.xls
Rev00Awater34_4_qtz.xls
Rev00Awater34_5_qtz.xls
Rev00Awater56_4A_qtz.xls
Rev00Awater56_4B_qtz.xls
Rev00Awater56_5_qtz.xls
Rev00AWaterChemPlot.xls
Rev00AZone1-2water.xls
CO2_budget_a1.xls
CO2_budget_b1.xls
water_0_thgm4A.xls
water34_3A_qtz.xls
water34_3B_qtz.xls
water34_4_qtz.xls
water34_5_qtz.xls
water56_4A_qtz.xls
water56_4B_qtz.xls
water56_5_qtz.xls
Zone1-2water.xls
_ebsc2.zip

CO2 Archive
gasC14-NRG-5-1996dataV1.2.xls
gasC14-SD-12-1996dataV1.2.xls
gasC14-SD-7-1996dataV1.2.xls
gasC14-UZ-1-1985dataV1.2.xls
gasC14-UZ-6-1995dataV1.2.xls

Colloids Archive
GWcolloidsV1.2.xls

P&S Archive/ normative spreadsheets
normative_hiCO2_l4c4_ui-zone34-500V1.2.xls
normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls
normative_hiCO2_SPW_V1.2.xls
normative_hiCO2_synJ13_V1.2.xls
normative_hiCO2_testcase34.xls
normative_hiCO2_testcase56.xls

TH Archive/ myplot routine/ myplot output
l4c1-LDTH36-1Dds_mc-li-flux.exl

l4c1-LDTH36-1Dds_mc-ui-flux.exl
l4c4-LDTH60-1Dds_mc-li-flux.exl
l4c4-LDTH60-1Dds_mc-ui-flux.exl

TH Archive/myplot routine/source
flux_files_readme
myplot.m.txt

TH Archive/Nuft/3-14 transmittal from NEPO/ LB99EBS1233129.001/ Stratigraphy
Mpa_pch1.v1
UZ99_3.grd
UZ99_3_3D.mesh

TH Archive/Nuft/3-14 transmittal from NEPO/ LB99EBS1233129.002/ Initial Saturation/ Glacial Infiltration
SAVE.pa_glaL1.dat
SAVE.pa_glaL2.dat
SAVE.pa_glam1.dat
SAVE.pa_glam2.dat
SAVE.pa_glau1.dat
SAVE.pa_glau2.dat

TH Archive, Nuft/3-14 transmittal from NEPO/ LB99EBS1233129.002/ Initial Saturation/ Monsoon Infiltration
SAVE.pa_monL1.dat
SAVE.pa_monL2.dat
SAVE.pa_monm1.dat
SAVE.pa_monm2.dat
SAVE.pa_monu1.dat
SAVE.pa_monu2.dat

TH Archive/Nuft/3-14 transmittal from NEPO/ LB99EBS1233129.002/ Initial Saturation/ Present Day Infiltration
SAVE.pa_pchL1.dat
SAVE.pa_pchL2.dat
SAVE.pa_pchm1.dat
SAVE.pa_pchm2.dat
SAVE.pa_pchu1.dat
SAVE.pa_pchu2.dat

TH Archive/Nuft/3-14 transmittal from NEPO /LB99EBS1233129.003/ Temp_Pres
bcs_99.dat
UZ99_3-14Files.doc

TH Archive/Nuft/3-14 transmittal from NEPO /LB99EBS1233129.004/ Infiltration Flux/ Glacial Infiltration
pa_glaL1.dat
pa_glam1.dat
pa_glau1.dat

TH Archive/Nuft/3-14 transmittal from NEPO /LB99EBS1233129.004/ Infiltration Flux/ Monsoon Infiltration
pa_monL1.dat
pa_monm1.dat
pa_monu1.dat

TH Archive/Nuft/3-14 transmittal from NEPO /LB99EBS1233129.004/ Infiltration Flux /Present Day Infiltration
pa_pchL1.dat
pa_pchm1.dat
pa_pchu1.dat

TH Archive/Nuft /Chim_surf & Chim_wt files/input files
bcs_99.dat
bcs_99_testcase.txt
chim_test
column.data
column_testcase.data.txt

TH Archive/Nuft/Chim_surf & Chim_wt files/output files
chim_out
outpt
outpt_wt

TH Archive/Nuft/Chim_surf & Chim_wt files/source
chim_surf_bc_tst.f
chim_surf_TP.f
chim_wt_TP.f
chim_surf_TP

TH Archive/Nuft/Columninfiltration files/ input files
column.data
columninfiltration_tst.dat
columninfiltration_tst.NV

TH Archive/Nuft/Columninfiltration files/output files
columninfiltration_tst.out
Glaciall.out
Glacialm.out
Glacialu.out

Monsoonl.out
Monsoonm.out
Monsoonu.out
yml.out
ymm.out
ymu.out

TH Archive/Nuft/Columninfiltration files/source
columnInfiltration.c
th28dir

TH Archive/Nuft/Convertcoords files/ input files
Glaciall.inf
Glacialm.inf
Glacialu.inf
Monsoonl.inf
Monsoonm.inf
Monsoonu.inf
yml.inf
ymm.inf
ymu.inf

TH Archive/Nuft/Convertcoords files/output files
Glaciall.NV
Glacialm.NV
Glacialu.NV
Monsoonl.NV
Monsoonm.NV
Monsoonu.NV
yml.NV
ymm.NV
ymu.NV

TH Archive/Nuft/Cover files
cover.m
dft1.dat
shape1.dat

TH Archive/Nuft/infiltration spreadsheet
infiltration.xls

TH Archive/Nuft/ NUFT input files/ l4c1-lower
l4c1.nft
l4c1_col.units
l4c1_nft_msh.dkm

l4c1_nft_msh.dkm0
l4c1_nft_msh_dkm.f
l4c1_nft_msh_dkm.m
l4c1_nft_msh_dkm0.f
l4c1_nft_msh_dkm0.m
l4c1-LDTH36-1Dds_li-00-i.in
l4c1-LDTH36-1Dds_mc-li-01.in
l4c1-LDTH36-1Dds_mc-li-01v.in
l4c1-LDTH60-1Dds_mc-mi-01.out

TH Archive/Nuft/ NUFT input files/ l4c1-upper
l4c1.nft
l4c1_col.units
l4c1_nft_msh.dkm
l4c1_nft_msh.dkm0
l4c1_nft_msh_dkm.f
l4c1_nft_msh_dkm.m
l4c1_nft_msh_dkm0.f
l4c1_nft_msh_dkm0.m
l4c1-LDTH36-1Dds_mc-ui-01.in
l4c1-LDTH36-1Dds_mc-ui-01v.in
l4c1-LDTH36-1Dds_ui-00-i.in
l4c1-LDTH60-1Dds_mc-mi-01.out

TH Archive/Nuft/ NUFT input files/l4c4-lower
l4c4.col
l4c4.nft
l4c4_nft_msh.dkm
l4c4_nft_msh.dkm0
l4c4_nft_msh_dkm.f
l4c4_nft_msh_dkm.m
l4c4_nft_msh_dkm0.f
l4c4_nft_msh_dkm0.m
l4c4-LDTH60-1Dds_li-00-i.in
l4c4-LDTH60-1Dds_mc-li-01.in
l4c4-LDTH60-1Dds_mc-li-01v.in

TH Archive/Nuft/NUFT input files/l4c4-upper
l4c4.col
l4c4.nft
l4c4_nft_msh.dkm
l4c4_nft_msh.dkm0
l4c4_nft_msh_dkm.f
l4c4_nft_msh_dkm.m
l4c4_nft_msh_dkm0.f
l4c4_nft_msh_dkm0.m

l4c4-LDTH60-1Dds_mc-ui-01.in
l4c4-LDTH60-1Dds_mc-ui-01v.in
l4c4-LDTH60-1Dds_ui-00-i.in

TH Archive/Nuft/NUFT input files
dkm_afc-ds-NBS-l_inf
dkm_afc-ds-NBS-m_inf
dkm_afc-ds-NBS-u_inf
dkm-afc-1Dds-mc-li-00
dkm-afc-1Dds-mc-ui-00
dkm-afc-EBS_Rev10
dkm-afc-pbf-EBS_Rev00
dkm-afc-pbf-EBS_Rev10
LDTH-SDT-0.3Qheat-1e6y_vent-00v
LDTH-SDT-0.3Qheat-50y_vent-00
modprop_dr-up-00v
output.times-00v
outputtime
run_control_param_LDTH-v00
run_control_param_LDTH-v01
vtough.pkg

TH Archive/Nuft /NUFT output files/ l4c1-lower
l4c1-LDTH36-1Dds_mc-li-00-i.res
l4c1-LDTH36-1Dds_mc-li-01.f.ext
l4c1-LDTH36-1Dds_mc-li-01.Gflux_0_1.dat
l4c1-LDTH36-1Dds_mc-li-01.Gflux_1_2.dat
l4c1-LDTH36-1Dds_mc-li-01.Gflux_2_3.dat
l4c1-LDTH36-1Dds_mc-li-01.Gflux_3_4.dat
l4c1-LDTH36-1Dds_mc-li-01.Gflux_3_5.dat
l4c1-LDTH36-1Dds_mc-li-01.Gflux_4_5.dat
l4c1-LDTH36-1Dds_mc-li-01.Gflux_5_6.dat
l4c1-LDTH36-1Dds_mc-li-01.Lflux_0_1.dat
l4c1-LDTH36-1Dds_mc-li-01.Lflux_1_2.dat
l4c1-LDTH36-1Dds_mc-li-01.Lflux_2_3.dat
l4c1-LDTH36-1Dds_mc-li-01.Lflux_3_4.dat
l4c1-LDTH36-1Dds_mc-li-01.Lflux_3_5.dat
l4c1-LDTH36-1Dds_mc-li-01.Lflux_4_5.dat
l4c1-LDTH36-1Dds_mc-li-01.Lflux_5_6.dat
l4c1-LDTH36-1Dds_mc-li-01.m.ext
l4c1-LDTH36-1Dds_mc-li-01v.f.EBS.ext
l4c1-LDTH36-1Dds_mc-li-01v.m.EBS.ext
l4c1-LDTH36-1Dds_mc-li-01v-a.res

TH Archive/Nuft /NUFT output files/ l4c1-upper
l4c1-LDTH36-1Dds_mc-ui-00-i.res

l4c1-LDTH36-1Dds_mc-ui-01.f.ext
l4c1-LDTH36-1Dds_mc-ui-01.Gflux_0_1.dat
l4c1-LDTH36-1Dds_mc-ui-01.Gflux_1_2.dat
l4c1-LDTH36-1Dds_mc-ui-01.Gflux_2_3.dat
l4c1-LDTH36-1Dds_mc-ui-01.Gflux_3_4.dat
l4c1-LDTH36-1Dds_mc-ui-01.Gflux_3_5.dat
l4c1-LDTH36-1Dds_mc-ui-01.Gflux_4_5.dat
l4c1-LDTH36-1Dds_mc-ui-01.Gflux_5_6.dat
l4c1-LDTH36-1Dds_mc-ui-01.Lflux_0_1.dat
l4c1-LDTH36-1Dds_mc-ui-01.Lflux_1_2.dat
l4c1-LDTH36-1Dds_mc-ui-01.Lflux_2_3.dat
l4c1-LDTH36-1Dds_mc-ui-01.Lflux_3_4.dat
l4c1-LDTH36-1Dds_mc-ui-01.Lflux_3_5.dat
l4c1-LDTH36-1Dds_mc-ui-01.Lflux_4_5.dat
l4c1-LDTH36-1Dds_mc-ui-01.Lflux_5_6.dat
l4c1-LDTH36-1Dds_mc-ui-01.m.ext
l4c1-LDTH36-1Dds_mc-ui-01v.f.EBS.ext
l4c1-LDTH36-1Dds_mc-ui-01v.m.EBS.ext
l4c1-LDTH36-1Dds_mc-ui-01v-a.res

TH Archive/Nuft /NUFT output files/l4c4-lower
l4c4-LDTH60-1Dds_mc-li-00-i.res
l4c4-LDTH60-1Dds_mc-li-01.f.ext
l4c4-LDTH60-1Dds_mc-li-01.Gflux_0_1.dat
l4c4-LDTH60-1Dds_mc-li-01.Gflux_1_2.dat
l4c4-LDTH60-1Dds_mc-li-01.Gflux_2_3.dat
l4c4-LDTH60-1Dds_mc-li-01.Gflux_3_4.dat
l4c4-LDTH60-1Dds_mc-li-01.Gflux_3_5.dat
l4c4-LDTH60-1Dds_mc-li-01.Gflux_4_5.dat
l4c4-LDTH60-1Dds_mc-li-01.Gflux_5_6.dat
l4c4-LDTH60-1Dds_mc-li-01.Lflux_0_1.dat
l4c4-LDTH60-1Dds_mc-li-01.Lflux_1_2.dat
l4c4-LDTH60-1Dds_mc-li-01.Lflux_2_3.dat
l4c4-LDTH60-1Dds_mc-li-01.Lflux_3_4.dat
l4c4-LDTH60-1Dds_mc-li-01.Lflux_3_5.dat
l4c4-LDTH60-1Dds_mc-li-01.Lflux_4_5.dat
l4c4-LDTH60-1Dds_mc-li-01.Lflux_5_6.dat
l4c4-LDTH60-1Dds_mc-li-01.m.ext
l4c4-LDTH60-1Dds_mc-li-01v.f.EBS.ext
l4c4-LDTH60-1Dds_mc-li-01v.m.EBS.ext
l4c4-LDTH60-1Dds_mc-li-01v-a.res

TH Archive/Nuft /NUFT output files/l4c4-upper
l4c4-LDTH60-1Dds_mc-ui-00-i.res
l4c4-LDTH60-1Dds_mc-ui-01.f.ext
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_0_1.dat

l4c4-LDTH60-1Dds_mc-ui-01.Gflux_1_2.dat
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_2_3.dat
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_3_4.dat
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_3_5.dat
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_4_5.dat
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_5_6.dat
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_0_1.dat
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_1_2.dat
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_2_3.dat
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_3_4.dat
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_3_5.dat
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_5_6.dat
l4c4-LDTH60-1Dds_mc-ui-01.m.ext
l4c4-LDTH60-1Dds_mc-ui-01v.f.EBS.ext
l4c4-LDTH60-1Dds_mc-ui-01v.m.EBS.ext
l4c4-LDTH60-1Dds_mc-ui-01v-a.res

TH Archive/Nuft /rme6 files
LBL99-YMESH
rme6
rme6.c
tspa99_primary_mesh
UZ99_3.grd

TH Archive/Nuft/YMESH files
l4c1.dat
l4c1_col.units
l4c4.dat
l4c4_col.units

TH Archive/SoluteRK/reformatted SoluteRK output
Fig12SRK-l4c4-ui.xls
Fig13SRK-l4c4-li.xls
Fig14SRK-l4c1-ui.xls
Fig15SRK-l4c1-li.xls

TH Archive/SoluteRK
SoluteRKV1.2_1500-2500-l4c1-li.mcd
SoluteRKV1.2_1500-2500-l4c1-ui.mcd
SoluteRKV1.2_1500-2500-l4c4-li.mcd
SoluteRKV1.2_1500-2500-l4c4-ui.mcd
SoluteRKV1.2_2500-10000-l4c1-li.mcd
SoluteRKV1.2_2500-10000-l4c1-ui.mcd
SoluteRKV1.2_2500-10000-l4c4-li.mcd
SoluteRKV1.2_2500-10000-l4c4-ui.mcd
SoluteRKV1.2_300-700-l4c1-li.mcd

SoluteRKV1.2_300-700-l4c1-ui.mcd
SoluteRKV1.2_300-700-l4c4-li.mcd
SoluteRKV1.2_300-700-l4c4-ui.mcd
SoluteRKV1.2_50-300-l4c1-li.mcd
SoluteRKV1.2_50-300-l4c1-ui.mcd
SoluteRKV1.2_50-300-l4c4-li.mcd
SoluteRKV1.2_50-300-l4c4-ui.mcd
SoluteRKV1.2_700-1500-l4c1-li.mcd
SoluteRKV1.2_700-1500-l4c1-ui.mcd
SoluteRKV1.2_700-1500-l4c4-li.mcd
SoluteRKV1.2_700-1500-l4c4-ui.mcd

TH Archive/TH figures

fig11.eps 1
fig11.ps
fig5.eps 1
fig5.ps
fig9.eps 1
fig9.ps
region.eps
region.ps
TH Fig 1.doc
TH Fig 1.eps
TH Fig 1.wmf
TH Fig 10.xls
TH Fig 12.xls
TH Fig 13.xls
TH Fig 14.xls
TH Fig 15.xls
TH Fig 4.xls
TH Fig 6.xls
TH Fig 7.xls
TH Fig 8.xls
TH Fig 9.doc
THFig2.doc
THFig2.eps
THFig3.doc

TH Archive/th+gas spreadsheets

RHspec.xls
th+gas_model-l4c1-li-04.xls
th+gas_model-l4c1-ui-04.xls
th+gas_model-l4c4-li-04.xls
th+gas_model-l4c4-ui-04.xls

TH Archive/vfluxprof routine/ source
vfluxprof.txt

TH Archive/vfluxprof routine/vfluxprof output
l4c1-LDTH36-1Dds_mc-li-01.f.ext.q.gas.vflux
l4c1-LDTH36-1Dds_mc-ui-01.f.ext.q.gas.vflux
l4c4-LDTH60-1Dds_mc-li-01.f.ext.q.gas.vflux
l4c4-LDTH60-1Dds_mc-ui-01.f.ext.q.gas.vflux

TH Archive/zoneavg routine/ source
zoneavg.txt

TH Archive/zoneavg output/l4c1-lower
l4c1-LDTH36-1Dds_mc-li-01.f.ext.zavg
l4c1-LDTH36-1Dds_mc-li-01.m.ext.zavg

TH Archive/zoneavg output/l4c1-upper
l4c1-LDTH36-1Dds_mc-ui-01.f.ext.zavg
l4c1-LDTH36-1Dds_mc-ui-01.m.ext.zavg

TH Archive/zoneavg output/l4c4-lower
l4c4-LDTH60-1Dds_mc-li-01.f.ext.zavg
l4c4-LDTH60-1Dds_mc-li-01.m.ext.zavg

TH Archive/zoneavg output/l4c4-upper
l4c4-LDTH60-1Dds_mc-ui-01.f.ext.zavg
l4c4-LDTH60-1Dds_mc-ui-01.m.ext.zavg

(end of listing)

ATTACHMENT II SOFTWARE ROUTINE DOCUMENTATION FOR NUFT PRE-PROCESSORS: RME6 V1.1

ROUTINE IDENTIFICATION

Rme6 v1.1. This routine was compiled using C++ vSC4.2. The source code for this routine is rme6.c (Attachment I).

ROUTINE PURPOSE AND VALIDATION

The purpose of this routine is to reformat and combine the files tspa99_primary_mesh and UZ99_3.grd (Attachment I) into a single file, LBL99-YMESH which YMESH V1.53 reads as "world view" data.

To demonstrate that rme6 performed in the correct manner, it was necessary to inspect a few lines from sections of the two input files and the output file to see that key information had been transferred correctly. The first several lines of the element and connectivity sections of tspa99_primary_mesh were extracted to files "elem10" and "conn10" and read into Microsoft Excel 97 in order to enhance their readability for this document. The first several lines of the UZ99_3.grd were extracted into a file "vert9," manually joined in groups of three consecutive ones (as the data will be joined later), and read into Excel in order to make them comprehensible in this document. The resulting three tables of input data are shown below.

tspa99_primary_mesh:

ELEME

1Aa 1	tcw11	2.332E+05	169398.601	236623.643	1626.0963
12a 1	tcw12	3.244E+06	169398.601	236623.643	1606.4657
1Ba 1	tcw12	3.244E+06	169398.601	236623.643	1569.837
21a 1	ptn21	6.724E+05	169398.601	236623.643	1547.7263
22a 1	ptn22	1.502E+06	169398.601	236623.643	1535.4527
23a 1	ptn23	1.238E+06	169398.601	236623.643	1519.984
24a 1	ptn24	2.919E+06	169398.601	236623.643	1496.5161
25a 1	ptn25	2.684E+06	169398.601	236623.643	1464.887
2Ca 1	ptn25	2.684E+06	169398.601	236623.643	1434.5821

CONNE

22a 1	21a 1	3	8.4773E+00	3.7963E+00	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.54E+03
21a 1	1Ba 1	3	3.7963E+00	1.8314E+01	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.55E+03
1Ba 1	12a 1	3	1.8314E+01	1.8314E+01	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.59E+03
12a 1	1Aa 1	3	1.8314E+01	1.3163E+00	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.62E+03
23a 1	22a 1	3	6.9915E+00	8.4773E+00	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.53E+03
24a 1	23a 1	3	1.6477E+01	6.9915E+00	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.51E+03
25a 1	24a 1	3	1.5152E+01	1.6477E+01	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.48E+03
2Ca 1	25a 1	3	1.5152E+01	1.5152E+01	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.45E+03
26a 1	2Ca 1	3	6.0487E+00	1.5152E+01	8.8566E+04	-1E+00	1.69E+05	2.37E+05	1.42E+03

UZ99_g.grd:

169251.917	236795.473	169201.033	236473.209	0	a 1	B-1
169201.033	236473.209	169428.63	236411.341	0	a 1	b14
169428.63	236411.341	169501.175	236823.139	0	a 1	b 2
169501.175	236823.139	169251.917	236795.473	0	a 1	a31
172943.786	230984.566	172730.132	231087.475	0	a 2	b33
172730.132	231087.475	172487.977	231043.026	0	a 2	a94
172487.977	231043.026	172606.485	230777.016	0	a 2	b30
172606.485	230777.016	172683.106	230740.154	0	a 2	b99
172683.106	230740.154	172829.738	230784.794	0	a 2	c 0

The first several lines of each section of output file LBL99-YMESH are shown below as written.

LBL99-YMESH:

```
$elc
% 1Aa_1 tcw11  2.332000e+05  1.693986e+05  2.366236e+05  1.626096e+03
% 12a_1 tcw12  3.244000e+06  1.693986e+05  2.366236e+05  1.606466e+03
% 1Ba_1 tcw12  3.244000e+06  1.693986e+05  2.366236e+05  1.569837e+03
% 21a_1 ptn21  6.724000e+05  1.693986e+05  2.366236e+05  1.547726e+03
% 22a_1 ptn22  1.502000e+06  1.693986e+05  2.366236e+05  1.535453e+03
% 23a_1 ptn23  1.238000e+06  1.693986e+05  2.366236e+05  1.519984e+03
% 24a_1 ptn24  2.919000e+06  1.693986e+05  2.366236e+05  1.496516e+03
% 25a_1 ptn25  2.684000e+06  1.693986e+05  2.366236e+05  1.464887e+03
% 2Ca_1 ptn25  2.684000e+06  1.693986e+05  2.366236e+05  1.434582e+03

$con
% 22a_1 21a_1  3  8.477300e+00  3.796300e+00  8.856600e+04  -1.000000e+00
% 21a_1 1Ba_1  3  3.796300e+00  1.831400e+01  8.856600e+04  -1.000000e+00
% 1Ba_1 12a_1  3  1.831400e+01  1.831400e+01  8.856600e+04  -1.000000e+00
% 12a_1 1Aa_1  3  1.831400e+01  1.316300e+00  8.856600e+04  -1.000000e+00
% 23a_1 22a_1  3  6.991500e+00  8.477300e+00  8.856600e+04  -1.000000e+00
% 24a_1 23a_1  3  1.647700e+01  6.991500e+00  8.856600e+04  -1.000000e+00
% 25a_1 24a_1  3  1.515200e+01  1.647700e+01  8.856600e+04  -1.000000e+00
% 2Ca_1 25a_1  3  1.515200e+01  1.515200e+01  8.856600e+04  -1.000000e+00
% 26a_1 2Ca_1  3  6.048700e+00  1.515200e+01  8.856600e+04  -1.000000e+00

$vertices
 169251.92  236795.47  169201.03  236473.21  0.00  3601  1*
 169201.03  236473.21  169428.63  236411.34  0.00  3601  3714
 169428.63  236411.34  169501.17  236823.14  0.00  3601  3702
 169501.17  236823.14  169251.92  236795.47  0.00  3601  3631
 172943.79  230984.57  172730.13  231087.48  0.00  3602  3733
 172730.13  231087.48  172487.98  231043.03  0.00  3602  3694
 172487.98  231043.03  172606.48  230777.02  0.00  3602  3730
 172606.48  230777.02  172683.11  230740.15  0.00  3602  3799
 172683.11  230740.15  172829.74  230784.79  0.00  3602  3800
```

By visual inspection it was clear that all the information from the ELEME section of tspa99_primary_mesh was entered unchanged into the $elc section of LBL99-YMESH

except the blank character in the middle of element names, like "22a 1," had been replaced by an underscore. Also, by inspection, it was clear that the first seven fields of information from the CONNE section of tspa99_primary_mesh had been transferred to the $con section of LBL99-YMESH without major change except for the blank-to-underscore change in element names. The last 3 columns of CONNE information were eliminated because they were not needed in the output file. Finally, by inspection it was observed that the (x,y) edge vertex coordinates and succeeding zero value from UZ99_3.grid were not modified in transfer to the $vertices section of LBL99-YMESH, but the names of the two columns separated by the edge, such as "a 1" and "B-1" in the first row of $vertices, had been *converted to integers* as required by YMESH. YMESH was able to read LBL99-YMESH as input and to draw an image of the mesh which was in agreement with other pictures of Yucca Mountain coring meshes. Therefore, it was concluded that rme6 was performing the task of converting data format for the range of parameters in files tspa99_primary_mesh and UZ99_3.grd in the expected manner to a correct YMESH world view.

ATTACHMENT III SOFTWARE ROUTINE DOCUMENTATION FOR NUFT PRE-PROCESSOR: COVER V1.1

ROUTINE IDENTIFICATION

This attachment describes the issue of routine: COVER V1.1. This routine was developed using MATLAB V. 5.2.0.3084 for Sun. COVER was run on a Sun Ultra 2 workstation with SunOS 5.5.1 operating system. The source code for this routine is "cover.m" (Attachment I).

ROUTINE PURPOSE AND VALIDATION

The purpose of this routine is to develop a block model of the repository from information contained in the input file: "dft1.dat" (Attachment I) which is listed in Table III-2. The output of this routine contains the edges of the block model in the file "shape1.dat" (Attachment I), which is listed in Table III-1. The resulting repository block model is intended to have a similar area to the original layout. The block model is used to develop infiltration rates over the repository footprint.

RANGE OF VALIDATION

This routine is limited to developing a block model from information in the file: "shape1.dat" (Attachment I). Validation is achieved by verifying that the objective of the code (i.e., similar footprint area) was achieved. The area outlined in "dft1.dat" (Attachment I) is calculated and compared to the area contained in the block model ("shape1.dat").

Table III-1. Area of Repository Block Model

Easting	Northing	Equation III-1
171368.06	235822.06	4303909
170422.51	235872.29	-121804376
170343.91	234392.62	-125402076
170205.80	234399.95	-195258392
170083.53	232098.24	-196365687
170221.63	232090.90	-28610852
170204.16	231762.08	-32257943
171149.71	231711.85	347432200
171368.06	235822.06	352179357
	Total area:	4216139

APPROACH

The exact area of a solid by coordinates is found by the following equation:

$$Area = \frac{1}{2} \cdot [x_1(y_2 - y_{(n)}) + x_2(y_3 - y_1) + \ldots + x_{(n)}(y_1 - y_{(n-1)})] \qquad \text{(Eq. III-1)}$$

where

$Area$ = area enclosed by coordinates
x = x coordinate
y = y coordinate

n = last point of figure
Source: (Hartman 1992, p. A-37)

The routine is verified by finding the area of the repository using Equation III-1. The routine predicted an area of 4,216,139 ft^2 (see Table III-1), and the actual area is 4,310,041 ft^2 (see Table III-2). This is an error of less than three percent which is acceptable for the thermal-hydrologic modeling application. Therefore, cover provides the correct results over the range of input parameters in the input file dft1.dat. This documents the accuracy of this routine, and the routine is therefore valid for its intended use.

Table III-2. Actual Area of Repository in Square Feet

Table listed in next page

East Boundary		West Boundary		from Equation III-1		
Northing	Easting	Northing	Easting	East pts	West pts	
235997.80	170544.61	235732.05	171362.51	19825810.91	26327279.22	
235964.55	170515.90	235690.53	171359.24	-8505333.09	10680821.43	
235898.04	170458.47	235607.39	171353.01	-12019879	14298551.92	
235823.52	170425.70	235523.64	171348.62	-13295761	14349590.18	
235742.01	170414.44	235439.90	171344.23	-14059191.3	14348365.82	
235658.52	170409.28	235356.16	171339.84	-14227470.8	14347998.2	
235575.03	170404.11	235272.42	171335.46	-14227039.1	14348488.1	
235491.54	170398.95	235188.67	171331.07	-14226608.3	14348120.46	
235408.05	170393.78	235104.93	171326.68	-14226176.7	14346896.18	
235324.56	170388.62	235021.19	171322.29	-14225745.9	14346528.56	
235241.07	170383.45	234937.45	171317.90	-14238944.9	14347017.54	
235157.42	170378.77	234853.70	171313.51	-14259851.2	14346649.89	
235073.68	170374.38	234769.96	171309.12	-14267150.6	14345425.71	
234989.94	170369.99	234686.22	171304.73	-14267634.8	14345058.09	
234906.19	170365.60	234602.48	171300.35	-14267267.2	14345547.81	
234822.45	170361.21	234518.73	171295.96	-14266047.7	14345180.17	
234738.71	170356.83	234434.99	171291.57	-14265680.9	14343956.07	
234654.97	170352.44	234351.25	171287.18	-14266165.1	14343588.45	
234571.22	170348.05	234267.51	171282.79	-14120149.9	14344077.25	
234489.19	170338.41	234183.76	171278.40	-13495060.5	14343709.61	
234412.77	170311.48	234100.02	171274.01	-12918977.3	14342485.6	
234337.48	170281.06	234016.28	171269.62	-12819609.6	14342117.98	
234262.20	170250.64	233932.54	171265.24	-12817319.4	14342607.52	
234186.91	170220.23	233848.79	171260.85	-12985250.2	14342239.88	
234109.63	170195.95	233765.05	171256.46	-13568021.1	14341015.96	
234027.47	170186.69	233681.31	171252.07	-13998706.2	14340648.34	
233945.12	170178.03	233597.57	171247.68	-14015011.7	14341136.96	
233862.76	170169.37	233513.82	171243.29	-14014298.5	14340769.32	
233780.41	170160.72	233430.08	171238.90	-14013586.1	14339545.49	
233698.05	170152.06	233346.34	171234.51	-14013723.7	14339177.87	
233615.69	170143.41	233262.60	171230.13	-14012160.5	14339667.24	
233533.34	170134.75	233178.85	171225.74	-14011447.3	14339299.6	
233450.98	170126.10	233095.11	171221.35	-14010735	14338075.85	
233368.63	170117.44	233011.37	171216.96	-14010021.8	14337708.23	
233286.27	170108.78	232927.63	171212.57	-14010159.1	14338196.67	
233203.91	170100.13	232843.88	171208.18	-14008596.2	14337829.03	
233121.56	170091.47	232760.14	171203.79	-14007883	14336605.37	
233039.20	170082.82	232676.40	171199.40	-14007170.6	14336237.76	
232956.85	170074.16	232592.66	171195.02	-14006457.4	14335870.97	
232874.49	170065.50	232508.92	171190.63	-14006594.6	14336359.31	
232792.13	170056.85	232425.17	171186.24	-14317086.2	14335991.67	
232706.11	170059.48	232341.43	171181.85	-14949078.6	14334768.12	
232616.32	170073.70	232257.69	171177.46	-15270917.5	14334400.5	
232526.53	170087.93	232173.95	171173.07	-15272195.2	14334888.75	
232436.74	170102.15	232090.20	171168.68	-15273472	14334521.11	
232346.95	170116.37	232006.46	171164.29	-15274748.9	14333297.64	
232257.16	170130.59	231922.72	171159.91	-15276025.7	14332930.86	
232167.37	170144.81	231838.98	171155.52	-15277302.5	14333419.02	
232077.58	170159.03	231755.23	171151.13	-15277728.5	14333051.38	
231987.80	170173.25	231671.49	171146.74	-15279005.3	14331828.01	
231898.01	170187.47	231587.75	171142.35	-11461275.2	10748595.29	
231853.11	170194.58	231545.88	171140.16	-29965308.7	-22706876.4	Total Area
			SUM:	-709051221	713361261.6	4310040.8

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ATTACHMENT IV SOFTWARE ROUTINE DOCUMENTATION FOR NUFT PRE-PROCESSOR: COLUMNINFILTRATION V1.1

ROUTINE IDENTIFICATION

This Attachment describes the issue of software routine: COLUMNINFILTRATION V1.1. This routine was developed and compiled using the C++ vSC4.2. COLUMNINFILTRATION was run on a Sun Ultra 2 workstation with SunOS 5.5.1 operating system. The source code for this routine is file "columninfiltration.c" (Attachment I).

ROUTINE PURPOSE

The purpose of this routine is to calculate the infiltration at a given location using a Gaussian interpolation method.

GAUSSIAN WEIGHTING FUNCTION

The Gaussian weighting function is:

$$I = \sum_{i=1}^{n} I_i \cdot W_i \qquad \text{(Eq IV-1)}$$

where

$$W = e^{-\left[\left(\frac{D}{Scale}\right)^2\right]} \qquad \text{(Eq IV-2)}$$

and
- I = Interpolated infiltration
- I_i = Value at point i, d meters away
- D_i = Plan distance between points.
- n = Number of points in data set
- W = Calculated weight assigned to each value (W=Wi)
- Scale = Effective radius of influence (Scale = 20ft)

Source: (Isaaks and Srivastava 1989, p. 208) and (Kitanidis 1997, p. 54)

The specific files used for this calculation are included in the electronic submittal described in Attachment I, and are follows:

Glaciall.NV
Glacialm.NV
Glacialu.NV
Monsoonl.NV
Monsoonm.NV
Monsoonu.NV
yml.NV
ymm.NV
ymu.NV
column.data

VALIDATION TEST CASE

Documentation of the accuracy of this routine is in the form of a test case. The test case involves the interpolation of the infiltration rate at an arbitrary reference location (242000N, 168000E) given infiltration rates at five various points. The input files for the test case are "columninfiltration_tst.NV" and "columninfiltration_tst.dat" (Attachment I). The output file from this test case is "columninfiltration_tst.out" (Attachment I). The hand calculation that verifies the accuracy of the test case is in Table IV-1. The routine is determined to be valid for its intended use.

Table IV-1. Calculation of Infiltration Using the Gaussian Method.

Reference Northing:	242000			
Reference Easting:	168000			
Data				
~~Northing~~	~~Easting~~	~~Weight~~	~~Infiltration~~	~~W_i * Infiltraiton$_i$~~
168192.021	242645.935	1.3001E-79	1.9472	2.5316E-79
168222.029	242645.830	9.5302E-82	1.2331	1.1752E-81
168252.037	242645.725	3.3991E-84	0.0000	0.0000E+00
168282.045	242645.621	5.8986E-87	0.4531	2.6727E-87
168312.053	242645.516	4.9805E-90	0.5400	2.6896E-90
	Sum:	1.3097E-79	Sum:	2.5433E-79
Estimated Infiltration				
1.9419	(= quotient of the sums)			

Notes:

A. The northing values, easting values, and infiltration rates were selected from file: "Glaciall.NV" (Attachment I).

B. The weight is found using Equation IV-2.

The test case was run and the predicted infiltration rate is 1.941933 (Attachment I; file: "columninfiltration_tst.out"). Therefore, ColumnInfiltration is qualified over the range of input parameters in the input file column.data and the nine input files *.NV. This documents the accuracy of this routine for predicting infiltration rates at given points.

ATTACHMENT V SOFTWARE ROUTINE DOCUMENTATION FOR NUFT PRE-PROCESSORS: CHIM_SURF_TP V1.1 AND CHIM_WT_TP V1.1

ROUTINE IDENTIFICATION

This attachment describes the initial issue of routines: CHIM_SURF_TP V1.1 and CHIM_WT_TP V1.1. These routines were developed and compiled using f77 v SC4.2. The source codes are "chim_surf_TP.f" and "chim_wt_TP.f" (Attachment I).

CHIM_SURF_TP and CHIM_WT_TP are classified as routines per AP-SI.1Q, and are qualified by this Attachment. They were run on a Sun Ultra 2 workstation with the SunOS 5.5.1 operating system.

ROUTINE PURPOSE AND DESCRIPTION

The purpose of the routines is to interpolate the temperature and pressure at the ground surface and at the water table for a given X-Y location using an inverse distance method. The specific input files used for this calculation are: "tspa99_primary_mesh", "bcs99.dat", and "column.data" (Attachment I).

INVERSE DISTANCE CUBED METHOD

The inverse distance cubed function is:

$$V = \frac{\sum_{i=1}^{n} V_i \cdot \frac{1}{d_i^{\,3}}}{\sum_{i=1}^{n} \frac{1}{d_i^{\,3}}} \qquad \text{(Eq. V-1)}$$

where V = Value of interest at a given point
V_i = Value at point i, d_i meters away
d_i = Plan distance between points.
n = Number of points in data set

VALIDATION TEST CASE

Documentation of the accuracy of this routine is in the form of a test case. The test case is the interpolation of temperature at an arbitrary location (170000N, 230000E) given five temperatures at various locations. The hand calculation that verifies the accuracy of the test case is in Table V-1. Due to the reduction in file size and changes in format, minor changes were made to CHIM_SURF_TP to execute the test case. The modified source code ("chim_surf_bc_tst.f") is in Attachment I and is used to execute the test case for both "chim_surf_TP.f" and "chim_wt_TP.f" (which are equivalent routines). The input file for the test case is "chim_test" and the output file is "chim_out".

Table V-1. Calculation of Temperature Using Inverse Distance Cubed Method.

Reference Northing:	170000			
Reference Easting:	230000			
Data				
Northing	Easting	1/(distance^3)	Temperature	T_i / (distance^3)
169398.601	236623.643	3.39908E-12	14.27	4.85048E-11
172705.438	230904.031	4.30854E-11	18.62	8.0225E-10
168909.656	233244.625	2.49348E-11	17.00	4.23892E-10
171465.906	237975.359	1.87545E-12	16.89	3.16763E-11
172320.452	237217.733	2.29468E-12	17.53	4.02258E-11
	Sum:	7.55894E-11	Sum:	1.34655E-09
Estimated Temperature:				
17.8140	(= quotient of the sums)			

Notes:

A. The northing and easting values were randomly selected from file: "tspa99_primary_mesh" (Attachment I).

B. Temperatures were randomly selected from "bcs99.txt" (Attachment I).

C. The distance is between each point and the reference location.

The test case was run and the predicted temperature is 17.8140°C (Attachment I, file: "chim_out") which is identical to the estimated temperature calculated in Table V-1. .

The same interpolation is done for temperature and pressure in both routines, and therefore it is reasonable to consider the pressure to be validated as well. The routines, Chim_Surf_TP v1.0 and Chim_wt_TP v1.0, are essentially identical but read in different segments of data in bcs_99.dat for surface and water table respectively. The output files for both Chim_Surf_TP v1.0 and Chim_wt_TP v1.0 were checked against the input values and were found to be consistent. This test case therefore documents the accuracy of both Chim-Surft TP v1.0 and Chim_wt_TP v1.0 for predicting temperature and pressure at given points over the range of input parameter in the input files used (tspa99_primary_mesh, bcs_99.dat, and column.data).

ATTACHMENT VI SOFTWARE ROUTINE DOCUMENTATION FOR NUFT POST PROCESSOR: MYPLOT V1.1

ROUTINE DESCRIPTION

MYPLOT V1.1 is a software routine developed to operate within industry-standard software MATLAB V. 5.2.0.3084 for Sun. The routine was written in the MATLAB language for technical computing. The purpose of this routine is to sort a set of NUFT output data and to produce tables of fluxes between zones in the model domain.

As described in the text of this report, the domain for 2-D NUFT "chimney" models was divided into 6 sub-domains or zones, plus a boundary "Zone 0" to capture evaporation and chemical alteration processes taking place in key areas. The results of gas and liquid fluxes from NUFT modeling were listed for each of the 7 zones in separate files. These files were used as inputs to the MYPLOT routine, and they are listed below:

Files for Liquid Flux Data	**(Associated Zone)**
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_0_1.dat	(Zone 0: Far-field host rock)
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_1_2.dat	(Zone 1: Host rock above mid-plane)
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_2_3.dat	(Zone 2: Host rock at drift wall)
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_3_4.dat	(Zone 3: Backfill above spring line)
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_3_5.dat	(Zone 4: Backfill at drip shield)
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_4_5.dat	(Zone 5: Lower backfill)
l4c4-LDTH60-1Dds_mc-ui-01.Lflux_5_6.dat	(Zone 6: Invert)
Files for Gas Flux Data	**(Associated Zone)**
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_0_1.dat	(Zone 0: Far-field host rock)
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_1_2.dat	(Zone 1: Host rock above mid-plane)
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_2_3.dat	(Zone 2: Host rock at drift wall)
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_3_4.dat	(Zone 3: Backfill above spring line)
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_3_5.dat	(Zone 4: Backfill at drip shield)
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_4_5.dat	(Zone 5: Lower backfill)
l4c4-LDTH60-1Dds_mc-ui-01.Gflux_5_6.dat	(Zone 6: Invert)

Base on the input files list above, the MYPLOT routine sorts out the gas and liquid flux data for all zones and generates an output file (file: "l4c4-LDTH60-1Dds_mc-ui-flux") that contains a summary table of data of fluxes between zones. Table VI-1 shows a listing of the routine MYPLOT. An example set of input files for the routine are provided in Tables VI-2 through VI-15. The resulting output file is listed in Table VI-16.

Validation of the MYPLOT routine was performed by manually checking the input and output files. The following example is intended to illustrate the relationship of the input and output files. In this case, the input file for liquid fluxes in Zone 0 (l4c4-LDTH60-1Dds_mc-ui-01.Lflux_0_1.dat, Table VI-2) as input data.

In Table VI-2, the liquid fluxes in kg/s are listed for 416 time-steps ranging from 50 to 1,000,000 years (from 1.578e+09 s to 3.156e+13 s). The MYPLOT routine translates the time in seconds (s) to years using the relation of 1 years = (365.25*86400) seconds. For example the first time-step in Table VI-2 is 1.578e+09 s. This was converted into 5.0003803E+01 years and is shown in the output file in Table VI-16. This was done for all the 416 time-steps

For the flux values, the 24th time-step was randomly chosen to show the process. In Table VI-2, for the 24th time-step (time = 1.581e+09 s or 5.0098867E+01 years in Table VI-16), the liquid flux value is 3.185e-05 (kg/s). This flux value was copied to the output file (Table VI-16) in the 24th row in column A. After this process was repeated for all the liquid and gas fluxes for all zones, a summary table was completed (Table VI-16). The following list explains the output data in Table VI-16:

Column	**Content**
First Column	Time Index
Second Column	Time in seconds
Column A	Liquid Flux for Zone 0 (From Table VI-2)
Column B	Liquid Flux for Zone 1 (From Table VI-3)
Column C	Liquid Flux for Zone 2 (From Table VI-4)
Column D	Liquid Flux for Zone 3 (From Table VI-5)
Column E	Liquid Flux for Zone 4 (From Table VI-6)
Column F	Liquid Flux for Zone 5 (From Table VI-7)
Column G	Liquid Flux for Zone 6 (From Table VI-8)
Column H	Gas Flux for Zone 0 (From Table VI-9)
Column I	Gas Flux for Zone 1 (From Table VI-10)
Column J	Gas Flux for Zone 2 (From Table VI-11)
Column K	Gas Flux for Zone 3 (From Table VI-12)
Column L	Gas Flux for Zone 4 (From Table VI-13)
Column M	Gas Flux for Zone 5 (From Table VI-14)
Column N	Gas Flux for Zone 6 (From Table VI-15)

Each data value in the output file was manually checked and compared against the input data. It was found that all the output data were in agreement with the input data. Therefore, the software routine MYPLOT V1.1 was validated for its intended use.

This routine provides correct results for any output file set generated by NUFT V3.0s, for simulation problems that include zoning of grid blocks. The zone-to-zone liquid and gas-phase water fluxes must be written to output files by NUFT, according to specific instructions in the NUFT input file.

Table VI-1 Program Listing for Software Routine MYPLOT V1.1

```
clear
infil=input('Infiltration: l=Low; m=Median; u=Upper ', 's');
if infil == 'l'
   catenamel='-1Dds_li-';
elseif infil == 'm'
   catenamel='-1Dds_mi-';
elseif infil == 'u'
   catenamel='-1Dds_ui-';
end

catenamel='00.Lflux_';
catenameg='00.Gflux_';
loc=input('Location = ', 's');
AML=input('AML = ', 's');

casename = strcat(loc,'-LDTH',AML,catenamel,'flux.exl')

% Open data files
Lflux01=strcat(loc,'-LDTH',AML,catenamel,catenamel,'0_1.dat');
fid_L01 = fopen(Lflux01, 'rt');
Lflux12=strcat(loc,'-LDTH',AML,catenamel,catenamel,'1_2.dat');
fid_L12 = fopen(Lflux12, 'rt');
Lflux23=strcat(loc,'-LDTH',AML,catenamel,catenamel,'2_3.dat');
fid_L23 = fopen(Lflux23, 'rt');
Lflux34=strcat(loc,'-LDTH',AML,catenamel,catenamel,'3_4.dat');
fid_L34 = fopen(Lflux34, 'rt');
Lflux35=strcat(loc,'-LDTH',AML,catenamel,catenamel,'3_5.dat');
fid_L35 = fopen(Lflux35, 'rt');
Lflux45=strcat(loc,'-LDTH',AML,catenamel,catenamel,'4_5.dat');
fid_L45 = fopen(Lflux45, 'rt');
Lflux56=strcat(loc,'-LDTH',AML,catenamel,catenamel,'5_6.dat');
fid_L56 = fopen(Lflux56, 'rt');

Gflux01=strcat(loc,'-LDTH',AML,catenamel,catenameg,'0_1.dat');
fid_G01 = fopen(Gflux01, 'rt');
Gflux12=strcat(loc,'-LDTH',AML,catenamel,catenameg,'1_2.dat');
fid_G12 = fopen(Gflux12, 'rt');
Gflux23=strcat(loc,'-LDTH',AML,catenamel,catenameg,'2_3.dat');
fid_G23 = fopen(Gflux23, 'rt');
Gflux34=strcat(loc,'-LDTH',AML,catenamel,catenameg,'3_4.dat');
fid_G34 = fopen(Gflux34, 'rt');
Gflux35=strcat(loc,'-LDTH',AML,catenamel,catenameg,'3_5.dat');
fid_G35 = fopen(Gflux35, 'rt');
Gflux45=strcat(loc,'-LDTH',AML,catenamel,catenameg,'4_5.dat');
fid_G45 = fopen(Gflux45, 'rt');
Gflux56=strcat(loc,'-LDTH',AML,catenamel,catenameg,'5_6.dat');
fid_G56 = fopen(Gflux56, 'rt');

%%% Open Liquid files
        while 1,
            comment = fscanf(fid_L01,'%s',1);
            if (size(comment,2) == size('(kg/s)',2))
               if (comment == '(kg/s)')
```

```
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_L12,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_L23,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_L34,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_L35,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_L45,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_L56,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end

%%% Scan Gas files
    while 1,
        comment = fscanf(fid_G01,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
```

```
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_G12,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_G23,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_G34,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_G35,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_G45,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end
    while 1,
        comment = fscanf(fid_G56,'%s',1);
        if (size(comment,2) == size('(kg/s)',2))
            if (comment == '(kg/s)')
                break
            end
        end
    end

%% Read real data
    i = 0;
    while 1,
```

```
        i = i+1;
                [data01, count] = fscanf(fid_L01,'%e',2);
                [data12, count] = fscanf(fid_L12,'%e',2);
                [data23, count] = fscanf(fid_L23,'%e',2);
                [data34, count] = fscanf(fid_L34,'%e',2);
                [data35, count] = fscanf(fid_L35,'%e',2);
                [data45, count] = fscanf(fid_L45,'%e',2);
                [data56, count] = fscanf(fid_L56,'%e',2);

                [datag01, count] = fscanf(fid_G01,'%e',2);
                [datag12, count] = fscanf(fid_G12,'%e',2);
                [datag23, count] = fscanf(fid_G23,'%e',2);
                [datag34, count] = fscanf(fid_G34,'%e',2);
                [datag35, count] = fscanf(fid_G35,'%e',2);
                [datag45, count] = fscanf(fid_G45,'%e',2);
                [datag56, count] = fscanf(fid_G56,'%e',2);
                if (count == 0)
                    break
                end
                tt(i) = data01(1);
              flux_L01(i)=data01(2);
              flux_L12(i)=data12(2);
              flux_L23(i)=data23(2);
              flux_L34(i)=data34(2);
              flux_L35(i)=data35(2);
              flux_L45(i)=data45(2);
              flux_L56(i)=data56(2);

              flux_G01(i)=datag01(2);
              flux_G12(i)=datag12(2);
              flux_G23(i)=datag23(2);
              flux_G34(i)=datag34(2);
              flux_G35(i)=datag35(2);
              flux_G45(i)=datag45(2);
              flux_G56(i)=datag56(2);
        end
        st=fclose('all');
        t=tt/365.25/86400;
%%% Plot Data

fluxtab=[t' flux_L01' flux_L12' flux_L23' flux_L34' flux_L35' flux_L45'
flux_L56' ...
            flux_G01' flux_G12' flux_G23' flux_G34' flux_G35' flux_G45'
flux_G56'];

save casename fluxtab -ascii

subplot(211)
semilogx(t, flux_L01,t, flux_L12,t, flux_L23,t, flux_L34,t, flux_L35,
t, flux_L45, t, flux_L56)
ylabel('Liquid Flux, kg/s')
subplot(212)
semilogx(t, flux_G01,t, flux_G12,t, flux_G23,t, flux_G34,t, flux_G35,
t, flux_G45, t, flux_G56)
legend('0-->1','1-->2','2-->3','3-->4','3-->5','4-->5','5-->6')
ylabel('Gas Flux, kg/s')
xlabel('Time, years')
```

Table VI-2. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Lflux_0_1.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:11 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.liquid summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00	40	1.596e+09	3.173e-05	79	1.628e+09	3.170e-05
2	1.578e+09	3.161e-05	41	1.597e+09	3.173e-05	80	1.629e+09	3.170e-05
3	1.578e+09	3.161e-05	42	1.598e+09	3.172e-05	81	1.629e+09	3.170e-05
4	1.578e+09	3.162e-05	43	1.599e+09	3.171e-05	82	1.630e+09	3.170e-05
5	1.578e+09	3.162e-05	44	1.600e+09	3.171e-05	83	1.631e+09	3.171e-05
6	1.578e+09	3.162e-05	45	1.600e+09	3.171e-05	84	1.633e+09	3.171e-05
7	1.578e+09	3.162e-05	46	1.601e+09	3.170e-05	85	1.635e+09	3.172e-05
8	1.578e+09	3.162e-05	47	1.601e+09	3.170e-05	86	1.637e+09	3.172e-05
9	1.578e+09	3.162e-05	48	1.602e+09	3.170e-05	87	1.641e+09	3.173e-05
10	1.578e+09	3.162e-05	49	1.603e+09	3.169e-05	88	1.642e+09	3.174e-05
11	1.578e+09	3.162e-05	50	1.603e+09	3.169e-05	89	1.643e+09	3.174e-05
12	1.578e+09	3.162e-05	51	1.604e+09	3.169e-05	90	1.645e+09	3.174e-05
13	1.578e+09	3.162e-05	52	1.604e+09	3.169e-05	91	1.647e+09	3.175e-05
14	1.578e+09	3.163e-05	53	1.604e+09	3.169e-05	92	1.649e+09	3.175e-05
15	1.578e+09	3.163e-05	54	1.605e+09	3.169e-05	93	1.651e+09	3.176e-05
16	1.578e+09	3.165e-05	55	1.605e+09	3.169e-05	94	1.653e+09	3.177e-05
17	1.579e+09	3.166e-05	56	1.606e+09	3.169e-05	95	1.654e+09	3.177e-05
18	1.579e+09	3.170e-05	57	1.606e+09	3.168e-05	96	1.655e+09	3.177e-05
19	1.579e+09	3.171e-05	58	1.607e+09	3.168e-05	97	1.657e+09	3.178e-05
20	1.579e+09	3.175e-05	59	1.608e+09	3.168e-05	98	1.658e+09	3.178e-05
21	1.580e+09	3.178e-05	60	1.609e+09	3.168e-05	99	1.660e+09	3.179e-05
22	1.580e+09	3.180e-05	61	1.610e+09	3.168e-05	100	1.663e+09	3.179e-05
23	1.580e+09	3.183e-05	62	1.610e+09	3.168e-05	101	1.666e+09	3.180e-05
24	1.581e+09	3.185e-05	63	1.610e+09	3.168e-05	102	1.669e+09	3.181e-05
25	1.581e+09	3.186e-05	64	1.611e+09	3.168e-05	103	1.672e+09	3.182e-05
26	1.582e+09	3.187e-05	65	1.611e+09	3.168e-05	104	1.677e+09	3.184e-05
27	1.583e+09	3.187e-05	66	1.612e+09	3.168e-05	105	1.682e+09	3.185e-05
28	1.583e+09	3.187e-05	67	1.613e+09	3.168e-05	106	1.687e+09	3.187e-05
29	1.584e+09	3.187e-05	68	1.614e+09	3.168e-05	107	1.692e+09	3.189e-05
30	1.585e+09	3.185e-05	69	1.615e+09	3.168e-05	108	1.698e+09	3.191e-05
31	1.587e+09	3.183e-05	70	1.616e+09	3.168e-05	109	1.704e+09	3.193e-05
32	1.588e+09	3.182e-05	71	1.617e+09	3.168e-05	110	1.710e+09	3.195e-05
33	1.590e+09	3.180e-05	72	1.618e+09	3.168e-05	111	1.716e+09	3.197e-05
34	1.592e+09	3.177e-05	73	1.620e+09	3.168e-05	112	1.722e+09	3.199e-05
35	1.593e+09	3.176e-05	74	1.622e+09	3.168e-05	113	1.726e+09	3.200e-05
36	1.594e+09	3.175e-05	75	1.624e+09	3.169e-05	114	1.730e+09	3.201e-05
37	1.595e+09	3.175e-05	76	1.625e+09	3.169e-05	115	1.736e+09	3.203e-05
38	1.595e+09	3.174e-05	77	1.626e+09	3.169e-05	116	1.742e+09	3.205e-05
39	1.596e+09	3.174e-05	78	1.628e+09	3.170e-05	117	1.749e+09	3.208e-05

118	1.753e+09	3.209e-05
119	1.757e+09	3.210e-05
120	1.762e+09	3.212e-05
121	1.768e+09	3.214e-05
122	1.775e+09	3.217e-05
123	1.782e+09	3.219e-05
124	1.786e+09	3.221e-05
125	1.789e+09	3.222e-05
126	1.792e+09	3.223e-05
127	1.796e+09	3.224e-05
128	1.801e+09	3.226e-05
129	1.807e+09	3.228e-05
130	1.813e+09	3.230e-05
131	1.818e+09	3.232e-05
132	1.826e+09	3.235e-05
133	1.835e+09	3.238e-05
134	1.842e+09	3.241e-05
135	1.846e+09	3.242e-05
136	1.850e+09	3.244e-05
137	1.854e+09	3.245e-05
138	1.859e+09	3.247e-05
139	1.866e+09	3.249e-05
140	1.874e+09	3.252e-05
141	1.883e+09	3.255e-05
142	1.890e+09	3.258e-05
143	1.893e+09	3.259e-05
144	1.896e+09	3.260e-05
145	1.900e+09	3.261e-05
146	1.906e+09	3.263e-05
147	1.915e+09	3.266e-05
148	1.927e+09	3.270e-05
149	1.940e+09	3.274e-05
150	1.954e+09	3.279e-05
151	1.960e+09	3.281e-05
152	1.966e+09	3.283e-05
153	1.975e+09	3.286e-05
154	1.986e+09	3.289e-05
155	2.002e+09	3.295e-05
156	2.017e+09	3.299e-05
157	2.029e+09	3.303e-05
158	2.041e+09	3.306e-05
159	2.054e+09	3.310e-05
160	2.074e+09	3.315e-05
161	2.082e+09	3.318e-05
162	2.091e+09	3.320e-05
163	2.102e+09	3.323e-05
164	2.117e+09	3.328e-05
165	2.142e+09	3.335e-05
166	2.175e+09	3.344e-05
167	2.215e+09	3.354e-05
168	2.271e+09	3.368e-05
169	2.341e+09	3.385e-05
170	2.346e+09	3.386e-05
171	2.352e+09	3.387e-05
172	2.364e+09	3.390e-05
173	2.388e+09	3.396e-05
174	2.432e+09	3.405e-05
175	2.507e+09	3.420e-05
176	2.512e+09	3.421e-05
177	2.517e+09	3.422e-05
178	2.527e+09	3.424e-05
179	2.549e+09	3.428e-05
180	2.592e+09	3.437e-05
181	2.604e+09	3.439e-05
182	2.617e+09	3.442e-05
183	2.643e+09	3.447e-05
184	2.694e+09	3.456e-05
185	2.722e+09	3.459e-05
186	2.749e+09	3.464e-05
187	2.803e+09	3.471e-05
188	2.897e+09	3.479e-05
189	3.037e+09	3.487e-05
190	3.156e+09	3.491e-05
191	3.338e+09	3.505e-05
192	3.600e+09	3.527e-05
193	3.931e+09	3.535e-05
194	4.299e+09	3.512e-05
195	4.581e+09	3.478e-05
196	4.864e+09	3.450e-05
197	5.232e+09	3.437e-05
198	5.759e+09	3.422e-05
199	5.954e+09	3.415e-05
200	6.052e+09	3.412e-05
201	6.150e+09	3.409e-05
202	6.312e+09	3.402e-05
203	6.503e+09	3.399e-05
204	6.867e+09	3.397e-05
205	7.485e+09	3.391e-05
206	7.935e+09	3.386e-05
207	8.047e+09	3.386e-05
208	8.160e+09	3.385e-05
209	8.392e+09	3.385e-05
210	8.838e+09	3.385e-05
211	9.302e+09	3.384e-05
212	9.467e+09	3.383e-05
213	9.931e+09	3.383e-05
214	1.020e+10	3.383e-05
215	1.046e+10	3.382e-05
216	1.065e+10	3.382e-05
217	1.084e+10	3.386e-05
218	1.102e+10	3.381e-05
219	1.121e+10	3.380e-05
220	1.155e+10	3.380e-05
221	1.206e+10	3.378e-05
222	1.231e+10	3.377e-05
223	1.256e+10	3.375e-05
224	1.262e+10	3.376e-05
225	1.313e+10	3.372e-05
226	1.321e+10	3.372e-05
227	1.330e+10	3.373e-05
228	1.348e+10	3.370e-05
229	1.372e+10	3.369e-05
230	1.396e+10	3.367e-05
231	1.440e+10	3.364e-05
232	1.452e+10	3.365e-05
233	1.465e+10	3.362e-05
234	1.477e+10	3.363e-05
235	1.489e+10	3.360e-05
236	1.514e+10	3.358e-05
237	1.546e+10	3.356e-05
238	1.578e+10	3.353e-05
239	1.594e+10	3.352e-05
240	1.611e+10	3.352e-05
241	1.628e+10	3.349e-05
242	1.645e+10	3.347e-05
243	1.663e+10	3.346e-05
244	1.681e+10	3.344e-05
245	1.700e+10	3.342e-05
246	1.718e+10	3.341e-05
247	1.751e+10	3.338e-05
248	1.802e+10	3.333e-05
249	1.853e+10	3.328e-05
250	1.882e+10	3.329e-05
251	1.910e+10	3.580e-05
252	1.913e+10	3.604e-05
253	1.915e+10	3.632e-05
254	1.920e+10	3.703e-05
255	1.931e+10	3.895e-05
256	1.935e+10	3.977e-05
257	1.939e+10	4.066e-05
258	1.948e+10	4.261e-05
259	1.953e+10	4.382e-05
260	1.958e+10	4.504e-05
261	1.963e+10	4.627e-05
262	1.968e+10	4.748e-05
263	1.978e+10	4.969e-05
264	1.986e+10	5.124e-05
265	1.993e+10	5.265e-05
266	2.002e+10	5.416e-05
267	2.009e+10	5.518e-05
268	2.016e+10	5.608e-05
269	2.030e+10	5.748e-05
270	2.040e+10	5.831e-05
271	2.051e+10	5.899e-05
272	2.071e+10	5.991e-05
273	2.074e+10	6.004e-05
274	2.077e+10	6.017e-05
275	2.084e+10	6.041e-05
276	2.086e+10	6.048e-05
277	2.088e+10	6.055e-05
278	2.094e+10	6.069e-05
279	2.099e+10	6.081e-05
280	2.103e+10	6.092e-05
281	2.114e+10	6.110e-05
282	2.125e+10	6.126e-05
283	2.136e+10	6.137e-05
284	2.145e+10	6.146e-05
285	2.154e+10	6.152e-05
286	2.173e+10	6.160e-05
287	2.209e+10	6.169e-05
288	2.247e+10	6.175e-05
289	2.320e+10	6.178e-05
290	2.377e+10	6.179e-05
291	2.433e+10	6.179e-05
292	2.467e+10	6.179e-05
293	2.501e+10	6.179e-05
294	2.516e+10	6.179e-05
295	2.524e+10	6.178e-05
296	2.532e+10	6.179e-05
297	2.536e+10	6.178e-05
298	2.541e+10	6.178e-05
299	2.550e+10	6.178e-05
300	2.565e+10	6.178e-05
301	2.573e+10	6.178e-05
302	2.580e+10	6.178e-05
303	2.596e+10	6.178e-05
304	2.630e+10	6.177e-05
305	2.663e+10	6.176e-05
306	2.695e+10	6.176e-05

307	2.757e+10	6.175e-05
308	2.803e+10	6.174e-05
309	2.849e+10	6.172e-05
310	2.873e+10	6.172e-05
311	2.897e+10	6.171e-05
312	2.944e+10	6.170e-05
313	2.985e+10	6.169e-05
314	3.026e+10	6.168e-05
315	3.054e+10	6.168e-05
316	3.082e+10	6.167e-05
317	3.121e+10	6.166e-05
318	3.156e+10	6.165e-05
319	3.173e+10	6.165e-05
320	3.182e+10	6.165e-05
321	3.191e+10	6.165e-05
322	3.209e+10	6.164e-05
323	3.238e+10	6.164e-05
324	3.279e+10	6.163e-05
325	3.316e+10	6.163e-05
326	3.353e+10	6.161e-05
327	3.371e+10	6.161e-05
328	3.388e+10	6.160e-05
329	3.423e+10	6.159e-05
330	3.450e+10	6.158e-05
331	3.464e+10	6.158e-05
332	3.478e+10	6.157e-05
333	3.488e+10	6.157e-05
334	3.498e+10	6.157e-05
335	3.501e+10	6.156e-05
336	3.503e+10	6.156e-05
337	3.509e+10	6.156e-05
338	3.516e+10	6.156e-05
339	3.523e+10	6.156e-05
340	3.537e+10	6.155e-05
341	3.549e+10	6.155e-05
342	3.561e+10	6.154e-05
343	3.573e+10	6.154e-05
344	3.576e+10	6.154e-05
345	3.579e+10	6.154e-05
346	3.586e+10	6.153e-05
347	3.593e+10	6.153e-05
348	3.600e+10	6.153e-05
349	3.615e+10	6.152e-05
350	3.642e+10	6.151e-05
351	3.657e+10	6.151e-05
352	3.671e+10	6.150e-05
353	3.702e+10	6.150e-05
354	3.702e+10	6.150e-05
355	3.702e+10	6.150e-05
356	3.702e+10	6.150e-05
357	3.702e+10	6.149e-05
358	3.702e+10	6.149e-05
359	3.702e+10	6.149e-05
360	3.702e+10	6.148e-05
361	3.703e+10	6.149e-05
362	3.703e+10	6.149e-05
363	3.704e+10	6.149e-05
364	3.704e+10	6.149e-05
365	3.704e+10	6.149e-05
366	3.704e+10	6.148e-05
367	3.704e+10	6.149e-05
368	3.704e+10	6.149e-05
369	3.704e+10	6.149e-05
370	3.704e+10	6.149e-05
371	3.704e+10	6.149e-05
372	3.704e+10	6.149e-05
373	3.704e+10	6.149e-05
374	3.704e+10	6.149e-05
375	3.704e+10	6.149e-05
376	3.704e+10	6.149e-05
377	3.704e+10	6.149e-05
378	3.704e+10	6.149e-05
379	3.705e+10	6.149e-05
380	3.706e+10	6.149e-05
381	3.710e+10	6.149e-05
382	3.717e+10	6.149e-05
383	3.733e+10	6.148e-05
384	3.768e+10	6.147e-05
385	3.794e+10	6.146e-05
386	3.821e+10	6.146e-05
387	3.878e+10	6.144e-05
388	4.000e+10	6.141e-05
389	4.255e+10	6.133e-05
390	4.734e+10	6.121e-05
391	5.233e+10	6.111e-05
392	6.137e+10	6.099e-05
393	6.312e+10	6.103e-05
394	7.707e+10	1.028e-04
395	7.889e+10	1.041e-04
396	9.467e+10	1.047e-04
397	1.113e+11	1.045e-04
398	1.262e+11	1.047e-04
399	1.483e+11	1.047e-04
400	1.578e+11	1.049e-04
401	1.886e+11	1.048e-04
402	2.209e+11	1.049e-04
403	2.645e+11	1.049e-04
404	3.156e+11	1.050e-04
405	3.809e+11	1.051e-04
406	4.837e+11	1.049e-04
407	6.330e+11	1.049e-04
408	8.519e+11	1.050e-04
409	1.181e+12	1.050e-04
410	1.691e+12	1.050e-04
411	2.533e+12	1.051e-04
412	4.020e+12	1.051e-04
413	6.952e+12	1.051e-04
414	1.319e+13	1.052e-04
415	2.693e+13	1.052e-04
416	3.156e+13	1.052e-04

Table VI-3. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Lflux_1_2.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.liquid summed over connections
```

(The columns of sequential numbers are time step indices added by the author for reference.)

	time (s)	flux (kg/s)						
1	1.578e+09	0.000e+00	37	1.595e+09	3.690e-06	73	1.620e+09	3.766e-05
2	1.578e+09	9.833e-06	38	1.595e+09	3.751e-06	74	1.622e+09	3.752e-05
3	1.578e+09	1.209e-05	39	1.596e+09	3.825e-06	75	1.624e+09	3.688e-05
4	1.578e+09	1.291e-05	40	1.596e+09	3.935e-06	76	1.625e+09	3.660e-05
5	1.578e+09	1.245e-05	41	1.597e+09	4.047e-06	77	1.626e+09	3.671e-05
6	1.578e+09	1.103e-05	42	1.598e+09	4.202e-06	78	1.628e+09	3.664e-05
7	1.578e+09	9.115e-06	43	1.599e+09	4.524e-06	79	1.628e+09	3.631e-05
8	1.578e+09	7.248e-06	44	1.600e+09	4.921e-06	80	1.629e+09	3.625e-05
9	1.578e+09	5.692e-06	45	1.600e+09	5.091e-06	81	1.629e+09	3.610e-05
10	1.578e+09	4.802e-06	46	1.601e+09	5.288e-06	82	1.630e+09	3.579e-05
11	1.578e+09	4.451e-06	47	1.601e+09	5.682e-06	83	1.631e+09	3.568e-05
12	1.578e+09	4.437e-06	48	1.602e+09	6.425e-06	84	1.633e+09	3.492e-05
13	1.578e+09	4.571e-06	49	1.603e+09	7.681e-06	85	1.635e+09	3.453e-05
14	1.578e+09	4.745e-06	50	1.603e+09	8.680e-06	86	1.637e+09	3.355e-05
15	1.578e+09	4.803e-06	51	1.604e+09	9.829e-06	87	1.641e+09	3.308e-05
16	1.578e+09	4.826e-06	52	1.604e+09	1.021e-05	88	1.642e+09	3.248e-05
17	1.579e+09	4.798e-06	53	1.604e+09	1.057e-05	89	1.643e+09	3.209e-05
18	1.579e+09	4.739e-06	54	1.605e+09	1.135e-05	90	1.645e+09	3.125e-05
19	1.579e+09	4.618e-06	55	1.605e+09	1.295e-05	91	1.647e+09	3.110e-05
20	1.579e+09	4.508e-06	56	1.606e+09	1.583e-05	92	1.649e+09	3.042e-05
21	1.580e+09	4.393e-06	57	1.606e+09	1.779e-05	93	1.651e+09	2.876e-05
22	1.580e+09	4.276e-06	58	1.607e+09	2.005e-05	94	1.653e+09	2.729e-05
23	1.580e+09	4.164e-06	59	1.608e+09	2.262e-05	95	1.654e+09	2.671e-05
24	1.581e+09	4.054e-06	60	1.609e+09	2.485e-05	96	1.655e+09	2.613e-05
25	1.581e+09	3.965e-06	61	1.610e+09	2.671e-05	97	1.657e+09	2.550e-05
26	1.582e+09	3.867e-06	62	1.610e+09	2.730e-05	98	1.658e+09	2.490e-05
27	1.583e+09	3.778e-06	63	1.610e+09	2.795e-05	99	1.660e+09	2.462e-05
28	1.583e+09	3.690e-06	64	1.611e+09	2.880e-05	100	1.663e+09	2.395e-05
29	1.584e+09	3.610e-06	65	1.611e+09	2.981e-05	101	1.666e+09	2.267e-05
30	1.585e+09	3.526e-06	66	1.612e+09	3.098e-05	102	1.669e+09	2.218e-05
31	1.587e+09	3.472e-06	67	1.613e+09	3.224e-05	103	1.672e+09	2.094e-05
32	1.588e+09	3.447e-06	68	1.614e+09	3.378e-05	104	1.677e+09	1.958e-05
33	1.590e+09	3.456e-06	69	1.615e+09	3.471e-05	105	1.682e+09	1.847e-05
34	1.592e+09	3.500e-06	70	1.616e+09	3.566e-05	106	1.687e+09	1.736e-05
35	1.593e+09	3.543e-06	71	1.617e+09	3.659e-05	107	1.692e+09	1.637e-05
36	1.594e+09	3.616e-06	72	1.618e+09	3.725e-05	108	1.698e+09	1.629e-05

109	1.704e+09	1.579e-05
110	1.710e+09	1.480e-05
111	1.716e+09	1.295e-05
112	1.722e+09	1.149e-05
113	1.726e+09	9.946e-06
114	1.730e+09	8.391e-06
115	1.736e+09	6.397e-06
116	1.742e+09	4.735e-06
117	1.749e+09	4.002e-06
118	1.753e+09	2.962e-06
119	1.757e+09	2.421e-06
120	1.762e+09	1.789e-06
121	1.768e+09	1.107e-06
122	1.775e+09	1.059e-06
123	1.782e+09	1.013e-06
124	1.786e+09	1.018e-06
125	1.789e+09	1.011e-06
126	1.792e+09	9.884e-07
127	1.796e+09	9.138e-07
128	1.801e+09	8.288e-07
129	1.807e+09	7.467e-07
130	1.813e+09	6.638e-07
131	1.818e+09	6.056e-07
132	1.826e+09	5.864e-07
133	1.835e+09	5.493e-07
134	1.842e+09	4.980e-07
135	1.846e+09	4.895e-07
136	1.850e+09	4.800e-07
137	1.854e+09	4.678e-07
138	1.859e+09	4.688e-07
139	1.866e+09	4.656e-07
140	1.874e+09	3.717e-07
141	1.883e+09	3.306e-07
142	1.890e+09	3.399e-07
143	1.893e+09	3.478e-07
144	1.896e+09	3.479e-07
145	1.900e+09	3.426e-07
146	1.906e+09	3.435e-07
147	1.915e+09	3.365e-07
148	1.927e+09	2.483e-07
149	1.940e+09	1.990e-07
150	1.954e+09	2.391e-07
151	1.960e+09	2.520e-07
152	1.966e+09	2.210e-07
153	1.975e+09	1.764e-07
154	1.986e+09	1.411e-07
155	2.002e+09	1.782e-07
156	2.017e+09	2.462e-07
157	2.029e+09	1.916e-07
158	2.041e+09	1.048e-07
159	2.054e+09	6.883e-08
160	2.074e+09	1.445e-07
161	2.082e+09	1.742e-07
162	2.091e+09	1.213e-07
163	2.102e+09	4.723e-08
164	2.117e+09	4.533e-09
165	2.142e+09	7.923e-11
166	2.175e+09	1.487e-11
167	2.215e+09	9.660e-12
168	2.271e+09	8.090e-12
169	2.341e+09	6.813e-12
170	2.346e+09	6.721e-12
171	2.352e+09	6.634e-12
172	2.364e+09	6.477e-12
173	2.388e+09	6.239e-12
174	2.432e+09	5.963e-12
175	2.507e+09	5.698e-12
176	2.512e+09	5.681e-12
177	2.517e+09	5.661e-12
178	2.527e+09	5.618e-12
179	2.549e+09	5.529e-12
180	2.592e+09	5.370e-12
181	2.604e+09	5.322e-12
182	2.617e+09	5.278e-12
183	2.643e+09	5.204e-12
184	2.694e+09	5.111e-12
185	2.722e+09	5.063e-12
186	2.749e+09	5.031e-12
187	2.803e+09	5.005e-12
188	2.897e+09	5.030e-12
189	3.037e+09	5.233e-12
190	3.156e+09	5.493e-12
191	3.338e+09	5.691e-12
192	3.600e+09	6.024e-12
193	3.931e+09	6.912e-12
194	4.299e+09	8.877e-12
195	4.581e+09	1.154e-11
196	4.864e+09	1.507e-11
197	5.232e+09	1.909e-11
198	5.759e+09	2.792e-11
199	5.954e+09	3.292e-11
200	6.052e+09	3.595e-11
201	6.150e+09	3.948e-11
202	6.312e+09	4.803e-11
203	6.503e+09	5.840e-11
204	6.867e+09	9.539e-11
205	7.485e+09	7.966e-10
206	7.935e+09	1.228e-08
207	8.047e+09	1.812e-08
208	8.160e+09	2.467e-08
209	8.392e+09	3.700e-08
210	8.838e+09	5.685e-08
211	9.302e+09	6.636e-08
212	9.467e+09	6.450e-08
213	9.931e+09	8.325e-08
214	1.020e+10	1.046e-07
215	1.046e+10	1.225e-07
216	1.065e+10	3.314e-07
217	1.084e+10	5.207e-07
218	1.102e+10	6.146e-07
219	1.121e+10	5.555e-07
220	1.155e+10	7.201e-07
221	1.206e+10	9.783e-07
222	1.231e+10	1.133e-06
223	1.256e+10	1.331e-06
224	1.262e+10	1.408e-06
225	1.313e+10	1.775e-06
226	1.321e+10	1.837e-06
227	1.330e+10	1.916e-06
228	1.348e+10	2.243e-06
229	1.372e+10	2.119e-06
230	1.396e+10	2.307e-06
231	1.440e+10	2.583e-06
232	1.452e+10	2.677e-06
233	1.465e+10	2.725e-06
234	1.477e+10	2.806e-06
235	1.489e+10	2.813e-06
236	1.514e+10	3.166e-06
237	1.546e+10	3.211e-06
238	1.578e+10	3.218e-06
239	1.594e+10	3.285e-06
240	1.611e+10	3.368e-06
241	1.628e+10	3.428e-06
242	1.645e+10	3.518e-06
243	1.663e+10	3.588e-06
244	1.681e+10	3.641e-06
245	1.700e+10	3.672e-06
246	1.718e+10	3.690e-06
247	1.751e+10	3.681e-06
248	1.802e+10	3.710e-06
249	1.853e+10	3.844e-06
250	1.882e+10	3.986e-06
251	1.910e+10	4.435e-06
252	1.913e+10	4.476e-06
253	1.915e+10	4.509e-06
254	1.920e+10	4.611e-06
255	1.931e+10	4.952e-06
256	1.935e+10	5.052e-06
257	1.939e+10	5.171e-06
258	1.948e+10	5.554e-06
259	1.953e+10	5.752e-06
260	1.958e+10	5.899e-06
261	1.963e+10	6.070e-06
262	1.968e+10	6.211e-06
263	1.978e+10	6.422e-06
264	1.986e+10	7.194e-06
265	1.993e+10	7.295e-06
266	2.002e+10	7.562e-06
267	2.009e+10	7.792e-06
268	2.016e+10	7.971e-06
269	2.030e+10	8.197e-06
270	2.040e+10	8.292e-06
271	2.051e+10	8.379e-06
272	2.071e+10	8.490e-06
273	2.074e+10	8.505e-06
274	2.077e+10	8.520e-06
275	2.084e+10	8.549e-06
276	2.086e+10	8.557e-06
277	2.088e+10	8.564e-06
278	2.094e+10	8.572e-06
279	2.099e+10	8.579e-06
280	2.103e+10	8.592e-06
281	2.114e+10	8.624e-06
282	2.125e+10	8.655e-06
283	2.136e+10	8.680e-06
284	2.145e+10	8.702e-06
285	2.154e+10	8.720e-06
286	2.173e+10	8.756e-06
287	2.209e+10	8.819e-06
288	2.247e+10	8.835e-06
289	2.320e+10	8.937e-06
290	2.377e+10	9.034e-06
291	2.433e+10	9.137e-06
292	2.467e+10	9.180e-06
293	2.501e+10	9.255e-06
294	2.516e+10	9.289e-06
295	2.524e+10	9.309e-06
296	2.532e+10	9.327e-06
297	2.536e+10	9.336e-06

298	2.541e+10	9.343e-06
299	2.550e+10	9.358e-06
300	2.565e+10	9.382e-06
301	2.573e+10	9.395e-06
302	2.580e+10	9.409e-06
303	2.596e+10	9.443e-06
304	2.630e+10	9.518e-06
305	2.663e+10	9.589e-06
306	2.695e+10	9.632e-06
307	2.757e+10	9.724e-06
308	2.803e+10	9.796e-06
309	2.849e+10	9.869e-06
310	2.873e+10	9.882e-06
311	2.897e+10	9.899e-06
312	2.944e+10	9.969e-06
313	2.985e+10	1.003e-05
314	3.026e+10	1.009e-05
315	3.054e+10	1.012e-05
316	3.082e+10	1.016e-05
317	3.121e+10	1.022e-05
318	3.156e+10	1.026e-05
319	3.173e+10	1.029e-05
320	3.182e+10	1.030e-05
321	3.191e+10	1.031e-05
322	3.209e+10	1.032e-05
323	3.238e+10	1.035e-05
324	3.279e+10	1.038e-05
325	3.316e+10	1.038e-05
326	3.353e+10	1.025e-05
327	3.371e+10	1.017e-05
328	3.388e+10	1.009e-05
329	3.423e+10	9.864e-06
330	3.450e+10	9.718e-06
331	3.464e+10	9.642e-06
332	3.478e+10	9.607e-06
333	3.488e+10	9.409e-06
334	3.498e+10	9.300e-06
335	3.501e+10	9.261e-06
336	3.503e+10	9.233e-06
337	3.509e+10	9.165e-06
338	3.516e+10	9.089e-06
339	3.523e+10	9.013e-06
340	3.537e+10	8.846e-06
341	3.549e+10	8.717e-06
342	3.561e+10	8.604e-06
343	3.573e+10	8.467e-06
344	3.576e+10	8.424e-06
345	3.579e+10	8.376e-06
346	3.586e+10	8.282e-06
347	3.593e+10	8.182e-06
348	3.600e+10	8.099e-06
349	3.615e+10	7.938e-06
350	3.642e+10	7.661e-06
351	3.657e+10	7.491e-06
352	3.671e+10	7.334e-06
353	3.702e+10	7.210e-06
354	3.702e+10	7.283e-06
355	3.702e+10	7.271e-06
356	3.702e+10	7.235e-06
357	3.702e+10	7.198e-06
358	3.702e+10	7.170e-06
359	3.702e+10	7.157e-06
360	3.702e+10	7.128e-06
361	3.703e+10	7.122e-06
362	3.703e+10	7.105e-06
363	3.704e+10	7.099e-06
364	3.704e+10	7.092e-06
365	3.704e+10	7.113e-06
366	3.704e+10	7.082e-06
367	3.704e+10	7.090e-06
368	3.704e+10	7.094e-06
369	3.704e+10	7.083e-06
370	3.704e+10	7.074e-06
371	3.704e+10	7.102e-06
372	3.704e+10	7.102e-06
373	3.704e+10	7.104e-06
374	3.704e+10	7.106e-06
375	3.704e+10	7.108e-06
376	3.704e+10	7.109e-06
377	3.704e+10	7.109e-06
378	3.704e+10	7.104e-06
379	3.705e+10	7.094e-06
380	3.706e+10	7.077e-06
381	3.710e+10	7.047e-06
382	3.717e+10	6.984e-06
383	3.733e+10	6.837e-06
384	3.768e+10	6.531e-06
385	3.794e+10	6.412e-06
386	3.821e+10	6.292e-06
387	3.878e+10	6.092e-06
388	4.000e+10	5.800e-06
389	4.255e+10	5.455e-06
390	4.734e+10	5.193e-06
391	5.233e+10	5.092e-06
392	6.137e+10	5.008e-06
393	6.312e+10	5.034e-06
394	7.707e+10	8.449e-06
395	7.889e+10	8.556e-06
396	9.467e+10	8.604e-06
397	1.113e+11	8.591e-06
398	1.262e+11	8.612e-06
399	1.483e+11	8.616e-06
400	1.578e+11	8.639e-06
401	1.886e+11	8.632e-06
402	2.209e+11	8.648e-06
403	2.645e+11	8.655e-06
404	3.156e+11	8.666e-06
405	3.809e+11	8.687e-06
406	4.837e+11	8.676e-06
407	6.330e+11	8.685e-06
408	8.519e+11	8.696e-06
409	1.181e+12	8.707e-06
410	1.691e+12	8.720e-06
411	2.533e+12	8.729e-06
412	4.020e+12	8.737e-06
413	6.952e+12	8.740e-06
414	1.319e+13	8.741e-06
415	2.693e+13	8.741e-06
416	3.156e+13	8.742e-06

Table VI-4. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Lflux_2_3.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.liquid summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00						
2	1.578e+09	3.062e-03	38	1.595e+09	2.329e-05	74	1.622e+09	3.899e-05
3	1.578e+09	1.067e-03	39	1.596e+09	2.433e-05	75	1.624e+09	3.785e-05
4	1.578e+09	3.954e-04	40	1.596e+09	2.603e-05	76	1.625e+09	3.708e-05
5	1.578e+09	1.840e-04	41	1.597e+09	2.737e-05	77	1.626e+09	3.665e-05
6	1.578e+09	1.036e-04	42	1.598e+09	2.923e-05	78	1.628e+09	3.619e-05
7	1.578e+09	6.856e-05	43	1.599e+09	3.234e-05	79	1.628e+09	3.578e-05
8	1.578e+09	5.130e-05	44	1.600e+09	3.481e-05	80	1.629e+09	3.562e-05
9	1.578e+09	4.021e-05	45	1.600e+09	3.576e-05	81	1.629e+09	3.536e-05
10	1.578e+09	3.276e-05	46	1.601e+09	3.670e-05	82	1.630e+09	3.498e-05
11	1.578e+09	2.682e-05	47	1.601e+09	3.771e-05	83	1.631e+09	3.480e-05
12	1.578e+09	2.202e-05	48	1.602e+09	3.946e-05	84	1.633e+09	3.414e-05
13	1.578e+09	1.789e-05	49	1.603e+09	4.212e-05	85	1.635e+09	3.355e-05
14	1.578e+09	1.464e-05	50	1.603e+09	4.382e-05	86	1.637e+09	3.239e-05
15	1.578e+09	1.232e-05	51	1.604e+09	4.463e-05	87	1.641e+09	3.141e-05
16	1.578e+09	1.059e-05	52	1.604e+09	4.485e-05	88	1.642e+09	3.077e-05
17	1.579e+09	9.284e-06	53	1.604e+09	4.488e-05	89	1.643e+09	2.992e-05
18	1.579e+09	8.158e-06	54	1.605e+09	4.523e-05	90	1.645e+09	2.842e-05
19	1.579e+09	7.207e-06	55	1.605e+09	4.585e-05	91	1.647e+09	2.798e-05
20	1.579e+09	6.508e-06	56	1.606e+09	4.622e-05	92	1.649e+09	2.689e-05
21	1.580e+09	6.020e-06	57	1.606e+09	4.600e-05	93	1.651e+09	2.547e-05
22	1.580e+09	5.653e-06	58	1.607e+09	4.593e-05	94	1.653e+09	2.497e-05
23	1.580e+09	5.399e-06	59	1.608e+09	4.581e-05	95	1.654e+09	2.484e-05
24	1.581e+09	5.256e-06	60	1.609e+09	4.530e-05	96	1.655e+09	2.459e-05
25	1.581e+09	5.193e-06	61	1.610e+09	4.468e-05	97	1.657e+09	2.446e-05
26	1.582e+09	5.223e-06	62	1.610e+09	4.432e-05	98	1.658e+09	2.329e-05
27	1.583e+09	5.343e-06	63	1.610e+09	4.411e-05	99	1.660e+09	2.252e-05
28	1.583e+09	5.614e-06	64	1.611e+09	4.387e-05	100	1.663e+09	2.146e-05
29	1.584e+09	6.058e-06	65	1.611e+09	4.359e-05	101	1.666e+09	1.982e-05
30	1.585e+09	6.820e-06	66	1.612e+09	4.326e-05	102	1.669e+09	1.957e-05
31	1.587e+09	7.504e-06	67	1.613e+09	4.279e-05	103	1.672e+09	1.854e-05
32	1.588e+09	8.782e-06	68	1.614e+09	4.228e-05	104	1.677e+09	1.676e-05
33	1.590e+09	1.081e-05	69	1.615e+09	4.183e-05	105	1.682e+09	1.568e-05
34	1.592e+09	1.437e-05	70	1.616e+09	4.150e-05	106	1.687e+09	1.491e-05
35	1.593e+09	1.706e-05	71	1.617e+09	4.115e-05	107	1.692e+09	1.430e-05
36	1.594e+09	1.972e-05	72	1.618e+09	4.063e-05	108	1.698e+09	1.390e-05
37	1.595e+09	2.181e-05	73	1.620e+09	3.997e-05	109	1.704e+09	1.243e-05

110	1.710e+09	1.060e-05
111	1.716e+09	9.654e-06
112	1.722e+09	6.951e-06
113	1.726e+09	4.466e-06
114	1.730e+09	3.108e-06
115	1.736e+09	1.997e-06
116	1.742e+09	1.248e-06
117	1.749e+09	6.327e-07
118	1.753e+09	6.098e-07
119	1.757e+09	5.857e-07
120	1.762e+09	5.547e-07
121	1.768e+09	5.189e-07
122	1.775e+09	4.822e-07
123	1.782e+09	4.485e-07
124	1.786e+09	4.311e-07
125	1.789e+09	4.194e-07
126	1.792e+09	4.078e-07
127	1.796e+09	3.948e-07
128	1.801e+09	3.800e-07
129	1.807e+09	3.585e-07
130	1.813e+09	3.396e-07
131	1.818e+09	3.230e-07
132	1.826e+09	3.031e-07
133	1.835e+09	2.763e-07
134	1.842e+09	2.596e-07
135	1.846e+09	2.507e-07
136	1.850e+09	2.419e-07
137	1.854e+09	2.324e-07
138	1.859e+09	2.226e-07
139	1.866e+09	2.088e-07
140	1.874e+09	1.919e-07
141	1.883e+09	1.721e-07
142	1.890e+09	1.508e-07
143	1.893e+09	1.460e-07
144	1.896e+09	1.430e-07
145	1.900e+09	1.383e-07
146	1.906e+09	1.296e-07
147	1.915e+09	1.149e-07
148	1.927e+09	9.425e-08
149	1.940e+09	7.157e-08
150	1.954e+09	5.455e-08
151	1.960e+09	5.094e-08
152	1.966e+09	4.717e-08
153	1.975e+09	4.100e-08
154	1.986e+09	3.112e-08
155	2.002e+09	1.083e-08
156	2.017e+09	0.000e+00
157	2.029e+09	0.000e+00
158	2.041e+09	0.000e+00
159	2.054e+09	0.000e+00
160	2.074e+09	0.000e+00
161	2.082e+09	0.000e+00
162	2.091e+09	0.000e+00
163	2.102e+09	0.000e+00
164	2.117e+09	0.000e+00
165	2.142e+09	0.000e+00
166	2.175e+09	0.000e+00
167	2.215e+09	0.000e+00
168	2.271e+09	0.000e+00
169	2.341e+09	0.000e+00
170	2.346e+09	0.000e+00
171	2.352e+09	0.000e+00
172	2.364e+09	0.000e+00
173	2.388e+09	0.000e+00
174	2.432e+09	0.000e+00
175	2.507e+09	0.000e+00
176	2.512e+09	0.000e+00
177	2.517e+09	0.000e+00
178	2.527e+09	0.000e+00
179	2.549e+09	0.000e+00
180	2.592e+09	0.000e+00
181	2.604e+09	0.000e+00
182	2.617e+09	0.000e+00
183	2.643e+09	0.000e+00
184	2.694e+09	0.000e+00
185	2.722e+09	0.000e+00
186	2.749e+09	0.000e+00
187	2.803e+09	0.000e+00
188	2.897e+09	0.000e+00
189	3.037e+09	0.000e+00
190	3.156e+09	0.000e+00
191	3.338e+09	0.000e+00
192	3.600e+09	0.000e+00
193	3.931e+09	0.000e+00
194	4.299e+09	0.000e+00
195	4.581e+09	0.000e+00
196	4.864e+09	0.000e+00
197	5.232e+09	0.000e+00
198	5.759e+09	0.000e+00
199	5.954e+09	0.000e+00
200	6.052e+09	0.000e+00
201	6.150e+09	0.000e+00
202	6.312e+09	0.000e+00
203	6.503e+09	0.000e+00
204	6.867e+09	0.000e+00
205	7.485e+09	0.000e+00
206	7.935e+09	0.000e+00
207	8.047e+09	0.000e+00
208	8.160e+09	0.000e+00
209	8.392e+09	0.000e+00
210	8.838e+09	0.000e+00
211	9.302e+09	0.000e+00
212	9.467e+09	0.000e+00
213	9.931e+09	2.164e-08
214	1.020e+10	4.129e-08
215	1.046e+10	5.662e-08
216	1.065e+10	6.499e-08
217	1.084e+10	7.134e-08
218	1.102e+10	7.687e-08
219	1.121e+10	8.297e-08
220	1.155e+10	9.471e-08
221	1.206e+10	2.851e-07
222	1.231e+10	3.071e-07
223	1.256e+10	4.203e-07
224	1.262e+10	4.567e-07
225	1.313e+10	6.399e-07
226	1.321e+10	6.712e-07
227	1.330e+10	7.097e-07
228	1.348e+10	4.948e-06
229	1.372e+10	9.383e-07
230	1.396e+10	1.960e-05
231	1.440e+10	1.533e-06
232	1.452e+10	1.666e-06
233	1.465e+10	1.740e-06
234	1.477e+10	1.856e-06
235	1.489e+10	1.847e-06
236	1.514e+10	7.522e-06
237	1.546e+10	2.952e-05
238	1.578e+10	2.510e-06
239	1.594e+10	2.563e-06
240	1.611e+10	2.613e-06
241	1.628e+10	2.693e-06
242	1.645e+10	2.770e-06
243	1.663e+10	2.850e-06
244	1.681e+10	3.173e-06
245	1.700e+10	3.075e-06
246	1.718e+10	3.159e-06
247	1.751e+10	3.182e-06
248	1.802e+10	3.272e-06
249	1.853e+10	3.353e-06
250	1.882e+10	3.404e-06
251	1.910e+10	3.716e-06
252	1.913e+10	3.705e-06
253	1.915e+10	3.763e-06
254	1.920e+10	3.928e-06
255	1.931e+10	5.676e-06
256	1.935e+10	4.454e-06
257	1.939e+10	4.515e-06
258	1.948e+10	4.766e-06
259	1.953e+10	5.770e-06
260	1.958e+10	5.231e-06
261	1.963e+10	8.933e-06
262	1.968e+10	5.803e-06
263	1.978e+10	6.000e-06
264	1.986e+10	6.201e-06
265	1.993e+10	6.374e-06
266	2.002e+10	6.544e-06
267	2.009e+10	6.833e-06
268	2.016e+10	8.246e-06
269	2.030e+10	1.405e-05
270	2.040e+10	7.615e-06
271	2.051e+10	7.731e-06
272	2.071e+10	7.901e-06
273	2.074e+10	7.928e-06
274	2.077e+10	7.954e-06
275	2.084e+10	8.003e-06
276	2.086e+10	8.017e-06
277	2.088e+10	8.024e-06
278	2.094e+10	8.030e-06
279	2.099e+10	8.041e-06
280	2.103e+10	8.059e-06
281	2.114e+10	8.106e-06
282	2.125e+10	8.150e-06
283	2.136e+10	8.184e-06
284	2.145e+10	8.213e-06
285	2.154e+10	8.237e-06
286	2.173e+10	8.285e-06
287	2.209e+10	8.374e-06
288	2.247e+10	8.415e-06
289	2.320e+10	8.550e-06
290	2.377e+10	8.676e-06
291	2.433e+10	8.804e-06
292	2.467e+10	8.845e-06
293	2.501e+10	8.923e-06
294	2.516e+10	8.958e-06
295	2.524e+10	8.976e-06
296	2.532e+10	8.995e-06
297	2.536e+10	9.005e-06
298	2.541e+10	9.013e-06

299	2.550e+10	9.033e-06
300	2.565e+10	9.064e-06
301	2.573e+10	9.081e-06
302	2.580e+10	9.109e-06
303	2.596e+10	9.146e-06
304	2.630e+10	9.245e-06
305	2.663e+10	9.338e-06
306	2.695e+10	9.421e-06
307	2.757e+10	9.675e-06
308	2.803e+10	9.689e-06
309	2.849e+10	9.811e-06
310	2.873e+10	9.871e-06
311	2.897e+10	9.945e-06
312	2.944e+10	1.014e-05
313	2.985e+10	1.033e-05
314	3.026e+10	1.052e-05
315	3.054e+10	1.064e-05
316	3.082e+10	1.076e-05
317	3.121e+10	1.091e-05
318	3.156e+10	1.105e-05
319	3.173e+10	1.111e-05
320	3.182e+10	1.115e-05
321	3.191e+10	1.118e-05
322	3.209e+10	1.124e-05
323	3.238e+10	1.134e-05
324	3.279e+10	1.147e-05
325	3.316e+10	1.159e-05
326	3.353e+10	1.165e-05
327	3.371e+10	1.166e-05
328	3.388e+10	1.170e-05
329	3.423e+10	1.173e-05
330	3.450e+10	1.178e-05
331	3.464e+10	1.180e-05
332	3.478e+10	1.183e-05
333	3.488e+10	1.178e-05
334	3.498e+10	1.177e-05
335	3.501e+10	1.177e-05
336	3.503e+10	1.177e-05
337	3.509e+10	1.176e-05
338	3.516e+10	1.175e-05
339	3.523e+10	1.174e-05
340	3.537e+10	1.172e-05
341	3.549e+10	1.169e-05
342	3.561e+10	1.167e-05
343	3.573e+10	1.164e-05
344	3.576e+10	1.163e-05
345	3.579e+10	1.161e-05
346	3.586e+10	1.158e-05
347	3.593e+10	1.155e-05
348	3.600e+10	1.152e-05
349	3.615e+10	1.147e-05
350	3.642e+10	1.137e-05
351	3.657e+10	1.128e-05
352	3.671e+10	1.120e-05
353	3.702e+10	1.119e-05
354	3.702e+10	1.134e-05
355	3.702e+10	1.131e-05
356	3.702e+10	1.123e-05
357	3.702e+10	1.115e-05
358	3.702e+10	1.109e-05
359	3.702e+10	1.109e-05
360	3.702e+10	1.108e-05
361	3.703e+10	1.109e-05
362	3.703e+10	1.108e-05
363	3.704e+10	1.107e-05
364	3.704e+10	1.107e-05
365	3.704e+10	1.109e-05
366	3.704e+10	1.105e-05
367	3.704e+10	1.106e-05
368	3.704e+10	1.107e-05
369	3.704e+10	1.105e-05
370	3.704e+10	1.103e-05
371	3.704e+10	1.108e-05
372	3.704e+10	1.108e-05
373	3.704e+10	1.109e-05
374	3.704e+10	1.109e-05
375	3.704e+10	1.109e-05
376	3.704e+10	1.109e-05
377	3.704e+10	1.109e-05
378	3.704e+10	1.109e-05
379	3.705e+10	1.108e-05
380	3.706e+10	1.107e-05
381	3.710e+10	1.105e-05
382	3.717e+10	1.101e-05
383	3.733e+10	1.089e-05
384	3.768e+10	1.064e-05
385	3.794e+10	1.050e-05
386	3.821e+10	1.038e-05
387	3.878e+10	1.009e-05
388	4.000e+10	9.462e-06
389	4.255e+10	8.373e-06
390	4.734e+10	6.892e-06
391	5.233e+10	6.157e-06
392	6.137e+10	5.495e-06
393	6.312e+10	5.646e-06
394	7.707e+10	8.725e-06
395	7.889e+10	8.813e-06
396	9.467e+10	8.750e-06
397	1.113e+11	8.673e-06
398	1.262e+11	8.671e-06
399	1.483e+11	8.652e-06
400	1.578e+11	8.684e-06
401	1.886e+11	8.661e-06
402	2.209e+11	8.671e-06
403	2.645e+11	8.673e-06
404	3.156e+11	8.676e-06
405	3.809e+11	8.697e-06
406	4.837e+11	8.679e-06
407	6.330e+11	8.686e-06
408	8.519e+11	8.697e-06
409	1.181e+12	8.707e-06
410	1.691e+12	8.719e-06
411	2.533e+12	8.729e-06
412	4.020e+12	8.737e-06
413	6.952e+12	8.740e-06
414	1.319e+13	8.741e-06
415	2.693e+13	8.741e-06
416	3.156e+13	8.742e-06

Table VI-5. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Lflux_3_4.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.liquid summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00						
2	1.578e+09	0.000e+00	40	1.596e+09	0.000e+00	78	1.628e+09	0.000e+00
3	1.578e+09	0.000e+00	41	1.597e+09	0.000e+00	79	1.628e+09	0.000e+00
4	1.578e+09	0.000e+00	42	1.598e+09	0.000e+00	80	1.629e+09	0.000e+00
5	1.578e+09	0.000e+00	43	1.599e+09	0.000e+00	81	1.629e+09	0.000e+00
6	1.578e+09	0.000e+00	44	1.600e+09	0.000e+00	82	1.630e+09	0.000e+00
7	1.578e+09	0.000e+00	45	1.600e+09	0.000e+00	83	1.631e+09	0.000e+00
8	1.578e+09	0.000e+00	46	1.601e+09	0.000e+00	84	1.633e+09	0.000e+00
9	1.578e+09	0.000e+00	47	1.601e+09	0.000e+00	85	1.635e+09	0.000e+00
10	1.578e+09	0.000e+00	48	1.602e+09	0.000e+00	86	1.637e+09	0.000e+00
11	1.578e+09	0.000e+00	49	1.603e+09	0.000e+00	87	1.641e+09	0.000e+00
12	1.578e+09	0.000e+00	50	1.603e+09	0.000e+00	88	1.642e+09	0.000e+00
13	1.578e+09	0.000e+00	51	1.604e+09	0.000e+00	89	1.643e+09	0.000e+00
14	1.578e+09	0.000e+00	52	1.604e+09	0.000e+00	90	1.645e+09	0.000e+00
15	1.578e+09	0.000e+00	53	1.604e+09	0.000e+00	91	1.647e+09	0.000e+00
16	1.578e+09	0.000e+00	54	1.605e+09	0.000e+00	92	1.649e+09	0.000e+00
17	1.579e+09	0.000e+00	55	1.605e+09	0.000e+00	93	1.651e+09	0.000e+00
18	1.579e+09	0.000e+00	56	1.606e+09	0.000e+00	94	1.653e+09	0.000e+00
19	1.579e+09	0.000e+00	57	1.606e+09	0.000e+00	95	1.654e+09	0.000e+00
20	1.579e+09	0.000e+00	58	1.607e+09	0.000e+00	96	1.655e+09	0.000e+00
21	1.580e+09	0.000e+00	59	1.608e+09	0.000e+00	97	1.657e+09	0.000e+00
22	1.580e+09	0.000e+00	60	1.609e+09	0.000e+00	98	1.658e+09	0.000e+00
23	1.580e+09	0.000e+00	61	1.610e+09	0.000e+00	99	1.660e+09	0.000e+00
24	1.581e+09	0.000e+00	62	1.610e+09	0.000e+00	100	1.663e+09	0.000e+00
25	1.581e+09	0.000e+00	63	1.610e+09	0.000e+00	101	1.666e+09	0.000e+00
26	1.582e+09	0.000e+00	64	1.611e+09	0.000e+00	102	1.669e+09	0.000e+00
27	1.583e+09	0.000e+00	65	1.611e+09	0.000e+00	103	1.672e+09	0.000e+00
28	1.583e+09	0.000e+00	66	1.612e+09	0.000e+00	104	1.677e+09	0.000e+00
29	1.584e+09	0.000e+00	67	1.613e+09	0.000e+00	105	1.682e+09	0.000e+00
30	1.585e+09	0.000e+00	68	1.614e+09	0.000e+00	106	1.687e+09	0.000e+00
31	1.587e+09	0.000e+00	69	1.615e+09	0.000e+00	107	1.692e+09	0.000e+00
32	1.588e+09	0.000e+00	70	1.616e+09	0.000e+00	108	1.698e+09	0.000e+00
33	1.590e+09	0.000e+00	71	1.617e+09	0.000e+00	109	1.704e+09	0.000e+00
34	1.592e+09	0.000e+00	72	1.618e+09	0.000e+00	110	1.710e+09	0.000e+00
35	1.593e+09	0.000e+00	73	1.620e+09	0.000e+00	111	1.716e+09	0.000e+00
36	1.594e+09	0.000e+00	74	1.622e+09	0.000e+00	112	1.722e+09	0.000e+00
37	1.595e+09	0.000e+00	75	1.624e+09	0.000e+00	113	1.726e+09	0.000e+00
38	1.595e+09	0.000e+00	76	1.625e+09	0.000e+00	114	1.730e+09	0.000e+00
39	1.596e+09	0.000e+00	77	1.626e+09	0.000e+00	115	1.736e+09	0.000e+00

116	1.742e+09	0.000e+00
117	1.749e+09	0.000e+00
118	1.753e+09	0.000e+00
119	1.757e+09	0.000e+00
120	1.762e+09	0.000e+00
121	1.768e+09	0.000e+00
122	1.775e+09	0.000e+00
123	1.782e+09	0.000e+00
124	1.786e+09	0.000e+00
125	1.789e+09	0.000e+00
126	1.792e+09	0.000e+00
127	1.796e+09	0.000e+00
128	1.801e+09	0.000e+00
129	1.807e+09	0.000e+00
130	1.813e+09	0.000e+00
131	1.818e+09	0.000e+00
132	1.826e+09	0.000e+00
133	1.835e+09	0.000e+00
134	1.842e+09	0.000e+00
135	1.846e+09	0.000e+00
136	1.850e+09	0.000e+00
137	1.854e+09	0.000e+00
138	1.859e+09	0.000e+00
139	1.866e+09	0.000e+00
140	1.874e+09	0.000e+00
141	1.883e+09	0.000e+00
142	1.890e+09	0.000e+00
143	1.893e+09	0.000e+00
144	1.896e+09	0.000e+00
145	1.900e+09	0.000e+00
146	1.906e+09	0.000e+00
147	1.915e+09	0.000e+00
148	1.927e+09	0.000e+00
149	1.940e+09	0.000e+00
150	1.954e+09	0.000e+00
151	1.960e+09	0.000e+00
152	1.966e+09	0.000e+00
153	1.975e+09	0.000e+00
154	1.986e+09	0.000e+00
155	2.002e+09	0.000e+00
156	2.017e+09	0.000e+00
157	2.029e+09	0.000e+00
158	2.041e+09	0.000e+00
159	2.054e+09	0.000e+00
160	2.074e+09	0.000e+00
161	2.082e+09	0.000e+00
162	2.091e+09	0.000e+00
163	2.102e+09	0.000e+00
164	2.117e+09	0.000e+00
165	2.142e+09	0.000e+00
166	2.175e+09	0.000e+00
167	2.215e+09	0.000e+00
168	2.271e+09	0.000e+00
169	2.341e+09	0.000e+00
170	2.346e+09	0.000e+00
171	2.352e+09	0.000e+00
172	2.364e+09	0.000e+00
173	2.388e+09	0.000e+00
174	2.432e+09	0.000e+00
175	2.507e+09	0.000e+00
176	2.512e+09	0.000e+00
177	2.517e+09	0.000e+00
178	2.527e+09	0.000e+00
179	2.549e+09	0.000e+00
180	2.592e+09	0.000e+00
181	2.604e+09	0.000e+00
182	2.617e+09	0.000e+00
183	2.643e+09	0.000e+00
184	2.694e+09	0.000e+00
185	2.722e+09	0.000e+00
186	2.749e+09	0.000e+00
187	2.803e+09	0.000e+00
188	2.897e+09	0.000e+00
189	3.037e+09	0.000e+00
190	3.156e+09	0.000e+00
191	3.338e+09	0.000e+00
192	3.600e+09	0.000e+00
193	3.931e+09	0.000e+00
194	4.299e+09	0.000e+00
195	4.581e+09	0.000e+00
196	4.864e+09	0.000e+00
197	5.232e+09	0.000e+00
198	5.759e+09	0.000e+00
199	5.954e+09	0.000e+00
200	6.052e+09	0.000e+00
201	6.150e+09	0.000e+00
202	6.312e+09	0.000e+00
203	6.503e+09	0.000e+00
204	6.867e+09	0.000e+00
205	7.485e+09	0.000e+00
206	7.935e+09	0.000e+00
207	8.047e+09	0.000e+00
208	8.160e+09	0.000e+00
209	8.392e+09	0.000e+00
210	8.838e+09	0.000e+00
211	9.302e+09	0.000e+00
212	9.467e+09	0.000e+00
213	9.931e+09	0.000e+00
214	1.020e+10	0.000e+00
215	1.046e+10	0.000e+00
216	1.065e+10	0.000e+00
217	1.084e+10	0.000e+00
218	1.102e+10	0.000e+00
219	1.121e+10	0.000e+00
220	1.155e+10	0.000e+00
221	1.206e+10	0.000e+00
222	1.231e+10	0.000e+00
223	1.256e+10	0.000e+00
224	1.262e+10	0.000e+00
225	1.313e+10	0.000e+00
226	1.321e+10	0.000e+00
227	1.330e+10	0.000e+00
228	1.348e+10	0.000e+00
229	1.372e+10	0.000e+00
230	1.396e+10	0.000e+00
231	1.440e+10	0.000e+00
232	1.452e+10	0.000e+00
233	1.465e+10	0.000e+00
234	1.477e+10	0.000e+00
235	1.489e+10	0.000e+00
236	1.514e+10	0.000e+00
237	1.546e+10	0.000e+00
238	1.578e+10	0.000e+00
239	1.594e+10	0.000e+00
240	1.611e+10	0.000e+00
241	1.628e+10	0.000e+00
242	1.645e+10	0.000e+00
243	1.663e+10	0.000e+00
244	1.681e+10	0.000e+00
245	1.700e+10	0.000e+00
246	1.718e+10	0.000e+00
247	1.751e+10	0.000e+00
248	1.802e+10	0.000e+00
249	1.853e+10	0.000e+00
250	1.882e+10	0.000e+00
251	1.910e+10	0.000e+00
252	1.913e+10	0.000e+00
253	1.915e+10	0.000e+00
254	1.920e+10	0.000e+00
255	1.931e+10	0.000e+00
256	1.935e+10	0.000e+00
257	1.939e+10	0.000e+00
258	1.948e+10	0.000e+00
259	1.953e+10	0.000e+00
260	1.958e+10	0.000e+00
261	1.963e+10	0.000e+00
262	1.968e+10	0.000e+00
263	1.978e+10	0.000e+00
264	1.986e+10	0.000e+00
265	1.993e+10	0.000e+00
266	2.002e+10	0.000e+00
267	2.009e+10	0.000e+00
268	2.016e+10	0.000e+00
269	2.030e+10	0.000e+00
270	2.040e+10	0.000e+00
271	2.051e+10	0.000e+00
272	2.071e+10	0.000e+00
273	2.074e+10	0.000e+00
274	2.077e+10	0.000e+00
275	2.084e+10	0.000e+00
276	2.086e+10	0.000e+00
277	2.088e+10	0.000e+00
278	2.094e+10	0.000e+00
279	2.099e+10	0.000e+00
280	2.103e+10	0.000e+00
281	2.114e+10	0.000e+00
282	2.125e+10	0.000e+00
283	2.136e+10	0.000e+00
284	2.145e+10	0.000e+00
285	2.154e+10	0.000e+00
286	2.173e+10	0.000e+00
287	2.209e+10	0.000e+00
288	2.247e+10	0.000e+00
289	2.320e+10	0.000e+00
290	2.377e+10	0.000e+00
291	2.433e+10	0.000e+00
292	2.467e+10	0.000e+00
293	2.501e+10	0.000e+00
294	2.516e+10	0.000e+00
295	2.524e+10	0.000e+00
296	2.532e+10	0.000e+00
297	2.536e+10	0.000e+00
298	2.541e+10	0.000e+00
299	2.550e+10	0.000e+00
300	2.565e+10	0.000e+00
301	2.573e+10	0.000e+00
302	2.580e+10	0.000e+00
303	2.596e+10	0.000e+00
304	2.630e+10	0.000e+00

305	2.663e+10	0.000e+00
306	2.695e+10	0.000e+00
307	2.757e+10	0.000e+00
308	2.803e+10	0.000e+00
309	2.849e+10	0.000e+00
310	2.873e+10	0.000e+00
311	2.897e+10	0.000e+00
312	2.944e+10	4.265e-09
313	2.985e+10	1.940e-07
314	3.026e+10	5.866e-07
315	3.054e+10	9.426e-07
316	3.082e+10	1.573e-06
317	3.121e+10	3.074e-06
318	3.156e+10	4.773e-06
319	3.173e+10	5.512e-06
320	3.182e+10	5.858e-06
321	3.191e+10	6.209e-06
322	3.209e+10	6.868e-06
323	3.238e+10	8.018e-06
324	3.279e+10	9.821e-06
325	3.316e+10	1.051e-05
326	3.353e+10	1.005e-05
327	3.371e+10	9.830e-06
328	3.388e+10	9.678e-06
329	3.423e+10	9.349e-06
330	3.450e+10	9.242e-06
331	3.464e+10	9.191e-06
332	3.478e+10	9.209e-06
333	3.488e+10	8.957e-06
334	3.498e+10	8.866e-06
335	3.501e+10	8.848e-06
336	3.503e+10	8.834e-06
337	3.509e+10	8.790e-06
338	3.516e+10	8.745e-06
339	3.523e+10	8.703e-06
340	3.537e+10	8.607e-06
341	3.549e+10	8.565e-06
342	3.561e+10	8.522e-06
343	3.573e+10	8.472e-06
344	3.576e+10	8.432e-06
345	3.579e+10	8.400e-06
346	3.586e+10	8.343e-06
347	3.593e+10	8.282e-06
348	3.600e+10	8.253e-06
349	3.615e+10	8.192e-06
350	3.642e+10	8.103e-06
351	3.657e+10	7.987e-06
352	3.671e+10	7.913e-06
353	3.702e+10	8.026e-06
354	3.702e+10	8.077e-06
355	3.702e+10	8.065e-06
356	3.702e+10	8.018e-06
357	3.702e+10	7.942e-06
358	3.702e+10	7.902e-06
359	3.702e+10	7.910e-06
360	3.702e+10	7.912e-06
361	3.703e+10	7.899e-06
362	3.703e+10	7.888e-06
363	3.704e+10	7.883e-06
364	3.704e+10	7.879e-06
365	3.704e+10	7.879e-06
366	3.704e+10	7.878e-06
367	3.704e+10	7.878e-06
368	3.704e+10	7.878e-06
369	3.704e+10	7.878e-06
370	3.704e+10	7.877e-06
371	3.704e+10	7.877e-06
372	3.704e+10	7.877e-06
373	3.704e+10	7.877e-06
374	3.704e+10	7.877e-06
375	3.704e+10	7.877e-06
376	3.704e+10	7.877e-06
377	3.704e+10	7.876e-06
378	3.704e+10	7.873e-06
379	3.705e+10	7.867e-06
380	3.706e+10	7.858e-06
381	3.710e+10	7.847e-06
382	3.717e+10	7.819e-06
383	3.733e+10	7.732e-06
384	3.768e+10	7.535e-06
385	3.794e+10	7.516e-06
386	3.821e+10	7.492e-06
387	3.878e+10	7.439e-06
388	4.000e+10	7.317e-06
389	4.255e+10	7.009e-06
390	4.734e+10	6.210e-06
391	5.233e+10	5.721e-06
392	6.137e+10	4.760e-06
393	6.312e+10	4.575e-06
394	7.707e+10	4.714e-06
395	7.889e+10	4.681e-06
396	9.467e+10	4.121e-06
397	1.113e+11	3.813e-06
398	1.262e+11	3.608e-06
399	1.483e+11	3.372e-06
400	1.578e+11	3.352e-06
401	1.886e+11	3.245e-06
402	2.209e+11	3.053e-06
403	2.645e+11	2.987e-06
404	3.156e+11	2.969e-06
405	3.809e+11	2.943e-06
406	4.837e+11	2.910e-06
407	6.330e+11	2.872e-06
408	8.519e+11	2.845e-06
409	1.181e+12	2.826e-06
410	1.691e+12	2.815e-06
411	2.533e+12	2.809e-06
412	4.020e+12	2.807e-06
413	6.952e+12	2.806e-06
414	1.319e+13	2.806e-06
415	2.693e+13	2.805e-06
416	3.156e+13	2.805e-06

Table VI-6. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Lflux_3_5.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.liquid summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00						
2	1.578e+09	0.000e+00	38	1.595e+09	0.000e+00	74	1.622e+09	0.000e+00
3	1.578e+09	0.000e+00	39	1.596e+09	0.000e+00	75	1.624e+09	0.000e+00
4	1.578e+09	0.000e+00	40	1.596e+09	0.000e+00	76	1.625e+09	0.000e+00
5	1.578e+09	0.000e+00	41	1.597e+09	0.000e+00	77	1.626e+09	0.000e+00
6	1.578e+09	0.000e+00	42	1.598e+09	0.000e+00	78	1.628e+09	0.000e+00
7	1.578e+09	0.000e+00	43	1.599e+09	0.000e+00	79	1.628e+09	0.000e+00
8	1.578e+09	0.000e+00	44	1.600e+09	0.000e+00	80	1.629e+09	0.000e+00
9	1.578e+09	0.000e+00	45	1.600e+09	0.000e+00	81	1.629e+09	0.000e+00
10	1.578e+09	0.000e+00	46	1.601e+09	0.000e+00	82	1.630e+09	0.000e+00
11	1.578e+09	0.000e+00	47	1.601e+09	0.000e+00	83	1.631e+09	0.000e+00
12	1.578e+09	0.000e+00	48	1.602e+09	0.000e+00	84	1.633e+09	0.000e+00
13	1.578e+09	0.000e+00	49	1.603e+09	0.000e+00	85	1.635e+09	0.000e+00
14	1.578e+09	0.000e+00	50	1.603e+09	0.000e+00	86	1.637e+09	0.000e+00
15	1.578e+09	0.000e+00	51	1.604e+09	0.000e+00	87	1.641e+09	0.000e+00
16	1.578e+09	0.000e+00	52	1.604e+09	0.000e+00	88	1.642e+09	0.000e+00
17	1.579e+09	0.000e+00	53	1.604e+09	0.000e+00	89	1.643e+09	0.000e+00
18	1.579e+09	0.000e+00	54	1.605e+09	0.000e+00	90	1.645e+09	0.000e+00
19	1.579e+09	0.000e+00	55	1.605e+09	0.000e+00	91	1.647e+09	0.000e+00
20	1.579e+09	0.000e+00	56	1.606e+09	0.000e+00	92	1.649e+09	0.000e+00
21	1.580e+09	0.000e+00	57	1.606e+09	0.000e+00	93	1.651e+09	0.000e+00
22	1.580e+09	0.000e+00	58	1.607e+09	0.000e+00	94	1.653e+09	0.000e+00
23	1.580e+09	0.000e+00	59	1.608e+09	0.000e+00	95	1.654e+09	0.000e+00
24	1.581e+09	0.000e+00	60	1.609e+09	0.000e+00	96	1.655e+09	0.000e+00
25	1.581e+09	0.000e+00	61	1.610e+09	0.000e+00	97	1.657e+09	0.000e+00
26	1.582e+09	0.000e+00	62	1.610e+09	0.000e+00	98	1.658e+09	0.000e+00
27	1.583e+09	0.000e+00	63	1.610e+09	0.000e+00	99	1.660e+09	0.000e+00
28	1.583e+09	0.000e+00	64	1.611e+09	0.000e+00	100	1.663e+09	0.000e+00
29	1.584e+09	0.000e+00	65	1.611e+09	0.000e+00	101	1.666e+09	0.000e+00
30	1.585e+09	0.000e+00	66	1.612e+09	0.000e+00	102	1.669e+09	0.000e+00
31	1.587e+09	0.000e+00	67	1.613e+09	0.000e+00	103	1.672e+09	0.000e+00
32	1.588e+09	0.000e+00	68	1.614e+09	0.000e+00	104	1.677e+09	0.000e+00
33	1.590e+09	0.000e+00	69	1.615e+09	0.000e+00	105	1.682e+09	0.000e+00
34	1.592e+09	0.000e+00	70	1.616e+09	0.000e+00	106	1.687e+09	0.000e+00
35	1.593e+09	0.000e+00	71	1.617e+09	0.000e+00	107	1.692e+09	0.000e+00
36	1.594e+09	0.000e+00	72	1.618e+09	0.000e+00	108	1.698e+09	0.000e+00
37	1.595e+09	0.000e+00	73	1.620e+09	0.000e+00	109	1.704e+09	0.000e+00

110	1.710e+09	0.000e+00	173	2.388e+09	0.000e+00	236	1.514e+10	0.000e+00
111	1.716e+09	0.000e+00	174	2.432e+09	0.000e+00	237	1.546e+10	0.000e+00
112	1.722e+09	0.000e+00	175	2.507e+09	0.000e+00	238	1.578e+10	0.000e+00
113	1.726e+09	0.000e+00	176	2.512e+09	0.000e+00	239	1.594e+10	0.000e+00
114	1.730e+09	0.000e+00	177	2.517e+09	0.000e+00	240	1.611e+10	0.000e+00
115	1.736e+09	0.000e+00	178	2.527e+09	0.000e+00	241	1.628e+10	0.000e+00
116	1.742e+09	0.000e+00	179	2.549e+09	0.000e+00	242	1.645e+10	0.000e+00
117	1.749e+09	0.000e+00	180	2.592e+09	0.000e+00	243	1.663e+10	0.000e+00
118	1.753e+09	0.000e+00	181	2.604e+09	0.000e+00	244	1.681e+10	0.000e+00
119	1.757e+09	0.000e+00	182	2.617e+09	0.000e+00	245	1.700e+10	0.000e+00
120	1.762e+09	0.000e+00	183	2.643e+09	0.000e+00	246	1.718e+10	0.000e+00
121	1.768e+09	0.000e+00	184	2.694e+09	0.000e+00	247	1.751e+10	0.000e+00
122	1.775e+09	0.000e+00	185	2.722e+09	0.000e+00	248	1.802e+10	0.000e+00
123	1.782e+09	0.000e+00	186	2.749e+09	0.000e+00	249	1.853e+10	0.000e+00
124	1.786e+09	0.000e+00	187	2.803e+09	0.000e+00	250	1.882e+10	0.000e+00
125	1.789e+09	0.000e+00	188	2.897e+09	0.000e+00	251	1.910e+10	0.000e+00
126	1.792e+09	0.000e+00	189	3.037e+09	0.000e+00	252	1.913e+10	0.000e+00
127	1.796e+09	0.000e+00	190	3.156e+09	0.000e+00	253	1.915e+10	0.000e+00
128	1.801e+09	0.000e+00	191	3.338e+09	0.000e+00	254	1.920e+10	0.000e+00
129	1.807e+09	0.000e+00	192	3.600e+09	0.000e+00	255	1.931e+10	0.000e+00
130	1.813e+09	0.000e+00	193	3.931e+09	0.000e+00	256	1.935e+10	0.000e+00
131	1.818e+09	0.000e+00	194	4.299e+09	0.000e+00	257	1.939e+10	0.000e+00
132	1.826e+09	0.000e+00	195	4.581e+09	0.000e+00	258	1.948e+10	0.000e+00
133	1.835e+09	0.000e+00	196	4.864e+09	0.000e+00	259	1.953e+10	0.000e+00
134	1.842e+09	0.000e+00	197	5.232e+09	0.000e+00	260	1.958e+10	0.000e+00
135	1.846e+09	0.000e+00	198	5.759e+09	0.000e+00	261	1.963e+10	0.000e+00
136	1.850e+09	0.000e+00	199	5.954e+09	0.000e+00	262	1.968e+10	0.000e+00
137	1.854e+09	0.000e+00	200	6.052e+09	0.000e+00	263	1.978e+10	0.000e+00
138	1.859e+09	0.000e+00	201	6.150e+09	0.000e+00	264	1.986e+10	0.000e+00
139	1.866e+09	0.000e+00	202	6.312e+09	0.000e+00	265	1.993e+10	0.000e+00
140	1.874e+09	0.000e+00	203	6.503e+09	0.000e+00	266	2.002e+10	0.000e+00
141	1.883e+09	0.000e+00	204	6.867e+09	0.000e+00	267	2.009e+10	0.000e+00
142	1.890e+09	0.000e+00	205	7.485e+09	0.000e+00	268	2.016e+10	0.000e+00
143	1.893e+09	0.000e+00	206	7.935e+09	0.000e+00	269	2.030e+10	0.000e+00
144	1.896e+09	0.000e+00	207	8.047e+09	0.000e+00	270	2.040e+10	0.000e+00
145	1.900e+09	0.000e+00	208	8.160e+09	0.000e+00	271	2.051e+10	0.000e+00
146	1.906e+09	0.000e+00	209	8.392e+09	0.000e+00	272	2.071e+10	0.000e+00
147	1.915e+09	0.000e+00	210	8.838e+09	0.000e+00	273	2.074e+10	0.000e+00
148	1.927e+09	0.000e+00	211	9.302e+09	0.000e+00	274	2.077e+10	0.000e+00
149	1.940e+09	0.000e+00	212	9.467e+09	0.000e+00	275	2.084e+10	0.000e+00
150	1.954e+09	0.000e+00	213	9.931e+09	0.000e+00	276	2.086e+10	0.000e+00
151	1.960e+09	0.000e+00	214	1.020e+10	0.000e+00	277	2.088e+10	0.000e+00
152	1.966e+09	0.000e+00	215	1.046e+10	0.000e+00	278	2.094e+10	0.000e+00
153	1.975e+09	0.000e+00	216	1.065e+10	0.000e+00	279	2.099e+10	0.000e+00
154	1.986e+09	0.000e+00	217	1.084e+10	0.000e+00	280	2.103e+10	0.000e+00
155	2.002e+09	0.000e+00	218	1.102e+10	0.000e+00	281	2.114e+10	0.000e+00
156	2.017e+09	0.000e+00	219	1.121e+10	0.000e+00	282	2.125e+10	0.000e+00
157	2.029e+09	0.000e+00	220	1.155e+10	0.000e+00	283	2.136e+10	0.000e+00
158	2.041e+09	0.000e+00	221	1.206e+10	0.000e+00	284	2.145e+10	0.000e+00
159	2.054e+09	0.000e+00	222	1.231e+10	0.000e+00	285	2.154e+10	0.000e+00
160	2.074e+09	0.000e+00	223	1.256e+10	0.000e+00	286	2.173e+10	0.000e+00
161	2.082e+09	0.000e+00	224	1.262e+10	0.000e+00	287	2.209e+10	0.000e+00
162	2.091e+09	0.000e+00	225	1.313e+10	0.000e+00	288	2.247e+10	0.000e+00
163	2.102e+09	0.000e+00	226	1.321e+10	0.000e+00	289	2.320e+10	0.000e+00
164	2.117e+09	0.000e+00	227	1.330e+10	0.000e+00	290	2.377e+10	0.000e+00
165	2.142e+09	0.000e+00	228	1.348e+10	0.000e+00	291	2.433e+10	0.000e+00
166	2.175e+09	0.000e+00	229	1.372e+10	0.000e+00	292	2.467e+10	0.000e+00
167	2.215e+09	0.000e+00	230	1.396e+10	0.000e+00	293	2.501e+10	0.000e+00
168	2.271e+09	0.000e+00	231	1.440e+10	0.000e+00	294	2.516e+10	0.000e+00
169	2.341e+09	0.000e+00	232	1.452e+10	0.000e+00	295	2.524e+10	0.000e+00
170	2.346e+09	0.000e+00	233	1.465e+10	0.000e+00	296	2.532e+10	0.000e+00
171	2.352e+09	0.000e+00	234	1.477e+10	0.000e+00	297	2.536e+10	0.000e+00
172	2.364e+09	0.000e+00	235	1.489e+10	0.000e+00	298	2.541e+10	0.000e+00

299	2.550e+10	0.000e+00
300	2.565e+10	0.000e+00
301	2.573e+10	0.000e+00
302	2.580e+10	0.000e+00
303	2.596e+10	0.000e+00
304	2.630e+10	0.000e+00
305	2.663e+10	0.000e+00
306	2.695e+10	0.000e+00
307	2.757e+10	0.000e+00
308	2.803e+10	0.000e+00
309	2.849e+10	2.165e-13
310	2.873e+10	2.676e-08
311	2.897e+10	6.039e-08
312	2.944e+10	1.849e-07
313	2.985e+10	3.058e-07
314	3.026e+10	4.519e-07
315	3.054e+10	7.236e-07
316	3.082e+10	1.001e-06
317	3.121e+10	1.000e-06
318	3.156e+10	1.039e-06
319	3.173e+10	1.084e-06
320	3.182e+10	1.107e-06
321	3.191e+10	1.131e-06
322	3.209e+10	1.180e-06
323	3.238e+10	1.223e-06
324	3.279e+10	1.001e-06
325	3.316e+10	1.203e-06
326	3.353e+10	1.784e-06
327	3.371e+10	2.040e-06
328	3.388e+10	2.243e-06
329	3.423e+10	2.662e-06
330	3.450e+10	2.864e-06
331	3.464e+10	2.955e-06
332	3.478e+10	2.900e-06
333	3.488e+10	3.214e-06
334	3.498e+10	3.335e-06
335	3.501e+10	3.358e-06
336	3.503e+10	3.384e-06
337	3.509e+10	3.439e-06
338	3.516e+10	3.495e-06
339	3.523e+10	3.548e-06
340	3.537e+10	3.662e-06
341	3.549e+10	3.705e-06
342	3.561e+10	3.767e-06
343	3.573e+10	3.816e-06
344	3.576e+10	3.862e-06
345	3.579e+10	3.896e-06
346	3.586e+10	3.953e-06
347	3.593e+10	4.012e-06
348	3.600e+10	4.049e-06
349	3.615e+10	4.116e-06
350	3.642e+10	4.212e-06
351	3.657e+10	4.289e-06
352	3.671e+10	4.347e-06
353	3.702e+10	4.333e-06
354	3.702e+10	4.299e-06
355	3.702e+10	4.301e-06
356	3.702e+10	4.302e-06
357	3.702e+10	4.304e-06
358	3.702e+10	4.300e-06
359	3.702e+10	4.299e-06
360	3.702e+10	4.305e-06
361	3.703e+10	4.330e-06
362	3.703e+10	4.350e-06
363	3.704e+10	4.361e-06
364	3.704e+10	4.369e-06
365	3.704e+10	4.374e-06
366	3.704e+10	4.371e-06
367	3.704e+10	4.371e-06
368	3.704e+10	4.372e-06
369	3.704e+10	4.372e-06
370	3.704e+10	4.372e-06
371	3.704e+10	4.372e-06
372	3.704e+10	4.372e-06
373	3.704e+10	4.373e-06
374	3.704e+10	4.373e-06
375	3.704e+10	4.375e-06
376	3.704e+10	4.377e-06
377	3.704e+10	4.382e-06
378	3.704e+10	4.389e-06
379	3.705e+10	4.400e-06
380	3.706e+10	4.414e-06
381	3.710e+10	4.428e-06
382	3.717e+10	4.447e-06
383	3.733e+10	4.497e-06
384	3.768e+10	4.604e-06
385	3.794e+10	4.595e-06
386	3.821e+10	4.593e-06
387	3.878e+10	4.575e-06
388	4.000e+10	4.510e-06
389	4.255e+10	4.337e-06
390	4.734e+10	4.060e-06
391	5.233e+10	3.902e-06
392	6.137e+10	3.734e-06
393	6.312e+10	3.746e-06
394	7.707e+10	5.971e-06
395	7.889e+10	6.039e-06
396	9.467e+10	6.004e-06
397	1.113e+11	5.949e-06
398	1.262e+11	5.949e-06
399	1.483e+11	5.927e-06
400	1.578e+11	5.930e-06
401	1.886e+11	5.905e-06
402	2.209e+11	5.902e-06
403	2.645e+11	5.896e-06
404	3.156e+11	5.895e-06
405	3.809e+11	5.907e-06
406	4.837e+11	5.890e-06
407	6.330e+11	5.893e-06
408	8.519e+11	5.899e-06
409	1.181e+12	5.907e-06
410	1.691e+12	5.919e-06
411	2.533e+12	5.928e-06
412	4.020e+12	5.936e-06
413	6.952e+12	5.939e-06
414	1.319e+13	5.939e-06
415	2.693e+13	5.940e-06
416	3.156e+13	5.940e-06

Table VI-7. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Lflux_4_5.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.liquid summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00	40	1.596e+09	0.000e+00	79	1.628e+09	0.000e+00
2	1.578e+09	0.000e+00	41	1.597e+09	0.000e+00	80	1.629e+09	0.000e+00
3	1.578e+09	0.000e+00	42	1.598e+09	0.000e+00	81	1.629e+09	0.000e+00
4	1.578e+09	0.000e+00	43	1.599e+09	0.000e+00	82	1.630e+09	0.000e+00
5	1.578e+09	0.000e+00	44	1.600e+09	0.000e+00	83	1.631e+09	0.000e+00
6	1.578e+09	0.000e+00	45	1.600e+09	0.000e+00	84	1.633e+09	0.000e+00
7	1.578e+09	0.000e+00	46	1.601e+09	0.000e+00	85	1.635e+09	0.000e+00
8	1.578e+09	0.000e+00	47	1.601e+09	0.000e+00	86	1.637e+09	0.000e+00
9	1.578e+09	0.000e+00	48	1.602e+09	0.000e+00	87	1.641e+09	0.000e+00
10	1.578e+09	0.000e+00	49	1.603e+09	0.000e+00	88	1.642e+09	0.000e+00
11	1.578e+09	0.000e+00	50	1.603e+09	0.000e+00	89	1.643e+09	0.000e+00
12	1.578e+09	0.000e+00	51	1.604e+09	0.000e+00	90	1.645e+09	0.000e+00
13	1.578e+09	0.000e+00	52	1.604e+09	0.000e+00	91	1.647e+09	0.000e+00
14	1.578e+09	0.000e+00	53	1.604e+09	0.000e+00	92	1.649e+09	0.000e+00
15	1.578e+09	0.000e+00	54	1.605e+09	0.000e+00	93	1.651e+09	0.000e+00
16	1.578e+09	0.000e+00	55	1.605e+09	0.000e+00	94	1.653e+09	0.000e+00
17	1.579e+09	0.000e+00	56	1.606e+09	0.000e+00	95	1.654e+09	0.000e+00
18	1.579e+09	0.000e+00	57	1.606e+09	0.000e+00	96	1.655e+09	0.000e+00
19	1.579e+09	0.000e+00	58	1.607e+09	0.000e+00	97	1.657e+09	0.000e+00
20	1.579e+09	0.000e+00	59	1.608e+09	0.000e+00	98	1.658e+09	0.000e+00
21	1.580e+09	0.000e+00	60	1.609e+09	0.000e+00	99	1.660e+09	0.000e+00
22	1.580e+09	0.000e+00	61	1.610e+09	0.000e+00	100	1.663e+09	0.000e+00
23	1.580e+09	0.000e+00	62	1.610e+09	0.000e+00	101	1.666e+09	0.000e+00
24	1.581e+09	0.000e+00	63	1.610e+09	0.000e+00	102	1.669e+09	0.000e+00
25	1.581e+09	0.000e+00	64	1.611e+09	0.000e+00	103	1.672e+09	0.000e+00
26	1.582e+09	0.000e+00	65	1.611e+09	0.000e+00	104	1.677e+09	0.000e+00
27	1.583e+09	0.000e+00	66	1.612e+09	0.000e+00	105	1.682e+09	0.000e+00
28	1.583e+09	0.000e+00	67	1.613e+09	0.000e+00	106	1.687e+09	0.000e+00
29	1.584e+09	0.000e+00	68	1.614e+09	0.000e+00	107	1.692e+09	0.000e+00
30	1.585e+09	0.000e+00	69	1.615e+09	0.000e+00	108	1.698e+09	0.000e+00
31	1.587e+09	0.000e+00	70	1.616e+09	0.000e+00	109	1.704e+09	0.000e+00
32	1.588e+09	0.000e+00	71	1.617e+09	0.000e+00	110	1.710e+09	0.000e+00
33	1.590e+09	0.000e+00	72	1.618e+09	0.000e+00	111	1.716e+09	0.000e+00
34	1.592e+09	0.000e+00	73	1.620e+09	0.000e+00	112	1.722e+09	0.000e+00
35	1.593e+09	0.000e+00	74	1.622e+09	0.000e+00	113	1.726e+09	0.000e+00
36	1.594e+09	0.000e+00	75	1.624e+09	0.000e+00	114	1.730e+09	0.000e+00
37	1.595e+09	0.000e+00	76	1.625e+09	0.000e+00	115	1.736e+09	0.000e+00
38	1.595e+09	0.000e+00	77	1.626e+09	0.000e+00	116	1.742e+09	0.000e+00
39	1.596e+09	0.000e+00	78	1.628e+09	0.000e+00	117	1.749e+09	0.000e+00

118	1.753e+09	0.000e+00	181	2.604e+09	0.000e+00	244	1.681e+10	0.000e+00
119	1.757e+09	0.000e+00	182	2.617e+09	0.000e+00	245	1.700e+10	0.000e+00
120	1.762e+09	0.000e+00	183	2.643e+09	0.000e+00	246	1.718e+10	0.000e+00
121	1.768e+09	0.000e+00	184	2.694e+09	0.000e+00	247	1.751e+10	0.000e+00
122	1.775e+09	0.000e+00	185	2.722e+09	0.000e+00	248	1.802e+10	0.000e+00
123	1.782e+09	0.000e+00	186	2.749e+09	0.000e+00	249	1.853e+10	0.000e+00
124	1.786e+09	0.000e+00	187	2.803e+09	0.000e+00	250	1.882e+10	0.000e+00
125	1.789e+09	0.000e+00	188	2.897e+09	0.000e+00	251	1.910e+10	0.000e+00
126	1.792e+09	0.000e+00	189	3.037e+09	0.000e+00	252	1.913e+10	0.000e+00
127	1.796e+09	0.000e+00	190	3.156e+09	0.000e+00	253	1.915e+10	0.000e+00
128	1.801e+09	0.000e+00	191	3.338e+09	0.000e+00	254	1.920e+10	0.000e+00
129	1.807e+09	0.000e+00	192	3.600e+09	0.000e+00	255	1.931e+10	0.000e+00
130	1.813e+09	0.000e+00	193	3.931e+09	0.000e+00	256	1.935e+10	0.000e+00
131	1.818e+09	0.000e+00	194	4.299e+09	0.000e+00	257	1.939e+10	0.000e+00
132	1.826e+09	0.000e+00	195	4.581e+09	0.000e+00	258	1.948e+10	0.000e+00
133	1.835e+09	0.000e+00	196	4.864e+09	0.000e+00	259	1.953e+10	0.000e+00
134	1.842e+09	0.000e+00	197	5.232e+09	0.000e+00	260	1.958e+10	0.000e+00
135	1.846e+09	0.000e+00	198	5.759e+09	0.000e+00	261	1.963e+10	0.000e+00
136	1.850e+09	0.000e+00	199	5.954e+09	0.000e+00	262	1.968e+10	0.000e+00
137	1.854e+09	0.000e+00	200	6.052e+09	0.000e+00	263	1.978e+10	0.000e+00
138	1.859e+09	0.000e+00	201	6.150e+09	0.000e+00	264	1.986e+10	0.000e+00
139	1.866e+09	0.000e+00	202	6.312e+09	0.000e+00	265	1.993e+10	0.000e+00
140	1.874e+09	0.000e+00	203	6.503e+09	0.000e+00	266	2.002e+10	0.000e+00
141	1.883e+09	0.000e+00	204	6.867e+09	0.000e+00	267	2.009e+10	0.000e+00
142	1.890e+09	0.000e+00	205	7.485e+09	0.000e+00	268	2.016e+10	0.000e+00
143	1.893e+09	0.000e+00	206	7.935e+09	0.000e+00	269	2.030e+10	0.000e+00
144	1.896e+09	0.000e+00	207	8.047e+09	0.000e+00	270	2.040e+10	0.000e+00
145	1.900e+09	0.000e+00	208	8.160e+09	0.000e+00	271	2.051e+10	0.000e+00
146	1.906e+09	0.000e+00	209	8.392e+09	0.000e+00	272	2.071e+10	0.000e+00
147	1.915e+09	0.000e+00	210	8.838e+09	0.000e+00	273	2.074e+10	0.000e+00
148	1.927e+09	0.000e+00	211	9.302e+09	0.000e+00	274	2.077e+10	0.000e+00
149	1.940e+09	0.000e+00	212	9.467e+09	0.000e+00	275	2.084e+10	0.000e+00
150	1.954e+09	0.000e+00	213	9.931e+09	0.000e+00	276	2.086e+10	0.000e+00
151	1.960e+09	0.000e+00	214	1.020e+10	0.000e+00	277	2.088e+10	0.000e+00
152	1.966e+09	0.000e+00	215	1.046e+10	0.000e+00	278	2.094e+10	0.000e+00
153	1.975e+09	0.000e+00	216	1.065e+10	0.000e+00	279	2.099e+10	0.000e+00
154	1.986e+09	0.000e+00	217	1.084e+10	0.000e+00	280	2.103e+10	0.000e+00
155	2.002e+09	0.000e+00	218	1.102e+10	0.000e+00	281	2.114e+10	0.000e+00
156	2.017e+09	0.000e+00	219	1.121e+10	0.000e+00	282	2.125e+10	0.000e+00
157	2.029e+09	0.000e+00	220	1.155e+10	0.000e+00	283	2.136e+10	0.000e+00
158	2.041e+09	0.000e+00	221	1.206e+10	0.000e+00	284	2.145e+10	0.000e+00
159	2.054e+09	0.000e+00	222	1.231e+10	0.000e+00	285	2.154e+10	0.000e+00
160	2.074e+09	0.000e+00	223	1.256e+10	0.000e+00	286	2.173e+10	0.000e+00
161	2.082e+09	0.000e+00	224	1.262e+10	0.000e+00	287	2.209e+10	0.000e+00
162	2.091e+09	0.000e+00	225	1.313e+10	0.000e+00	288	2.247e+10	0.000e+00
163	2.102e+09	0.000e+00	226	1.321e+10	0.000e+00	289	2.320e+10	0.000e+00
164	2.117e+09	0.000e+00	227	1.330e+10	0.000e+00	290	2.377e+10	0.000e+00
165	2.142e+09	0.000e+00	228	1.348e+10	0.000e+00	291	2.433e+10	0.000e+00
166	2.175e+09	0.000e+00	229	1.372e+10	0.000e+00	292	2.467e+10	0.000e+00
167	2.215e+09	0.000e+00	230	1.396e+10	0.000e+00	293	2.501e+10	0.000e+00
168	2.271e+09	0.000e+00	231	1.440e+10	0.000e+00	294	2.516e+10	0.000e+00
169	2.341e+09	0.000e+00	232	1.452e+10	0.000e+00	295	2.524e+10	0.000e+00
170	2.346e+09	0.000e+00	233	1.465e+10	0.000e+00	296	2.532e+10	0.000e+00
171	2.352e+09	0.000e+00	234	1.477e+10	0.000e+00	297	2.536e+10	0.000e+00
172	2.364e+09	0.000e+00	235	1.489e+10	0.000e+00	298	2.541e+10	0.000e+00
173	2.388e+09	0.000e+00	236	1.514e+10	0.000e+00	299	2.550e+10	0.000e+00
174	2.432e+09	0.000e+00	237	1.546e+10	0.000e+00	300	2.565e+10	0.000e+00
175	2.507e+09	0.000e+00	238	1.578e+10	0.000e+00	301	2.573e+10	0.000e+00
176	2.512e+09	0.000e+00	239	1.594e+10	0.000e+00	302	2.580e+10	0.000e+00
177	2.517e+09	0.000e+00	240	1.611e+10	0.000e+00	303	2.596e+10	0.000e+00
178	2.527e+09	0.000e+00	241	1.628e+10	0.000e+00	304	2.630e+10	0.000e+00
179	2.549e+09	0.000e+00	242	1.645e+10	0.000e+00	305	2.663e+10	0.000e+00
180	2.592e+09	0.000e+00	243	1.663e+10	0.000e+00	306	2.695e+10	0.000e+00

307	2.757e+10	0.000e+00
308	2.803e+10	0.000e+00
309	2.849e+10	0.000e+00
310	2.873e+10	0.000e+00
311	2.897e+10	0.000e+00
312	2.944e+10	0.000e+00
313	2.985e+10	0.000e+00
314	3.026e+10	0.000e+00
315	3.054e+10	0.000e+00
316	3.082e+10	0.000e+00
317	3.121e+10	0.000e+00
318	3.156e+10	0.000e+00
319	3.173e+10	0.000e+00
320	3.182e+10	0.000e+00
321	3.191e+10	0.000e+00
322	3.209e+10	0.000e+00
323	3.238e+10	0.000e+00
324	3.279e+10	0.000e+00
325	3.316e+10	1.219e-09
326	3.353e+10	3.178e-07
327	3.371e+10	6.189e-07
328	3.388e+10	6.800e-07
329	3.423e+10	8.451e-07
330	3.450e+10	8.614e-07
331	3.464e+10	8.514e-07
332	3.478e+10	6.862e-07
333	3.488e+10	8.414e-07
334	3.498e+10	8.973e-07
335	3.501e+10	9.087e-07
336	3.503e+10	9.210e-07
337	3.509e+10	9.474e-07
338	3.516e+10	9.744e-07
339	3.523e+10	1.000e-06
340	3.537e+10	1.057e-06
341	3.549e+10	1.070e-06
342	3.561e+10	1.095e-06
343	3.573e+10	1.109e-06
344	3.576e+10	1.133e-06
345	3.579e+10	1.151e-06
346	3.586e+10	1.181e-06
347	3.593e+10	1.213e-06
348	3.600e+10	1.231e-06
349	3.615e+10	1.266e-06
350	3.642e+10	1.316e-06
351	3.657e+10	1.356e-06
352	3.671e+10	1.385e-06
353	3.702e+10	1.367e-06
354	3.702e+10	1.347e-06
355	3.702e+10	1.348e-06
356	3.702e+10	1.350e-06
357	3.702e+10	1.356e-06
358	3.702e+10	1.360e-06
359	3.702e+10	1.362e-06
360	3.702e+10	1.365e-06
361	3.703e+10	1.377e-06
362	3.703e+10	1.387e-06
363	3.704e+10	1.393e-06
364	3.704e+10	1.397e-06
365	3.704e+10	1.399e-06
366	3.704e+10	1.398e-06
367	3.704e+10	1.398e-06
368	3.704e+10	1.398e-06
369	3.704e+10	1.399e-06
370	3.704e+10	1.398e-06
371	3.704e+10	1.399e-06
372	3.704e+10	1.399e-06
373	3.704e+10	1.399e-06
374	3.704e+10	1.399e-06
375	3.704e+10	1.400e-06
376	3.704e+10	1.401e-06
377	3.704e+10	1.403e-06
378	3.704e+10	1.407e-06
379	3.705e+10	1.412e-06
380	3.706e+10	1.420e-06
381	3.710e+10	1.427e-06
382	3.717e+10	1.438e-06
383	3.733e+10	1.469e-06
384	3.768e+10	1.537e-06
385	3.794e+10	1.533e-06
386	3.821e+10	1.533e-06
387	3.878e+10	1.527e-06
388	4.000e+10	1.507e-06
389	4.255e+10	1.455e-06
390	4.734e+10	1.397e-06
391	5.233e+10	1.373e-06
392	6.137e+10	1.383e-06
393	6.312e+10	1.410e-06
394	7.707e+10	2.534e-06
395	7.889e+10	2.577e-06
396	9.467e+10	2.633e-06
397	1.113e+11	2.663e-06
398	1.262e+11	2.681e-06
399	1.483e+11	2.701e-06
400	1.578e+11	2.717e-06
401	1.886e+11	2.731e-06
402	2.209e+11	2.748e-06
403	2.645e+11	2.761e-06
404	3.156e+11	2.770e-06
405	3.809e+11	2.782e-06
406	4.837e+11	2.782e-06
407	6.330e+11	2.788e-06
408	8.519e+11	2.792e-06
409	1.181e+12	2.795e-06
410	1.691e+12	2.798e-06
411	2.533e+12	2.800e-06
412	4.020e+12	2.802e-06
413	6.952e+12	2.803e-06
414	1.319e+13	2.803e-06
415	2.693e+13	2.803e-06
416	3.156e+13	2.803e-06

Table VI-8. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Lflux_5_6.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.liquid summed over connections
```

time (s) flux (kg/s) **(The sequential numbers in the left-hand column are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00	39	1.596e+09	0.000e+00	77	1.626e+09	0.000e+00
2	1.578e+09	0.000e+00	40	1.596e+09	0.000e+00	78	1.628e+09	0.000e+00
3	1.578e+09	0.000e+00	41	1.597e+09	0.000e+00	79	1.628e+09	0.000e+00
4	1.578e+09	0.000e+00	42	1.598e+09	0.000e+00	80	1.629e+09	0.000e+00
5	1.578e+09	0.000e+00	43	1.599e+09	0.000e+00	81	1.629e+09	0.000e+00
6	1.578e+09	0.000e+00	44	1.600e+09	0.000e+00	82	1.630e+09	0.000e+00
7	1.578e+09	0.000e+00	45	1.600e+09	0.000e+00	83	1.631e+09	0.000e+00
8	1.578e+09	0.000e+00	46	1.601e+09	0.000e+00	84	1.633e+09	0.000e+00
9	1.578e+09	0.000e+00	47	1.601e+09	0.000e+00	85	1.635e+09	0.000e+00
10	1.578e+09	0.000e+00	48	1.602e+09	0.000e+00	86	1.637e+09	0.000e+00
11	1.578e+09	0.000e+00	49	1.603e+09	0.000e+00	87	1.641e+09	0.000e+00
12	1.578e+09	0.000e+00	50	1.603e+09	0.000e+00	88	1.642e+09	0.000e+00
13	1.578e+09	0.000e+00	51	1.604e+09	0.000e+00	89	1.643e+09	0.000e+00
14	1.578e+09	0.000e+00	52	1.604e+09	0.000e+00	90	1.645e+09	0.000e+00
15	1.578e+09	0.000e+00	53	1.604e+09	0.000e+00	91	1.647e+09	0.000e+00
16	1.578e+09	0.000e+00	54	1.605e+09	0.000e+00	92	1.649e+09	0.000e+00
17	1.579e+09	0.000e+00	55	1.605e+09	0.000e+00	93	1.651e+09	0.000e+00
18	1.579e+09	0.000e+00	56	1.606e+09	0.000e+00	94	1.653e+09	0.000e+00
19	1.579e+09	0.000e+00	57	1.606e+09	0.000e+00	95	1.654e+09	0.000e+00
20	1.579e+09	0.000e+00	58	1.607e+09	0.000e+00	96	1.655e+09	0.000e+00
21	1.580e+09	0.000e+00	59	1.608e+09	0.000e+00	97	1.657e+09	0.000e+00
22	1.580e+09	0.000e+00	60	1.609e+09	0.000e+00	98	1.658e+09	0.000e+00
23	1.580e+09	0.000e+00	61	1.610e+09	0.000e+00	99	1.660e+09	0.000e+00
24	1.581e+09	0.000e+00	62	1.610e+09	0.000e+00	100	1.663e+09	0.000e+00
25	1.581e+09	0.000e+00	63	1.610e+09	0.000e+00	101	1.666e+09	0.000e+00
26	1.582e+09	0.000e+00	64	1.611e+09	0.000e+00	102	1.669e+09	0.000e+00
27	1.583e+09	0.000e+00	65	1.611e+09	0.000e+00	103	1.672e+09	0.000e+00
28	1.583e+09	0.000e+00	66	1.612e+09	0.000e+00	104	1.677e+09	0.000e+00
29	1.584e+09	0.000e+00	67	1.613e+09	0.000e+00	105	1.682e+09	0.000e+00
30	1.585e+09	0.000e+00	68	1.614e+09	0.000e+00	106	1.687e+09	0.000e+00
31	1.587e+09	0.000e+00	69	1.615e+09	0.000e+00	107	1.692e+09	0.000e+00
32	1.588e+09	0.000e+00	70	1.616e+09	0.000e+00	108	1.698e+09	0.000e+00
33	1.590e+09	0.000e+00	71	1.617e+09	0.000e+00	109	1.704e+09	0.000e+00
34	1.592e+09	0.000e+00	72	1.618e+09	0.000e+00	110	1.710e+09	0.000e+00
35	1.593e+09	0.000e+00	73	1.620e+09	0.000e+00	111	1.716e+09	0.000e+00
36	1.594e+09	0.000e+00	74	1.622e+09	0.000e+00	112	1.722e+09	0.000e+00
37	1.595e+09	0.000e+00	75	1.624e+09	0.000e+00	113	1.726e+09	0.000e+00
38	1.595e+09	0.000e+00	76	1.625e+09	0.000e+00	114	1.730e+09	0.000e+00

115	1.736e+09	0.000e+00
116	1.742e+09	0.000e+00
117	1.749e+09	0.000e+00
118	1.753e+09	0.000e+00
119	1.757e+09	0.000e+00
120	1.762e+09	0.000e+00
121	1.768e+09	0.000e+00
122	1.775e+09	0.000e+00
123	1.782e+09	0.000e+00
124	1.786e+09	0.000e+00
125	1.789e+09	0.000e+00
126	1.792e+09	0.000e+00
127	1.796e+09	0.000e+00
128	1.801e+09	0.000e+00
129	1.807e+09	0.000e+00
130	1.813e+09	0.000e+00
131	1.818e+09	0.000e+00
132	1.826e+09	0.000e+00
133	1.835e+09	0.000e+00
134	1.842e+09	0.000e+00
135	1.846e+09	0.000e+00
136	1.850e+09	0.000e+00
137	1.854e+09	0.000e+00
138	1.859e+09	0.000e+00
139	1.866e+09	0.000e+00
140	1.874e+09	0.000e+00
141	1.883e+09	0.000e+00
142	1.890e+09	0.000e+00
143	1.893e+09	0.000e+00
144	1.896e+09	0.000e+00
145	1.900e+09	0.000e+00
146	1.906e+09	0.000e+00
147	1.915e+09	0.000e+00
148	1.927e+09	0.000e+00
149	1.940e+09	0.000e+00
150	1.954e+09	0.000e+00
151	1.960e+09	0.000e+00
152	1.966e+09	0.000e+00
153	1.975e+09	0.000e+00
154	1.986e+09	0.000e+00
155	2.002e+09	0.000e+00
156	2.017e+09	0.000e+00
157	2.029e+09	0.000e+00
158	2.041e+09	0.000e+00
159	2.054e+09	0.000e+00
160	2.074e+09	0.000e+00
161	2.082e+09	0.000e+00
162	2.091e+09	0.000e+00
163	2.102e+09	0.000e+00
164	2.117e+09	0.000e+00
165	2.142e+09	0.000e+00
166	2.175e+09	0.000e+00
167	2.215e+09	0.000e+00
168	2.271e+09	0.000e+00
169	2.341e+09	0.000e+00
170	2.346e+09	0.000e+00
171	2.352e+09	0.000e+00
172	2.364e+09	0.000e+00
173	2.388e+09	0.000e+00
174	2.432e+09	0.000e+00
175	2.507e+09	0.000e+00
176	2.512e+09	0.000e+00
177	2.517e+09	0.000e+00
178	2.527e+09	0.000e+00
179	2.549e+09	0.000e+00
180	2.592e+09	0.000e+00
181	2.604e+09	0.000e+00
182	2.617e+09	0.000e+00
183	2.643e+09	0.000e+00
184	2.694e+09	0.000e+00
185	2.722e+09	0.000e+00
186	2.749e+09	0.000e+00
187	2.803e+09	0.000e+00
188	2.897e+09	0.000e+00
189	3.037e+09	0.000e+00
190	3.156e+09	0.000e+00
191	3.338e+09	0.000e+00
192	3.600e+09	0.000e+00
193	3.931e+09	0.000e+00
194	4.299e+09	0.000e+00
195	4.581e+09	0.000e+00
196	4.864e+09	0.000e+00
197	5.232e+09	0.000e+00
198	5.759e+09	0.000e+00
199	5.954e+09	0.000e+00
200	6.052e+09	0.000e+00
201	6.150e+09	0.000e+00
202	6.312e+09	0.000e+00
203	6.503e+09	0.000e+00
204	6.867e+09	0.000e+00
205	7.485e+09	0.000e+00
206	7.935e+09	0.000e+00
207	8.047e+09	0.000e+00
208	8.160e+09	0.000e+00
209	8.392e+09	0.000e+00
210	8.838e+09	0.000e+00
211	9.302e+09	0.000e+00
212	9.467e+09	0.000e+00
213	9.931e+09	0.000e+00
214	1.020e+10	0.000e+00
215	1.046e+10	0.000e+00
216	1.065e+10	0.000e+00
217	1.084e+10	0.000e+00
218	1.102e+10	0.000e+00
219	1.121e+10	0.000e+00
220	1.155e+10	0.000e+00
221	1.206e+10	0.000e+00
222	1.231e+10	0.000e+00
223	1.256e+10	0.000e+00
224	1.262e+10	0.000e+00
225	1.313e+10	0.000e+00
226	1.321e+10	0.000e+00
227	1.330e+10	0.000e+00
228	1.348e+10	0.000e+00
229	1.372e+10	0.000e+00
230	1.396e+10	0.000e+00
231	1.440e+10	0.000e+00
232	1.452e+10	0.000e+00
233	1.465e+10	0.000e+00
234	1.477e+10	0.000e+00
235	1.489e+10	0.000e+00
236	1.514e+10	0.000e+00
237	1.546e+10	0.000e+00
238	1.578e+10	0.000e+00
239	1.594e+10	0.000e+00
240	1.611e+10	0.000e+00
241	1.628e+10	0.000e+00
242	1.645e+10	0.000e+00
243	1.663e+10	0.000e+00
244	1.681e+10	0.000e+00
245	1.700e+10	0.000e+00
246	1.718e+10	0.000e+00
247	1.751e+10	0.000e+00
248	1.802e+10	0.000e+00
249	1.853e+10	0.000e+00
250	1.882e+10	0.000e+00
251	1.910e+10	0.000e+00
252	1.913e+10	0.000e+00
253	1.915e+10	0.000e+00
254	1.920e+10	0.000e+00
255	1.931e+10	0.000e+00
256	1.935e+10	0.000e+00
257	1.939e+10	0.000e+00
258	1.948e+10	0.000e+00
259	1.953e+10	0.000e+00
260	1.958e+10	0.000e+00
261	1.963e+10	0.000e+00
262	1.968e+10	0.000e+00
263	1.978e+10	0.000e+00
264	1.986e+10	0.000e+00
265	1.993e+10	0.000e+00
266	2.002e+10	0.000e+00
267	2.009e+10	0.000e+00
268	2.016e+10	0.000e+00
269	2.030e+10	0.000e+00
270	2.040e+10	0.000e+00
271	2.051e+10	0.000e+00
272	2.071e+10	0.000e+00
273	2.074e+10	0.000e+00
274	2.077e+10	0.000e+00
275	2.084e+10	0.000e+00
276	2.086e+10	0.000e+00
277	2.088e+10	0.000e+00
278	2.094e+10	0.000e+00
279	2.099e+10	0.000e+00
280	2.103e+10	0.000e+00
281	2.114e+10	0.000e+00
282	2.125e+10	0.000e+00
283	2.136e+10	0.000e+00
284	2.145e+10	0.000e+00
285	2.154e+10	0.000e+00
286	2.173e+10	0.000e+00
287	2.209e+10	0.000e+00
288	2.247e+10	0.000e+00
289	2.320e+10	0.000e+00
290	2.377e+10	0.000e+00
291	2.433e+10	0.000e+00
292	2.467e+10	0.000e+00
293	2.501e+10	0.000e+00
294	2.516e+10	0.000e+00
295	2.524e+10	0.000e+00
296	2.532e+10	0.000e+00
297	2.536e+10	0.000e+00
298	2.541e+10	0.000e+00
299	2.550e+10	0.000e+00
300	2.565e+10	0.000e+00
301	2.573e+10	0.000e+00
302	2.580e+10	0.000e+00
303	2.596e+10	0.000e+00

304	2.630e+10	0.000e+00
305	2.663e+10	0.000e+00
306	2.695e+10	0.000e+00
307	2.757e+10	0.000e+00
308	2.803e+10	0.000e+00
309	2.849e+10	0.000e+00
310	2.873e+10	0.000e+00
311	2.897e+10	0.000e+00
312	2.944e+10	0.000e+00
313	2.985e+10	0.000e+00
314	3.026e+10	0.000e+00
315	3.054e+10	0.000e+00
316	3.082e+10	0.000e+00
317	3.121e+10	0.000e+00
318	3.156e+10	0.000e+00
319	3.173e+10	0.000e+00
320	3.182e+10	0.000e+00
321	3.191e+10	0.000e+00
322	3.209e+10	0.000e+00
323	3.238e+10	0.000e+00
324	3.279e+10	0.000e+00
325	3.316e+10	0.000e+00
326	3.353e+10	0.000e+00
327	3.371e+10	0.000e+00
328	3.388e+10	0.000e+00
329	3.423e+10	0.000e+00
330	3.450e+10	4.478e-07
331	3.464e+10	4.151e-07
332	3.478e+10	-1.498e-09
333	3.488e+10	9.153e-07
334	3.498e+10	8.589e-07
335	3.501e+10	1.242e-06
336	3.503e+10	1.300e-06
337	3.509e+10	1.400e-06
338	3.516e+10	1.539e-06
339	3.523e+10	1.738e-06
340	3.537e+10	2.123e-06
341	3.549e+10	2.300e-06
342	3.561e+10	2.611e-06
343	3.573e+10	2.576e-06
344	3.576e+10	2.509e-06
345	3.579e+10	2.560e-06
346	3.586e+10	2.661e-06
347	3.593e+10	2.898e-06
348	3.600e+10	2.938e-06
349	3.615e+10	3.088e-06
350	3.642e+10	3.372e-06
351	3.657e+10	4.647e-06
352	3.671e+10	4.427e-06
353	3.702e+10	3.700e-06
354	3.702e+10	3.546e-06
355	3.702e+10	3.591e-06
356	3.702e+10	3.570e-06
357	3.702e+10	3.527e-06
358	3.702e+10	3.520e-06
359	3.702e+10	3.557e-06
360	3.702e+10	3.621e-06
361	3.703e+10	3.713e-06
362	3.703e+10	3.766e-06
363	3.704e+10	3.786e-06
364	3.704e+10	3.808e-06
365	3.704e+10	3.812e-06
366	3.704e+10	3.811e-06
367	3.704e+10	3.814e-06
368	3.704e+10	3.816e-06
369	3.704e+10	3.819e-06
370	3.704e+10	3.818e-06
371	3.704e+10	3.816e-06
372	3.704e+10	3.816e-06
373	3.704e+10	3.817e-06
374	3.704e+10	3.818e-06
375	3.704e+10	3.820e-06
376	3.704e+10	3.824e-06
377	3.704e+10	3.833e-06
378	3.704e+10	3.852e-06
379	3.705e+10	3.885e-06
380	3.706e+10	3.925e-06
381	3.710e+10	3.965e-06
382	3.717e+10	4.036e-06
383	3.733e+10	4.274e-06
384	3.768e+10	4.957e-06
385	3.794e+10	4.823e-06
386	3.821e+10	5.203e-06
387	3.878e+10	4.808e-06
388	4.000e+10	5.093e-06
389	4.255e+10	4.952e-06
390	4.734e+10	4.796e-06
391	5.233e+10	4.661e-06
392	6.137e+10	4.702e-06
393	6.312e+10	4.678e-06
394	7.707e+10	8.706e-06
395	7.889e+10	8.312e-06
396	9.467e+10	8.399e-06
397	1.113e+11	8.443e-06
398	1.262e+11	8.392e-06
399	1.483e+11	8.382e-06
400	1.578e+11	8.376e-06
401	1.886e+11	8.371e-06
402	2.209e+11	8.332e-06
403	2.645e+11	8.293e-06
404	3.156e+11	8.261e-06
405	3.809e+11	8.223e-06
406	4.837e+11	8.175e-06
407	6.330e+11	8.120e-06
408	8.519e+11	8.069e-06
409	1.181e+12	8.025e-06
410	1.691e+12	7.991e-06
411	2.533e+12	7.951e-06
412	4.020e+12	7.936e-06
413	6.952e+12	7.930e-06
414	1.319e+13	7.927e-06
415	2.693e+13	7.924e-06
416	3.156e+13	7.922e-06

Table VI-9. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Gflux_0_1.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.gas summed over connections
```

time (s) flux (kg/s)

(The columns of sequential numbers are time step indices added by the author for reference.)

1	1.578e+09	0.000e+00						
2	1.578e+09	-3.540e-06	42	1.598e+09	-2.163e-07	82	1.630e+09	-1.973e-07
3	1.578e+09	-1.496e-06	43	1.599e+09	-2.014e-07	83	1.631e+09	-1.989e-07
4	1.578e+09	-9.664e-07	44	1.600e+09	-1.966e-07	84	1.633e+09	-2.021e-07
5	1.578e+09	-6.273e-07	45	1.600e+09	-1.974e-07	85	1.635e+09	-2.071e-07
6	1.578e+09	-3.379e-07	46	1.601e+09	-1.961e-07	86	1.637e+09	-2.125e-07
7	1.578e+09	-2.463e-07	47	1.601e+09	-1.907e-07	87	1.641e+09	-2.195e-07
8	1.578e+09	-2.070e-07	48	1.602e+09	-1.873e-07	88	1.642e+09	-2.230e-07
9	1.578e+09	-1.789e-07	49	1.603e+09	-1.841e-07	89	1.643e+09	-2.261e-07
10	1.578e+09	-1.628e-07	50	1.603e+09	-1.851e-07	90	1.645e+09	-2.303e-07
11	1.578e+09	-1.549e-07	51	1.604e+09	-1.802e-07	91	1.647e+09	-2.341e-07
12	1.578e+09	-1.604e-07	52	1.604e+09	-1.800e-07	92	1.649e+09	-2.377e-07
13	1.578e+09	-1.751e-07	53	1.604e+09	-1.794e-07	93	1.651e+09	-2.422e-07
14	1.578e+09	-3.177e-07	54	1.605e+09	-1.804e-07	94	1.653e+09	-2.478e-07
15	1.578e+09	-2.742e-07	55	1.605e+09	-1.801e-07	95	1.654e+09	-2.501e-07
16	1.578e+09	-3.386e-07	56	1.606e+09	-1.791e-07	96	1.655e+09	-2.527e-07
17	1.579e+09	-4.038e-07	57	1.606e+09	-1.773e-07	97	1.657e+09	-2.561e-07
18	1.579e+09	-5.545e-07	58	1.607e+09	-1.769e-07	98	1.658e+09	-2.596e-07
19	1.579e+09	-5.180e-07	59	1.608e+09	-1.747e-07	99	1.660e+09	-2.638e-07
20	1.579e+09	-5.747e-07	60	1.609e+09	-1.718e-07	100	1.663e+09	-2.694e-07
21	1.580e+09	-6.264e-07	61	1.610e+09	-1.735e-07	101	1.666e+09	-2.761e-07
22	1.580e+09	-6.270e-07	62	1.610e+09	-1.721e-07	102	1.669e+09	-2.835e-07
23	1.580e+09	-6.210e-07	63	1.610e+09	-1.717e-07	103	1.672e+09	-2.926e-07
24	1.581e+09	-5.860e-07	64	1.611e+09	-1.717e-07	104	1.677e+09	-3.025e-07
25	1.581e+09	-5.941e-07	65	1.611e+09	-1.718e-07	105	1.682e+09	-3.147e-07
26	1.582e+09	-5.406e-07	66	1.612e+09	-1.720e-07	106	1.687e+09	-3.277e-07
27	1.583e+09	-5.124e-07	67	1.613e+09	-1.702e-07	107	1.692e+09	-3.404e-07
28	1.583e+09	-4.811e-07	68	1.614e+09	-1.735e-07	108	1.698e+09	-3.552e-07
29	1.584e+09	-4.863e-07	69	1.615e+09	-1.736e-07	109	1.704e+09	-3.728e-07
30	1.585e+09	-4.129e-07	70	1.616e+09	-1.724e-07	110	1.710e+09	-3.876e-07
31	1.587e+09	-3.742e-07	71	1.617e+09	-1.735e-07	111	1.716e+09	-4.021e-07
32	1.588e+09	-3.410e-07	72	1.618e+09	-1.750e-07	112	1.722e+09	-4.195e-07
33	1.590e+09	-3.079e-07	73	1.620e+09	-1.771e-07	113	1.726e+09	-4.301e-07
34	1.592e+09	-2.739e-07	74	1.622e+09	-1.801e-07	114	1.730e+09	-4.404e-07
35	1.593e+09	-2.617e-07	75	1.624e+09	-1.847e-07	115	1.736e+09	-4.543e-07
36	1.594e+09	-2.497e-07	76	1.625e+09	-1.861e-07	116	1.742e+09	-4.698e-07
37	1.595e+09	-2.396e-07	77	1.626e+09	-1.900e-07	117	1.749e+09	-4.885e-07
38	1.595e+09	-2.330e-07	78	1.628e+09	-1.926e-07	118	1.753e+09	-4.986e-07
39	1.596e+09	-2.343e-07	79	1.628e+09	-1.930e-07	119	1.757e+09	-5.086e-07
40	1.596e+09	-2.212e-07	80	1.629e+09	-1.944e-07	120	1.762e+09	-5.218e-07
41	1.597e+09	-2.150e-07	81	1.629e+09	-1.948e-07	121	1.768e+09	-5.393e-07

122	1.775e+09	-5.580e-07
123	1.782e+09	-5.766e-07
124	1.786e+09	-5.879e-07
125	1.789e+09	-5.967e-07
126	1.792e+09	-6.055e-07
127	1.796e+09	-6.161e-07
128	1.801e+09	-6.287e-07
129	1.807e+09	-6.467e-07
130	1.813e+09	-6.626e-07
131	1.818e+09	-6.783e-07
132	1.826e+09	-6.987e-07
133	1.835e+09	-7.249e-07
134	1.842e+09	-7.468e-07
135	1.846e+09	-7.591e-07
136	1.850e+09	-7.709e-07
137	1.854e+09	-7.829e-07
138	1.859e+09	-7.970e-07
139	1.866e+09	-8.174e-07
140	1.874e+09	-8.402e-07
141	1.883e+09	-8.639e-07
142	1.890e+09	-8.859e-07
143	1.893e+09	-8.947e-07
144	1.896e+09	-9.034e-07
145	1.900e+09	-9.151e-07
146	1.906e+09	-9.304e-07
147	1.915e+09	-9.556e-07
148	1.927e+09	-9.878e-07
149	1.940e+09	-1.023e-06
150	1.954e+09	-1.062e-06
151	1.960e+09	-1.080e-06
152	1.966e+09	-1.096e-06
153	1.975e+09	-1.118e-06
154	1.986e+09	-1.147e-06
155	2.002e+09	-1.189e-06
156	2.017e+09	-1.227e-06
157	2.029e+09	-1.256e-06
158	2.041e+09	-1.283e-06
159	2.054e+09	-1.315e-06
160	2.074e+09	-1.361e-06
161	2.082e+09	-1.382e-06
162	2.091e+09	-1.403e-06
163	2.102e+09	-1.431e-06
164	2.117e+09	-1.467e-06
165	2.142e+09	-1.526e-06
166	2.175e+09	-1.601e-06
167	2.215e+09	-1.690e-06
168	2.271e+09	-1.808e-06
169	2.341e+09	-1.953e-06
170	2.346e+09	-1.967e-06
171	2.352e+09	-1.978e-06
172	2.364e+09	-2.005e-06
173	2.388e+09	-2.049e-06
174	2.432e+09	-2.135e-06
175	2.507e+09	-2.271e-06
176	2.512e+09	-2.281e-06
177	2.517e+09	-2.290e-06
178	2.527e+09	-2.310e-06
179	2.549e+09	-2.345e-06
180	2.592e+09	-2.420e-06
181	2.604e+09	-2.447e-06
182	2.617e+09	-2.468e-06
183	2.643e+09	-2.516e-06
184	2.694e+09	-2.602e-06
185	2.722e+09	-2.634e-06
186	2.749e+09	-2.674e-06
187	2.803e+09	-2.752e-06
188	2.897e+09	-2.829e-06
189	3.037e+09	-2.912e-06
190	3.156e+09	-2.956e-06
191	3.338e+09	-3.111e-06
192	3.600e+09	-3.335e-06
193	3.931e+09	-3.436e-06
194	4.299e+09	-3.219e-06
195	4.581e+09	-2.885e-06
196	4.864e+09	-2.616e-06
197	5.232e+09	-2.490e-06
198	5.759e+09	-2.319e-06
199	5.954e+09	-2.247e-06
200	6.052e+09	-2.211e-06
201	6.150e+09	-2.170e-06
202	6.312e+09	-2.101e-06
203	6.503e+09	-2.054e-06
204	6.867e+09	-2.008e-06
205	7.485e+09	-1.913e-06
206	7.935e+09	-1.832e-06
207	8.047e+09	-1.818e-06
208	8.160e+09	-1.808e-06
209	8.392e+09	-1.794e-06
210	8.838e+09	-1.764e-06
211	9.302e+09	-1.728e-06
212	9.467e+09	-1.713e-06
213	9.931e+09	-1.693e-06
214	1.020e+10	-1.683e-06
215	1.046e+10	-1.669e-06
216	1.065e+10	-1.658e-06
217	1.084e+10	-1.685e-06
218	1.102e+10	-1.633e-06
219	1.121e+10	-1.624e-06
220	1.155e+10	-1.616e-06
221	1.206e+10	-1.591e-06
222	1.231e+10	-1.578e-06
223	1.256e+10	-1.564e-06
224	1.262e+10	-1.573e-06
225	1.313e+10	-1.536e-06
226	1.321e+10	-1.532e-06
227	1.330e+10	-1.545e-06
228	1.348e+10	-1.518e-06
229	1.372e+10	-1.506e-06
230	1.396e+10	-1.491e-06
231	1.440e+10	-1.465e-06
232	1.452e+10	-1.481e-06
233	1.465e+10	-1.454e-06
234	1.477e+10	-1.467e-06
235	1.489e+10	-1.440e-06
236	1.514e+10	-1.426e-06
237	1.546e+10	-1.407e-06
238	1.578e+10	-1.387e-06
239	1.594e+10	-1.378e-06
240	1.611e+10	-1.390e-06
241	1.628e+10	-1.359e-06
242	1.645e+10	-1.350e-06
243	1.663e+10	-1.343e-06
244	1.681e+10	-1.329e-06
245	1.700e+10	-1.318e-06
246	1.718e+10	-1.307e-06
247	1.751e+10	-1.286e-06
248	1.802e+10	-1.258e-06
249	1.853e+10	-1.228e-06
250	1.882e+10	-1.243e-06
251	1.910e+10	-1.197e-06
252	1.913e+10	-1.198e-06
253	1.915e+10	-1.198e-06
254	1.920e+10	-1.197e-06
255	1.931e+10	-1.192e-06
256	1.935e+10	-1.191e-06
257	1.939e+10	-1.189e-06
258	1.948e+10	-1.188e-06
259	1.953e+10	-1.189e-06
260	1.958e+10	-1.188e-06
261	1.963e+10	-1.188e-06
262	1.968e+10	-1.186e-06
263	1.978e+10	-1.184e-06
264	1.986e+10	-1.183e-06
265	1.993e+10	-1.181e-06
266	2.002e+10	-1.176e-06
267	2.009e+10	-1.172e-06
268	2.016e+10	-1.168e-06
269	2.030e+10	-1.161e-06
270	2.040e+10	-1.153e-06
271	2.051e+10	-1.146e-06
272	2.071e+10	-1.130e-06
273	2.074e+10	-1.130e-06
274	2.077e+10	-1.127e-06
275	2.084e+10	-1.124e-06
276	2.086e+10	-1.116e-06
277	2.088e+10	-1.116e-06
278	2.094e+10	-1.113e-06
279	2.099e+10	-1.109e-06
280	2.103e+10	-1.106e-06
281	2.114e+10	-1.094e-06
282	2.125e+10	-1.093e-06
283	2.136e+10	-1.076e-06
284	2.145e+10	-1.074e-06
285	2.154e+10	-1.067e-06
286	2.173e+10	-1.045e-06
287	2.209e+10	-1.014e-06
288	2.247e+10	-9.847e-07
289	2.320e+10	-9.329e-07
290	2.377e+10	-8.943e-07
291	2.433e+10	-8.592e-07
292	2.467e+10	-8.394e-07
293	2.501e+10	-8.200e-07
294	2.516e+10	-8.177e-07
295	2.524e+10	-8.074e-07
296	2.532e+10	-8.059e-07
297	2.536e+10	-8.021e-07
298	2.541e+10	-7.997e-07
299	2.550e+10	-7.966e-07
300	2.565e+10	-7.853e-07
301	2.573e+10	-7.814e-07
302	2.580e+10	-7.801e-07
303	2.596e+10	-7.746e-07
304	2.630e+10	-7.517e-07
305	2.663e+10	-7.358e-07
306	2.695e+10	-7.200e-07
307	2.757e+10	-6.913e-07
308	2.803e+10	-6.709e-07
309	2.849e+10	-6.512e-07
310	2.873e+10	-6.421e-07

311	2.897e+10	-6.331e-07
312	2.944e+10	-6.154e-07
313	2.985e+10	-6.007e-07
314	3.026e+10	-5.864e-07
315	3.054e+10	-5.764e-07
316	3.082e+10	-5.669e-07
317	3.121e+10	-5.556e-07
318	3.156e+10	-5.465e-07
319	3.173e+10	-5.424e-07
320	3.182e+10	-5.403e-07
321	3.191e+10	-5.397e-07
322	3.209e+10	-5.344e-07
323	3.238e+10	-5.283e-07
324	3.279e+10	-5.196e-07
325	3.316e+10	-5.113e-07
326	3.353e+10	-4.989e-07
327	3.371e+10	-4.927e-07
328	3.388e+10	-4.869e-07
329	3.423e+10	-4.749e-07
330	3.450e+10	-4.670e-07
331	3.464e+10	-4.632e-07
332	3.478e+10	-4.608e-07
333	3.488e+10	-4.563e-07
334	3.498e+10	-4.536e-07
335	3.501e+10	-4.516e-07
336	3.503e+10	-4.509e-07
337	3.509e+10	-4.491e-07
338	3.516e+10	-4.469e-07
339	3.523e+10	-4.447e-07
340	3.537e+10	-4.408e-07
341	3.549e+10	-4.359e-07
342	3.561e+10	-4.326e-07
343	3.573e+10	-4.292e-07
344	3.576e+10	-4.286e-07
345	3.579e+10	-4.276e-07
346	3.586e+10	-4.251e-07
347	3.593e+10	-4.233e-07
348	3.600e+10	-4.211e-07
349	3.615e+10	-4.161e-07
350	3.642e+10	-4.092e-07
351	3.657e+10	-4.042e-07
352	3.671e+10	-3.998e-07
353	3.702e+10	-3.935e-07
354	3.702e+10	-3.985e-07
355	3.702e+10	-3.945e-07
356	3.702e+10	-3.887e-07
357	3.702e+10	-3.830e-07
358	3.702e+10	-3.765e-07
359	3.702e+10	-3.748e-07
360	3.702e+10	-3.705e-07
361	3.703e+10	-3.790e-07
362	3.703e+10	-3.796e-07
363	3.704e+10	-3.800e-07
364	3.704e+10	-3.795e-07
365	3.704e+10	-3.911e-07
366	3.704e+10	-3.679e-07
367	3.704e+10	-3.780e-07
368	3.704e+10	-3.786e-07
369	3.704e+10	-3.630e-07
370	3.704e+10	-3.557e-07
371	3.704e+10	-3.876e-07
372	3.704e+10	-3.868e-07
373	3.704e+10	-3.890e-07
374	3.704e+10	-3.891e-07
375	3.704e+10	-3.893e-07
376	3.704e+10	-3.903e-07
377	3.704e+10	-3.914e-07
378	3.704e+10	-3.916e-07
379	3.705e+10	-3.915e-07
380	3.706e+10	-3.910e-07
381	3.710e+10	-3.901e-07
382	3.717e+10	-3.882e-07
383	3.733e+10	-3.840e-07
384	3.768e+10	-3.749e-07
385	3.794e+10	-3.671e-07
386	3.821e+10	-3.614e-07
387	3.878e+10	-3.497e-07
388	4.000e+10	-3.259e-07
389	4.255e+10	-2.755e-07
390	4.734e+10	-1.977e-07
391	5.233e+10	-1.515e-07
392	6.137e+10	-1.109e-07
393	6.312e+10	-9.476e-08
394	7.707e+10	-6.243e-08
395	7.889e+10	-5.396e-08
396	9.467e+10	-3.444e-08
397	1.113e+11	-3.798e-08
398	1.262e+11	-1.636e-08
399	1.483e+11	-1.744e-08
400	1.578e+11	-7.421e-09
401	1.886e+11	-1.403e-08
402	2.209e+11	-9.320e-09
403	2.645e+11	-8.440e-09
404	3.156e+11	-4.907e-09
405	3.809e+11	-2.828e-09
406	4.837e+11	8.604e-10
407	6.330e+11	1.067e-09
408	8.519e+11	9.190e-10
409	1.181e+12	9.787e-10
410	1.691e+12	8.979e-10
411	2.533e+12	6.684e-10
412	4.020e+12	4.201e-10
413	6.952e+12	4.752e-11
414	1.319e+13	-5.119e-11
415	2.693e+13	-6.994e-12
416	3.156e+13	-6.268e-11

Table VI-10. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Gflux_1_2.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.gas summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00	39	1.596e+09	-5.586e-07	77	1.626e+09	-4.182e-05
2	1.578e+09	-4.681e-05	40	1.596e+09	-7.092e-07	78	1.628e+09	-4.191e-05
3	1.578e+09	-7.728e-06	41	1.597e+09	-8.867e-07	79	1.628e+09	-4.149e-05
4	1.578e+09	-4.337e-06	42	1.598e+09	-1.145e-06	80	1.629e+09	-4.146e-05
5	1.578e+09	-2.374e-06	43	1.599e+09	-1.763e-06	81	1.629e+09	-4.129e-05
6	1.578e+09	-1.454e-06	44	1.600e+09	-2.561e-06	82	1.630e+09	-4.078e-05
7	1.578e+09	-1.116e-06	45	1.600e+09	-2.897e-06	83	1.631e+09	-4.074e-05
8	1.578e+09	-9.110e-07	46	1.601e+09	-3.289e-06	84	1.633e+09	-3.955e-05
9	1.578e+09	-7.094e-07	47	1.601e+09	-4.017e-06	85	1.635e+09	-3.897e-05
10	1.578e+09	-5.359e-07	48	1.602e+09	-5.120e-06	86	1.637e+09	-3.780e-05
11	1.578e+09	-3.940e-07	49	1.603e+09	-6.870e-06	87	1.641e+09	-3.760e-05
12	1.578e+09	-3.408e-07	50	1.603e+09	-8.224e-06	88	1.642e+09	-3.681e-05
13	1.578e+09	-2.838e-07	51	1.604e+09	-9.727e-06	89	1.643e+09	-3.645e-05
14	1.578e+09	-3.400e-07	52	1.604e+09	-1.022e-05	90	1.645e+09	-3.551e-05
15	1.578e+09	-2.416e-07	53	1.604e+09	-1.068e-05	91	1.647e+09	-3.568e-05
16	1.578e+09	-2.561e-07	54	1.605e+09	-1.165e-05	92	1.649e+09	-3.516e-05
17	1.579e+09	-2.738e-07	55	1.605e+09	-1.361e-05	93	1.651e+09	-3.313e-05
18	1.579e+09	-3.740e-07	56	1.606e+09	-1.710e-05	94	1.653e+09	-3.167e-05
19	1.579e+09	-3.079e-07	57	1.606e+09	-1.936e-05	95	1.654e+09	-3.120e-05
20	1.579e+09	-3.478e-07	58	1.607e+09	-2.196e-05	96	1.655e+09	-3.054e-05
21	1.580e+09	-3.629e-07	59	1.608e+09	-2.489e-05	97	1.657e+09	-2.985e-05
22	1.580e+09	-3.509e-07	60	1.609e+09	-2.749e-05	98	1.658e+09	-2.907e-05
23	1.580e+09	-3.334e-07	61	1.610e+09	-2.935e-05	99	1.660e+09	-2.894e-05
24	1.581e+09	-3.399e-07	62	1.610e+09	-2.989e-05	100	1.663e+09	-2.839e-05
25	1.581e+09	-3.746e-07	63	1.610e+09	-3.061e-05	101	1.666e+09	-2.669e-05
26	1.582e+09	-3.696e-07	64	1.611e+09	-3.156e-05	102	1.669e+09	-2.638e-05
27	1.583e+09	-3.794e-07	65	1.611e+09	-3.269e-05	103	1.672e+09	-2.506e-05
28	1.583e+09	-3.904e-07	66	1.612e+09	-3.403e-05	104	1.677e+09	-2.377e-05
29	1.584e+09	-4.241e-07	67	1.613e+09	-3.554e-05	105	1.682e+09	-2.288e-05
30	1.585e+09	-4.270e-07	68	1.614e+09	-3.731e-05	106	1.687e+09	-2.098e-05
31	1.587e+09	-4.294e-07	69	1.615e+09	-3.849e-05	107	1.692e+09	-1.984e-05
32	1.588e+09	-4.500e-07	70	1.616e+09	-3.971e-05	108	1.698e+09	-1.977e-05
33	1.590e+09	-4.608e-07	71	1.617e+09	-4.095e-05	109	1.704e+09	-1.893e-05
34	1.592e+09	-4.104e-07	72	1.618e+09	-4.192e-05	110	1.710e+09	-1.711e-05
35	1.593e+09	-4.078e-07	73	1.620e+09	-4.261e-05	111	1.716e+09	-1.556e-05
36	1.594e+09	-4.202e-07	74	1.622e+09	-4.270e-05	112	1.722e+09	-1.401e-05
37	1.595e+09	-4.116e-07	75	1.624e+09	-4.187e-05	113	1.726e+09	-1.201e-05
38	1.595e+09	-4.194e-07	76	1.625e+09	-4.145e-05	114	1.730e+09	-1.030e-05

115	1.736e+09	-8.004e-06	178	2.527e+09	-2.057e-07	241	1.628e+10	-3.070e-06
116	1.742e+09	-6.442e-06	179	2.549e+09	-2.056e-07	242	1.645e+10	-3.142e-06
117	1.749e+09	-5.200e-06	180	2.592e+09	-2.059e-07	243	1.663e+10	-3.232e-06
118	1.753e+09	-4.610e-06	181	2.604e+09	-2.103e-07	244	1.681e+10	-3.281e-06
119	1.757e+09	-4.044e-06	182	2.617e+09	-2.105e-07	245	1.700e+10	-3.308e-06
120	1.762e+09	-3.401e-06	183	2.643e+09	-2.123e-07	246	1.718e+10	-3.323e-06
121	1.768e+09	-2.695e-06	184	2.694e+09	-2.129e-07	247	1.751e+10	-3.310e-06
122	1.775e+09	-2.629e-06	185	2.722e+09	-2.050e-07	248	1.802e+10	-3.338e-06
123	1.782e+09	-2.697e-06	186	2.749e+09	-1.990e-07	249	1.853e+10	-3.433e-06
124	1.786e+09	-2.704e-06	187	2.803e+09	-1.948e-07	250	1.882e+10	-3.564e-06
125	1.789e+09	-2.605e-06	188	2.897e+09	-1.765e-07	251	1.910e+10	-3.965e-06
126	1.792e+09	-2.361e-06	189	3.037e+09	-1.561e-07	252	1.913e+10	-4.004e-06
127	1.796e+09	-2.239e-06	190	3.156e+09	-1.382e-07	253	1.915e+10	-4.019e-06
128	1.801e+09	-2.268e-06	191	3.338e+09	-1.171e-07	254	1.920e+10	-4.108e-06
129	1.807e+09	-2.120e-06	192	3.600e+09	-8.908e-08	255	1.931e+10	-4.362e-06
130	1.813e+09	-1.963e-06	193	3.931e+09	-5.285e-08	256	1.935e+10	-4.459e-06
131	1.818e+09	-1.888e-06	194	4.299e+09	-6.386e-09	257	1.939e+10	-4.547e-06
132	1.826e+09	-1.859e-06	195	4.581e+09	2.438e-08	258	1.948e+10	-4.883e-06
133	1.835e+09	-1.800e-06	196	4.864e+09	5.291e-08	259	1.953e+10	-5.050e-06
134	1.842e+09	-1.872e-06	197	5.232e+09	8.041e-08	260	1.958e+10	-5.162e-06
135	1.846e+09	-1.838e-06	198	5.759e+09	1.220e-07	261	1.963e+10	-5.312e-06
136	1.850e+09	-1.694e-06	199	5.954e+09	1.393e-07	262	1.968e+10	-5.415e-06
137	1.854e+09	-1.630e-06	200	6.052e+09	1.446e-07	263	1.978e+10	-5.579e-06
138	1.859e+09	-1.579e-06	201	6.150e+09	1.531e-07	264	1.986e+10	-6.017e-06
139	1.866e+09	-1.523e-06	202	6.312e+09	1.651e-07	265	1.993e+10	-6.417e-06
140	1.874e+09	-1.433e-06	203	6.503e+09	1.778e-07	266	2.002e+10	-6.670e-06
141	1.883e+09	-1.409e-06	204	6.867e+09	1.984e-07	267	2.009e+10	-6.875e-06
142	1.890e+09	-1.460e-06	205	7.485e+09	2.233e-07	268	2.016e+10	-7.038e-06
143	1.893e+09	-1.418e-06	206	7.935e+09	2.285e-07	269	2.030e+10	-7.241e-06
144	1.896e+09	-1.445e-06	207	8.047e+09	2.279e-07	270	2.040e+10	-7.321e-06
145	1.900e+09	-1.448e-06	208	8.160e+09	2.251e-07	271	2.051e+10	-7.418e-06
146	1.906e+09	-1.355e-06	209	8.392e+09	2.211e-07	272	2.071e+10	-7.527e-06
147	1.915e+09	-1.269e-06	210	8.838e+09	2.179e-07	273	2.074e+10	-7.545e-06
148	1.927e+09	-1.197e-06	211	9.302e+09	2.193e-07	274	2.077e+10	-7.563e-06
149	1.940e+09	-1.152e-06	212	9.467e+09	2.248e-07	275	2.084e+10	-7.596e-06
150	1.954e+09	-1.210e-06	213	9.931e+09	2.127e-07	276	2.086e+10	-7.594e-06
151	1.960e+09	-1.161e-06	214	1.020e+10	1.990e-07	277	2.088e+10	-7.601e-06
152	1.966e+09	-1.109e-06	215	1.046e+10	1.886e-07	278	2.094e+10	-7.614e-06
153	1.975e+09	-1.025e-06	216	1.065e+10	1.814e-07	279	2.099e+10	-7.630e-06
154	1.986e+09	-9.478e-07	217	1.084e+10	-6.101e-08	280	2.103e+10	-7.653e-06
155	2.002e+09	-9.637e-07	218	1.102e+10	-1.024e-08	281	2.114e+10	-7.698e-06
156	2.017e+09	-1.050e-06	219	1.121e+10	-2.213e-07	282	2.125e+10	-7.746e-06
157	2.029e+09	-9.046e-07	220	1.155e+10	-3.863e-07	283	2.136e+10	-7.765e-06
158	2.041e+09	-7.332e-07	221	1.206e+10	-6.342e-07	284	2.145e+10	-7.796e-06
159	2.054e+09	-6.769e-07	222	1.231e+10	-7.501e-07	285	2.154e+10	-7.812e-06
160	2.074e+09	-8.261e-07	223	1.256e+10	-9.787e-07	286	2.173e+10	-7.841e-06
161	2.082e+09	-7.712e-07	224	1.262e+10	-1.054e-06	287	2.209e+10	-7.901e-06
162	2.091e+09	-6.909e-07	225	1.313e+10	-1.415e-06	288	2.247e+10	-7.924e-06
163	2.102e+09	-5.515e-07	226	1.321e+10	-1.476e-06	289	2.320e+10	-8.032e-06
164	2.117e+09	-4.577e-07	227	1.330e+10	-1.554e-06	290	2.377e+10	-8.127e-06
165	2.142e+09	-4.987e-07	228	1.348e+10	-1.600e-06	291	2.433e+10	-8.235e-06
166	2.175e+09	-4.276e-07	229	1.372e+10	-1.754e-06	292	2.467e+10	-8.261e-06
167	2.215e+09	-3.600e-07	230	1.396e+10	-1.940e-06	293	2.501e+10	-8.319e-06
168	2.271e+09	-3.107e-07	231	1.440e+10	-2.215e-06	294	2.516e+10	-8.354e-06
169	2.341e+09	-2.691e-07	232	1.452e+10	-2.314e-06	295	2.524e+10	-8.356e-06
170	2.346e+09	-2.696e-07	233	1.465e+10	-2.359e-06	296	2.532e+10	-8.373e-06
171	2.352e+09	-2.637e-07	234	1.477e+10	-2.444e-06	297	2.536e+10	-8.374e-06
172	2.364e+09	-2.599e-07	235	1.489e+10	-2.441e-06	298	2.541e+10	-8.379e-06
173	2.388e+09	-2.452e-07	236	1.514e+10	-2.505e-06	299	2.550e+10	-8.393e-06
174	2.432e+09	-2.241e-07	237	1.546e+10	-2.662e-06	300	2.565e+10	-8.406e-06
175	2.507e+09	-2.043e-07	238	1.578e+10	-2.853e-06	301	2.573e+10	-8.415e-06
176	2.512e+09	-2.031e-07	239	1.594e+10	-2.920e-06	302	2.580e+10	-8.430e-06
177	2.517e+09	-2.045e-07	240	1.611e+10	-3.008e-06	303	2.596e+10	-8.453e-06

304	2.630e+10	-8.518e-06
305	2.663e+10	-8.580e-06
306	2.695e+10	-8.618e-06
307	2.757e+10	-8.654e-06
308	2.803e+10	-8.645e-06
309	2.849e+10	-8.634e-06
310	2.873e+10	-8.631e-06
311	2.897e+10	-8.618e-06
312	2.944e+10	-8.576e-06
313	2.985e+10	-8.541e-06
314	3.026e+10	-8.480e-06
315	3.054e+10	-8.414e-06
316	3.082e+10	-8.377e-06
317	3.121e+10	-8.332e-06
318	3.156e+10	-8.308e-06
319	3.173e+10	-8.298e-06
320	3.182e+10	-8.290e-06
321	3.191e+10	-8.285e-06
322	3.209e+10	-8.261e-06
323	3.238e+10	-8.232e-06
324	3.279e+10	-8.179e-06
325	3.316e+10	-8.078e-06
326	3.353e+10	-7.715e-06
327	3.371e+10	-7.510e-06
328	3.388e+10	-7.316e-06
329	3.423e+10	-6.829e-06
330	3.450e+10	-6.534e-06
331	3.464e+10	-6.386e-06
332	3.478e+10	-6.354e-06
333	3.488e+10	-6.023e-06
334	3.498e+10	-5.840e-06
335	3.501e+10	-5.780e-06
336	3.503e+10	-5.735e-06
337	3.509e+10	-5.626e-06
338	3.516e+10	-5.508e-06
339	3.523e+10	-5.390e-06
340	3.537e+10	-5.134e-06
341	3.549e+10	-4.950e-06
342	3.561e+10	-4.790e-06
343	3.573e+10	-4.598e-06
344	3.576e+10	-4.539e-06
345	3.579e+10	-4.471e-06
346	3.586e+10	-4.339e-06
347	3.593e+10	-4.199e-06
348	3.600e+10	-4.082e-06
349	3.615e+10	-3.855e-06
350	3.642e+10	-3.474e-06
351	3.657e+10	-3.251e-06
352	3.671e+10	-3.043e-06
353	3.702e+10	-2.840e-06
354	3.702e+10	-3.021e-06
355	3.702e+10	-2.918e-06
356	3.702e+10	-2.848e-06
357	3.702e+10	-2.807e-06
358	3.702e+10	-2.781e-06
359	3.702e+10	-2.772e-06
360	3.702e+10	-2.737e-06
361	3.703e+10	-2.729e-06
362	3.703e+10	-2.708e-06
363	3.704e+10	-2.699e-06
364	3.704e+10	-2.691e-06
365	3.704e+10	-2.716e-06
366	3.704e+10	-2.683e-06
367	3.704e+10	-2.687e-06
368	3.704e+10	-2.688e-06
369	3.704e+10	-2.663e-06
370	3.704e+10	-2.655e-06
371	3.704e+10	-2.704e-06
372	3.704e+10	-2.705e-06
373	3.704e+10	-2.708e-06
374	3.704e+10	-2.710e-06
375	3.704e+10	-2.712e-06
376	3.704e+10	-2.713e-06
377	3.704e+10	-2.712e-06
378	3.704e+10	-2.706e-06
379	3.705e+10	-2.693e-06
380	3.706e+10	-2.670e-06
381	3.710e+10	-2.633e-06
382	3.717e+10	-2.554e-06
383	3.733e+10	-2.364e-06
384	3.768e+10	-1.967e-06
385	3.794e+10	-1.824e-06
386	3.821e+10	-1.673e-06
387	3.878e+10	-1.421e-06
388	4.000e+10	-1.052e-06
389	4.255e+10	-6.286e-07
390	4.734e+10	-3.174e-07
391	5.233e+10	-2.227e-07
392	6.137e+10	-1.366e-07
393	6.312e+10	-1.369e-07
394	7.707e+10	-7.987e-08
395	7.889e+10	-7.320e-08
396	9.467e+10	-4.735e-08
397	1.113e+11	-3.421e-08
398	1.262e+11	-2.524e-08
399	1.483e+11	-1.919e-08
400	1.578e+11	-1.629e-08
401	1.886e+11	-1.330e-08
402	2.209e+11	-1.009e-08
403	2.645e+11	-7.475e-09
404	3.156e+11	-5.425e-09
405	3.809e+11	-4.297e-09
406	4.837e+11	-2.451e-09
407	6.330e+11	-1.522e-09
408	8.519e+11	-9.303e-10
409	1.181e+12	-3.114e-10
410	1.691e+12	-8.896e-11
411	2.533e+12	1.541e-11
412	4.020e+12	3.191e-11
413	6.952e+12	-4.335e-11
414	1.319e+13	-6.171e-11
415	2.693e+13	-3.360e-11
416	3.156e+13	-4.417e-11

Table VI-11. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Gflux_2_3.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.gas summed over connections
```

(The columns of sequential numbers are time step indices added by the author for reference.)

	time (s)	flux (kg/s)						
1	1.578e+09	0.000e+00	39	1.596e+09	-2.108e-05	77	1.626e+09	-4.158e-05
2	1.578e+09	-5.765e-05	40	1.596e+09	-2.283e-05	78	1.628e+09	-4.127e-05
3	1.578e+09	-8.768e-06	41	1.597e+09	-2.423e-05	79	1.628e+09	-4.077e-05
4	1.578e+09	-4.881e-06	42	1.598e+09	-2.620e-05	80	1.629e+09	-4.063e-05
5	1.578e+09	-2.590e-06	43	1.599e+09	-2.961e-05	81	1.629e+09	-4.035e-05
6	1.578e+09	-1.645e-06	44	1.600e+09	-3.248e-05	82	1.630e+09	-3.975e-05
7	1.578e+09	-1.296e-06	45	1.600e+09	-3.357e-05	83	1.631e+09	-3.965e-05
8	1.578e+09	-1.089e-06	46	1.601e+09	-3.469e-05	84	1.633e+09	-3.852e-05
9	1.578e+09	-8.980e-07	47	1.601e+09	-3.604e-05	85	1.635e+09	-3.776e-05
10	1.578e+09	-7.452e-07	48	1.602e+09	-3.808e-05	86	1.637e+09	-3.640e-05
11	1.578e+09	-6.396e-07	49	1.603e+09	-4.125e-05	87	1.641e+09	-3.567e-05
12	1.578e+09	-6.284e-07	50	1.603e+09	-4.323e-05	88	1.642e+09	-3.472e-05
13	1.578e+09	-6.166e-07	51	1.604e+09	-4.442e-05	89	1.643e+09	-3.395e-05
14	1.578e+09	-7.159e-07	52	1.604e+09	-4.474e-05	90	1.645e+09	-3.238e-05
15	1.578e+09	-6.432e-07	53	1.604e+09	-4.486e-05	91	1.647e+09	-3.214e-05
16	1.578e+09	-6.761e-07	54	1.605e+09	-4.539e-05	92	1.649e+09	-3.130e-05
17	1.579e+09	-7.056e-07	55	1.605e+09	-4.634e-05	93	1.651e+09	-2.955e-05
18	1.579e+09	-8.242e-07	56	1.606e+09	-4.730e-05	94	1.653e+09	-2.906e-05
19	1.579e+09	-7.815e-07	57	1.606e+09	-4.738e-05	95	1.654e+09	-2.896e-05
20	1.579e+09	-8.666e-07	58	1.607e+09	-4.766e-05	96	1.655e+09	-2.869e-05
21	1.580e+09	-9.512e-07	59	1.608e+09	-4.789e-05	97	1.657e+09	-2.836e-05
22	1.580e+09	-1.033e-06	60	1.609e+09	-4.769e-05	98	1.658e+09	-2.696e-05
23	1.580e+09	-1.148e-06	61	1.610e+09	-4.694e-05	99	1.660e+09	-2.628e-05
24	1.581e+09	-1.308e-06	62	1.610e+09	-4.669e-05	100	1.663e+09	-2.546e-05
25	1.581e+09	-1.531e-06	63	1.610e+09	-4.656e-05	101	1.666e+09	-2.331e-05
26	1.582e+09	-1.775e-06	64	1.611e+09	-4.642e-05	102	1.669e+09	-2.326e-05
27	1.583e+09	-2.096e-06	65	1.611e+09	-4.628e-05	103	1.672e+09	-2.192e-05
28	1.583e+09	-2.529e-06	66	1.612e+09	-4.613e-05	104	1.677e+09	-2.022e-05
29	1.584e+09	-3.124e-06	67	1.613e+09	-4.592e-05	105	1.682e+09	-1.901e-05
30	1.585e+09	-3.987e-06	68	1.614e+09	-4.564e-05	106	1.687e+09	-1.773e-05
31	1.587e+09	-4.666e-06	69	1.615e+09	-4.543e-05	107	1.692e+09	-1.681e-05
32	1.588e+09	-5.937e-06	70	1.616e+09	-4.536e-05	108	1.698e+09	-1.626e-05
33	1.590e+09	-7.912e-06	71	1.617e+09	-4.535e-05	109	1.704e+09	-1.458e-05
34	1.592e+09	-1.133e-05	72	1.618e+09	-4.513e-05	110	1.710e+09	-1.258e-05
35	1.593e+09	-1.378e-05	73	1.620e+09	-4.477e-05	111	1.716e+09	-1.096e-05
36	1.594e+09	-1.659e-05	74	1.622e+09	-4.399e-05	112	1.722e+09	-9.016e-06
37	1.595e+09	-1.857e-05	75	1.624e+09	-4.264e-05	113	1.726e+09	-5.887e-06
38	1.595e+09	-1.996e-05	76	1.625e+09	-4.174e-05	114	1.730e+09	-4.447e-06

115	1.736e+09	-3.251e-06	178	2.527e+09	-2.058e-07	241	1.628e+10	-2.339e-06
116	1.742e+09	-2.444e-06	179	2.549e+09	-2.061e-07	242	1.645e+10	-2.416e-06
117	1.749e+09	-1.805e-06	180	2.592e+09	-2.062e-07	243	1.663e+10	-2.499e-06
118	1.753e+09	-1.784e-06	181	2.604e+09	-2.106e-07	244	1.681e+10	-2.612e-06
119	1.757e+09	-1.758e-06	182	2.617e+09	-2.109e-07	245	1.700e+10	-2.719e-06
120	1.762e+09	-1.688e-06	183	2.643e+09	-2.124e-07	246	1.718e+10	-2.802e-06
121	1.768e+09	-1.619e-06	184	2.694e+09	-2.137e-07	247	1.751e+10	-2.822e-06
122	1.775e+09	-1.583e-06	185	2.722e+09	-2.055e-07	248	1.802e+10	-2.907e-06
123	1.782e+09	-1.507e-06	186	2.749e+09	-2.016e-07	249	1.853e+10	-2.980e-06
124	1.786e+09	-1.474e-06	187	2.803e+09	-2.009e-07	250	1.882e+10	-3.036e-06
125	1.789e+09	-1.501e-06	188	2.897e+09	-1.781e-07	251	1.910e+10	-3.177e-06
126	1.792e+09	-1.847e-06	189	3.037e+09	-1.581e-07	252	1.913e+10	-3.241e-06
127	1.796e+09	-1.688e-06	190	3.156e+09	-1.404e-07	253	1.915e+10	-3.277e-06
128	1.801e+09	-1.453e-06	191	3.338e+09	-1.184e-07	254	1.920e+10	-3.436e-06
129	1.807e+09	-1.415e-06	192	3.600e+09	-9.048e-08	255	1.931e+10	-3.812e-06
130	1.813e+09	-1.400e-06	193	3.931e+09	-5.477e-08	256	1.935e+10	-3.884e-06
131	1.818e+09	-1.392e-06	194	4.299e+09	-8.934e-09	257	1.939e+10	-3.921e-06
132	1.826e+09	-1.339e-06	195	4.581e+09	2.118e-08	258	1.948e+10	-4.118e-06
133	1.835e+09	-1.270e-06	196	4.864e+09	4.988e-08	259	1.953e+10	-4.366e-06
134	1.842e+09	-1.186e-06	197	5.232e+09	7.841e-08	260	1.958e+10	-4.516e-06
135	1.846e+09	-1.291e-06	198	5.759e+09	1.198e-07	261	1.963e+10	-4.789e-06
136	1.850e+09	-1.239e-06	199	5.954e+09	1.368e-07	262	1.968e+10	-5.015e-06
137	1.854e+09	-1.479e-06	200	6.052e+09	1.421e-07	263	1.978e+10	-5.204e-06
138	1.859e+09	-1.097e-06	201	6.150e+09	1.503e-07	264	1.986e+10	-5.391e-06
139	1.866e+09	-1.096e-06	202	6.312e+09	1.622e-07	265	1.993e+10	-5.548e-06
140	1.874e+09	-1.048e-06	203	6.503e+09	1.757e-07	266	2.002e+10	-5.648e-06
141	1.883e+09	-9.963e-07	204	6.867e+09	1.966e-07	267	2.009e+10	-5.932e-06
142	1.890e+09	-9.671e-07	205	7.485e+09	2.220e-07	268	2.016e+10	-6.233e-06
143	1.893e+09	-9.754e-07	206	7.935e+09	2.382e-07	269	2.030e+10	-6.579e-06
144	1.896e+09	-1.184e-06	207	8.047e+09	2.429e-07	270	2.040e+10	-6.672e-06
145	1.900e+09	-1.111e-06	208	8.160e+09	2.465e-07	271	2.051e+10	-6.798e-06
146	1.906e+09	-9.916e-07	209	8.392e+09	2.544e-07	272	2.071e+10	-6.963e-06
147	1.915e+09	-9.846e-07	210	8.838e+09	2.659e-07	273	2.074e+10	-6.989e-06
148	1.927e+09	-9.502e-07	211	9.302e+09	2.706e-07	274	2.077e+10	-7.016e-06
149	1.940e+09	-9.430e-07	212	9.467e+09	2.721e-07	275	2.084e+10	-7.065e-06
150	1.954e+09	-8.485e-07	213	9.931e+09	2.612e-07	276	2.086e+10	-7.069e-06
151	1.960e+09	-8.743e-07	214	1.020e+10	2.534e-07	277	2.088e+10	-7.077e-06
152	1.966e+09	-8.239e-07	215	1.046e+10	2.494e-07	278	2.094e+10	-7.092e-06
153	1.975e+09	-8.032e-07	216	1.065e+10	2.469e-07	279	2.099e+10	-7.110e-06
154	1.986e+09	-7.624e-07	217	1.084e+10	2.134e-07	280	2.103e+10	-7.134e-06
155	2.002e+09	-6.517e-07	218	1.102e+10	2.470e-07	281	2.114e+10	-7.191e-06
156	2.017e+09	-5.860e-07	219	1.121e+10	2.390e-07	282	2.125e+10	-7.247e-06
157	2.029e+09	-5.839e-07	220	1.155e+10	2.305e-07	283	2.136e+10	-7.276e-06
158	2.041e+09	-6.301e-07	221	1.206e+10	1.707e-07	284	2.145e+10	-7.312e-06
159	2.054e+09	-5.508e-07	222	1.231e+10	3.704e-08	285	2.154e+10	-7.334e-06
160	2.074e+09	-4.883e-07	223	1.256e+10	-7.169e-08	286	2.173e+10	-7.377e-06
161	2.082e+09	-5.513e-07	224	1.262e+10	-1.106e-07	287	2.209e+10	-7.462e-06
162	2.091e+09	-4.884e-07	225	1.313e+10	-2.840e-07	288	2.247e+10	-7.503e-06
163	2.102e+09	-5.141e-07	226	1.321e+10	-3.148e-07	289	2.320e+10	-7.647e-06
164	2.117e+09	-4.753e-07	227	1.330e+10	-3.609e-07	290	2.377e+10	-7.770e-06
165	2.142e+09	-4.326e-07	228	1.348e+10	-4.434e-07	291	2.433e+10	-7.904e-06
166	2.175e+09	-4.218e-07	229	1.372e+10	-5.845e-07	292	2.467e+10	-7.931e-06
167	2.215e+09	-3.564e-07	230	1.396e+10	-7.827e-07	293	2.501e+10	-7.990e-06
168	2.271e+09	-3.077e-07	231	1.440e+10	-1.169e-06	294	2.516e+10	-8.024e-06
169	2.341e+09	-2.666e-07	232	1.452e+10	-1.305e-06	295	2.524e+10	-8.024e-06
170	2.346e+09	-2.670e-07	233	1.465e+10	-1.377e-06	296	2.532e+10	-8.041e-06
171	2.352e+09	-2.612e-07	234	1.477e+10	-1.481e-06	297	2.536e+10	-8.044e-06
172	2.364e+09	-2.584e-07	235	1.489e+10	-1.479e-06	298	2.541e+10	-8.051e-06
173	2.388e+09	-2.435e-07	236	1.514e+10	-1.669e-06	299	2.550e+10	-8.068e-06
174	2.432e+09	-2.233e-07	237	1.546e+10	-1.911e-06	300	2.565e+10	-8.089e-06
175	2.507e+09	-2.045e-07	238	1.578e+10	-2.150e-06	301	2.573e+10	-8.102e-06
176	2.512e+09	-2.034e-07	239	1.594e+10	-2.204e-06	302	2.580e+10	-8.120e-06
177	2.517e+09	-2.046e-07	240	1.611e+10	-2.285e-06	303	2.596e+10	-8.153e-06

304	2.630e+10	-8.246e-06
305	2.663e+10	-8.329e-06
306	2.695e+10	-8.408e-06
307	2.757e+10	-8.513e-06
308	2.803e+10	-8.541e-06
309	2.849e+10	-8.576e-06
310	2.873e+10	-8.621e-06
311	2.897e+10	-8.663e-06
312	2.944e+10	-8.745e-06
313	2.985e+10	-8.834e-06
314	3.026e+10	-8.907e-06
315	3.054e+10	-8.930e-06
316	3.082e+10	-8.975e-06
317	3.121e+10	-9.031e-06
318	3.156e+10	-9.096e-06
319	3.173e+10	-9.127e-06
320	3.182e+10	-9.140e-06
321	3.191e+10	-9.155e-06
322	3.209e+10	-9.176e-06
323	3.238e+10	-9.219e-06
324	3.279e+10	-9.276e-06
325	3.316e+10	-9.288e-06
326	3.353e+10	-9.109e-06
327	3.371e+10	-9.005e-06
328	3.388e+10	-8.922e-06
329	3.423e+10	-8.697e-06
330	3.450e+10	-8.597e-06
331	3.464e+10	-8.548e-06
332	3.478e+10	-8.579e-06
333	3.488e+10	-8.395e-06
334	3.498e+10	-8.315e-06
335	3.501e+10	-8.286e-06
336	3.503e+10	-8.268e-06
337	3.509e+10	-8.220e-06
338	3.516e+10	-8.168e-06
339	3.523e+10	-8.117e-06
340	3.537e+10	-8.004e-06
341	3.549e+10	-7.926e-06
342	3.561e+10	-7.859e-06
343	3.573e+10	-7.773e-06
344	3.576e+10	-7.740e-06
345	3.579e+10	-7.704e-06
346	3.586e+10	-7.636e-06
347	3.593e+10	-7.563e-06
348	3.600e+10	-7.506e-06
349	3.615e+10	-7.389e-06
350	3.642e+10	-7.183e-06
351	3.657e+10	-7.042e-06
352	3.671e+10	-6.906e-06
353	3.702e+10	-6.822e-06
354	3.702e+10	-7.108e-06
355	3.702e+10	-6.947e-06
356	3.702e+10	-6.830e-06
357	3.702e+10	-6.750e-06
358	3.702e+10	-6.700e-06
359	3.702e+10	-6.707e-06
360	3.702e+10	-6.688e-06
361	3.703e+10	-6.697e-06
362	3.703e+10	-6.683e-06
363	3.704e+10	-6.672e-06
364	3.704e+10	-6.667e-06
365	3.704e+10	-6.696e-06
366	3.704e+10	-6.651e-06
367	3.704e+10	-6.658e-06
368	3.704e+10	-6.661e-06
369	3.704e+10	-6.623e-06
370	3.704e+10	-6.610e-06
371	3.704e+10	-6.687e-06
372	3.704e+10	-6.689e-06
373	3.704e+10	-6.693e-06
374	3.704e+10	-6.696e-06
375	3.704e+10	-6.699e-06
376	3.704e+10	-6.699e-06
377	3.704e+10	-6.697e-06
378	3.704e+10	-6.690e-06
379	3.705e+10	-6.680e-06
380	3.706e+10	-6.664e-06
381	3.710e+10	-6.637e-06
382	3.717e+10	-6.577e-06
383	3.733e+10	-6.422e-06
384	3.768e+10	-6.074e-06
385	3.794e+10	-5.916e-06
386	3.821e+10	-5.758e-06
387	3.878e+10	-5.420e-06
388	4.000e+10	-4.713e-06
389	4.255e+10	-3.544e-06
390	4.734e+10	-2.013e-06
391	5.233e+10	-1.337e-06
392	6.137e+10	-7.114e-07
393	6.312e+10	-7.431e-07
394	7.707e+10	-3.613e-07
395	7.889e+10	-3.310e-07
396	9.467e+10	-1.921e-07
397	1.113e+11	-1.264e-07
398	1.262e+11	-9.466e-08
399	1.483e+11	-6.811e-08
400	1.578e+11	-6.031e-08
401	1.886e+11	-4.505e-08
402	2.209e+11	-3.387e-08
403	2.645e+11	-2.529e-08
404	3.156e+11	-1.899e-08
405	3.809e+11	-1.436e-08
406	4.837e+11	-9.212e-09
407	6.330e+11	-5.980e-09
408	8.519e+11	-3.612e-09
409	1.181e+12	-1.957e-09
410	1.691e+12	-1.039e-09
411	2.533e+12	-4.675e-10
412	4.020e+12	-2.296e-10
413	6.952e+12	-2.293e-10
414	1.319e+13	-2.245e-10
415	2.693e+13	-1.574e-10
416	3.156e+13	-1.549e-10

Table VI-12. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Gflux_3_4.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.gas summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00	40	1.596e+09	-7.453e-07	79	1.628e+09	-5.583e-07
2	1.578e+09	6.710e-06	41	1.597e+09	-7.602e-07	80	1.629e+09	-5.219e-07
3	1.578e+09	-5.404e-07	42	1.598e+09	-7.837e-07	81	1.629e+09	-4.778e-07
4	1.578e+09	-3.857e-07	43	1.599e+09	-7.968e-07	82	1.630e+09	-4.559e-07
5	1.578e+09	-1.120e-07	44	1.600e+09	-8.055e-07	83	1.631e+09	-4.109e-07
6	1.578e+09	-8.227e-08	45	1.600e+09	-8.070e-07	84	1.633e+09	-4.211e-07
7	1.578e+09	-6.869e-08	46	1.601e+09	-8.063e-07	85	1.635e+09	-4.063e-07
8	1.578e+09	-6.416e-08	47	1.601e+09	-8.240e-07	86	1.637e+09	-4.454e-07
9	1.578e+09	-7.691e-08	48	1.602e+09	-8.656e-07	87	1.641e+09	-4.494e-07
10	1.578e+09	-9.581e-08	49	1.603e+09	-9.297e-07	88	1.642e+09	-4.648e-07
11	1.578e+09	-1.260e-07	50	1.603e+09	-9.694e-07	89	1.643e+09	-4.592e-07
12	1.578e+09	-1.466e-07	51	1.604e+09	-9.959e-07	90	1.645e+09	-4.684e-07
13	1.578e+09	-1.630e-07	52	1.604e+09	-1.009e-06	91	1.647e+09	-4.399e-07
14	1.578e+09	-1.846e-07	53	1.604e+09	-1.027e-06	92	1.649e+09	-4.284e-07
15	1.578e+09	-1.964e-07	54	1.605e+09	-1.054e-06	93	1.651e+09	-4.823e-07
16	1.578e+09	-2.318e-07	55	1.605e+09	-1.083e-06	94	1.653e+09	-5.132e-07
17	1.579e+09	-2.781e-07	56	1.606e+09	-1.047e-06	95	1.654e+09	-5.067e-07
18	1.579e+09	-3.329e-07	57	1.606e+09	-1.026e-06	96	1.655e+09	-5.072e-07
19	1.579e+09	-3.389e-07	58	1.607e+09	-9.499e-07	97	1.657e+09	-4.963e-07
20	1.579e+09	-3.835e-07	59	1.608e+09	-8.593e-07	98	1.658e+09	-5.090e-07
21	1.580e+09	-4.435e-07	60	1.609e+09	-7.645e-07	99	1.660e+09	-4.989e-07
22	1.580e+09	-5.144e-07	61	1.610e+09	-7.036e-07	100	1.663e+09	-5.136e-07
23	1.580e+09	-5.941e-07	62	1.610e+09	-6.767e-07	101	1.666e+09	-5.659e-07
24	1.581e+09	-4.703e-07	63	1.610e+09	-6.469e-07	102	1.669e+09	-5.420e-07
25	1.581e+09	-4.617e-07	64	1.611e+09	-6.183e-07	103	1.672e+09	-5.515e-07
26	1.582e+09	-4.629e-07	65	1.611e+09	-5.917e-07	104	1.677e+09	-5.548e-07
27	1.583e+09	-4.762e-07	66	1.612e+09	-5.715e-07	105	1.682e+09	-5.419e-07
28	1.583e+09	-4.994e-07	67	1.613e+09	-5.432e-07	106	1.687e+09	-5.260e-07
29	1.584e+09	-5.307e-07	68	1.614e+09	-5.163e-07	107	1.692e+09	-4.823e-07
30	1.585e+09	-5.542e-07	69	1.615e+09	-4.744e-07	108	1.698e+09	-4.382e-07
31	1.587e+09	-5.876e-07	70	1.616e+09	-4.337e-07	109	1.704e+09	-4.337e-07
32	1.588e+09	-6.203e-07	71	1.617e+09	-4.043e-07	110	1.710e+09	-4.438e-07
33	1.590e+09	-6.693e-07	72	1.618e+09	-3.979e-07	111	1.716e+09	-4.239e-07
34	1.592e+09	-8.164e-07	73	1.620e+09	-4.131e-07	112	1.722e+09	-3.726e-07
35	1.593e+09	-8.384e-07	74	1.622e+09	-4.781e-07	113	1.726e+09	-3.754e-07
36	1.594e+09	-8.117e-07	75	1.624e+09	-5.830e-07	114	1.730e+09	-3.606e-07
37	1.595e+09	-7.852e-07	76	1.625e+09	-6.381e-07	115	1.736e+09	-3.470e-07
38	1.595e+09	-7.667e-07	77	1.626e+09	-6.320e-07	116	1.742e+09	-3.358e-07
39	1.596e+09	-7.561e-07	78	1.628e+09	-5.772e-07	117	1.749e+09	-3.331e-07

118	1.753e+09	-3.340e-07
119	1.757e+09	-3.337e-07
120	1.762e+09	-3.254e-07
121	1.768e+09	-3.174e-07
122	1.775e+09	-3.149e-07
123	1.782e+09	-3.036e-07
124	1.786e+09	-2.973e-07
125	1.789e+09	-2.990e-07
126	1.792e+09	-3.002e-07
127	1.796e+09	-3.047e-07
128	1.801e+09	-3.007e-07
129	1.807e+09	-2.985e-07
130	1.813e+09	-3.001e-07
131	1.818e+09	-3.006e-07
132	1.826e+09	-2.930e-07
133	1.835e+09	-2.796e-07
134	1.842e+09	-2.653e-07
135	1.846e+09	-2.602e-07
136	1.850e+09	-2.579e-07
137	1.854e+09	-2.561e-07
138	1.859e+09	-2.512e-07
139	1.866e+09	-2.471e-07
140	1.874e+09	-2.449e-07
141	1.883e+09	-2.343e-07
142	1.890e+09	-2.286e-07
143	1.893e+09	-2.334e-07
144	1.896e+09	-2.378e-07
145	1.900e+09	-2.426e-07
146	1.906e+09	-2.418e-07
147	1.915e+09	-2.379e-07
148	1.927e+09	-2.401e-07
149	1.940e+09	-2.417e-07
150	1.954e+09	-2.243e-07
151	1.960e+09	-2.209e-07
152	1.966e+09	-2.200e-07
153	1.975e+09	-2.166e-07
154	1.986e+09	-2.070e-07
155	2.002e+09	-1.872e-07
156	2.017e+09	-1.732e-07
157	2.029e+09	-1.721e-07
158	2.041e+09	-1.707e-07
159	2.054e+09	-1.625e-07
160	2.074e+09	-1.507e-07
161	2.082e+09	-1.489e-07
162	2.091e+09	-1.510e-07
163	2.102e+09	-1.504e-07
164	2.117e+09	-1.429e-07
165	2.142e+09	-1.384e-07
166	2.175e+09	-1.363e-07
167	2.215e+09	-1.206e-07
168	2.271e+09	-1.088e-07
169	2.341e+09	-9.881e-08
170	2.346e+09	-9.831e-08
171	2.352e+09	-9.746e-08
172	2.364e+09	-9.616e-08
173	2.388e+09	-9.294e-08
174	2.432e+09	-8.781e-08
175	2.507e+09	-8.297e-08
176	2.512e+09	-8.308e-08
177	2.517e+09	-8.328e-08
178	2.527e+09	-8.338e-08
179	2.549e+09	-8.324e-08
180	2.592e+09	-8.364e-08
181	2.604e+09	-8.447e-08
182	2.617e+09	-8.461e-08
183	2.643e+09	-8.476e-08
184	2.694e+09	-8.422e-08
185	2.722e+09	-8.301e-08
186	2.749e+09	-8.205e-08
187	2.803e+09	-8.060e-08
188	2.897e+09	-7.628e-08
189	3.037e+09	-7.105e-08
190	3.156e+09	-6.632e-08
191	3.338e+09	-6.071e-08
192	3.600e+09	-5.355e-08
193	3.931e+09	-4.429e-08
194	4.299e+09	-3.212e-08
195	4.581e+09	-2.393e-08
196	4.864e+09	-1.629e-08
197	5.232e+09	-8.850e-09
198	5.759e+09	2.285e-09
199	5.954e+09	6.935e-09
200	6.052e+09	8.730e-09
201	6.150e+09	1.084e-08
202	6.312e+09	1.470e-08
203	6.503e+09	1.805e-08
204	6.867e+09	2.400e-08
205	7.485e+09	3.172e-08
206	7.935e+09	3.705e-08
207	8.047e+09	3.813e-08
208	8.160e+09	3.920e-08
209	8.392e+09	4.157e-08
210	8.838e+09	4.537e-08
211	9.302e+09	4.708e-08
212	9.467e+09	4.780e-08
213	9.931e+09	5.111e-08
214	1.020e+10	5.466e-08
215	1.046e+10	5.808e-08
216	1.065e+10	5.994e-08
217	1.084e+10	6.101e-08
218	1.102e+10	6.343e-08
219	1.121e+10	6.431e-08
220	1.155e+10	6.545e-08
221	1.206e+10	6.888e-08
222	1.231e+10	7.069e-08
223	1.256e+10	7.219e-08
224	1.262e+10	7.213e-08
225	1.313e+10	7.471e-08
226	1.321e+10	7.498e-08
227	1.330e+10	7.475e-08
228	1.348e+10	7.543e-08
229	1.372e+10	7.539e-08
230	1.396e+10	7.637e-08
231	1.440e+10	7.804e-08
232	1.452e+10	7.785e-08
233	1.465e+10	7.848e-08
234	1.477e+10	7.814e-08
235	1.489e+10	7.817e-08
236	1.514e+10	7.732e-08
237	1.546e+10	7.766e-08
238	1.578e+10	7.717e-08
239	1.594e+10	7.641e-08
240	1.611e+10	7.447e-08
241	1.628e+10	7.531e-08
242	1.645e+10	7.536e-08
243	1.663e+10	7.512e-08
244	1.681e+10	7.558e-08
245	1.700e+10	7.545e-08
246	1.718e+10	7.527e-08
247	1.751e+10	7.451e-08
248	1.802e+10	7.791e-08
249	1.853e+10	8.055e-08
250	1.882e+10	8.038e-08
251	1.910e+10	9.787e-08
252	1.913e+10	1.005e-07
253	1.915e+10	1.015e-07
254	1.920e+10	1.075e-07
255	1.931e+10	1.210e-07
256	1.935e+10	1.246e-07
257	1.939e+10	1.277e-07
258	1.948e+10	1.410e-07
259	1.953e+10	1.522e-07
260	1.958e+10	1.580e-07
261	1.963e+10	1.675e-07
262	1.968e+10	1.737e-07
263	1.978e+10	1.837e-07
264	1.986e+10	1.950e-07
265	1.993e+10	2.026e-07
266	2.002e+10	2.073e-07
267	2.009e+10	2.149e-07
268	2.016e+10	2.226e-07
269	2.030e+10	2.344e-07
270	2.040e+10	2.374e-07
271	2.051e+10	2.424e-07
272	2.071e+10	2.454e-07
273	2.074e+10	2.452e-07
274	2.077e+10	2.456e-07
275	2.084e+10	2.447e-07
276	2.086e+10	2.444e-07
277	2.088e+10	2.439e-07
278	2.094e+10	2.436e-07
279	2.099e+10	2.443e-07
280	2.103e+10	2.455e-07
281	2.114e+10	2.473e-07
282	2.125e+10	2.473e-07
283	2.136e+10	2.485e-07
284	2.145e+10	2.482e-07
285	2.154e+10	2.473e-07
286	2.173e+10	2.468e-07
287	2.209e+10	2.456e-07
288	2.247e+10	2.495e-07
289	2.320e+10	2.566e-07
290	2.377e+10	2.593e-07
291	2.433e+10	2.596e-07
292	2.467e+10	2.668e-07
293	2.501e+10	2.744e-07
294	2.516e+10	2.775e-07
295	2.524e+10	2.803e-07
296	2.532e+10	2.817e-07
297	2.536e+10	2.819e-07
298	2.541e+10	2.824e-07
299	2.550e+10	2.836e-07
300	2.565e+10	2.854e-07
301	2.573e+10	2.862e-07
302	2.580e+10	2.870e-07
303	2.596e+10	2.836e-07
304	2.630e+10	2.771e-07
305	2.663e+10	2.797e-07
306	2.695e+10	2.825e-07

307	2.757e+10	2.995e-07
308	2.803e+10	3.233e-07
309	2.849e+10	3.272e-07
310	2.873e+10	3.467e-07
311	2.897e+10	3.597e-07
312	2.944e+10	3.868e-07
313	2.985e+10	2.260e-07
314	3.026e+10	-1.429e-07
315	3.054e+10	-5.285e-07
316	3.082e+10	-1.067e-06
317	3.121e+10	-2.628e-06
318	3.156e+10	-4.271e-06
319	3.173e+10	-4.996e-06
320	3.182e+10	-5.335e-06
321	3.191e+10	-5.672e-06
322	3.209e+10	-6.327e-06
323	3.238e+10	-7.442e-06
324	3.279e+10	-9.075e-06
325	3.316e+10	-9.883e-06
326	3.353e+10	-9.431e-06
327	3.371e+10	-9.153e-06
328	3.388e+10	-9.007e-06
329	3.423e+10	-8.630e-06
330	3.450e+10	-8.529e-06
331	3.464e+10	-8.492e-06
332	3.478e+10	-8.614e-06
333	3.488e+10	-8.306e-06
334	3.498e+10	-8.203e-06
335	3.501e+10	-8.167e-06
336	3.503e+10	-8.147e-06
337	3.509e+10	-8.091e-06
338	3.516e+10	-8.033e-06
339	3.523e+10	-7.976e-06
340	3.537e+10	-7.855e-06
341	3.549e+10	-7.800e-06
342	3.561e+10	-7.742e-06
343	3.573e+10	-7.682e-06
344	3.576e+10	-7.634e-06
345	3.579e+10	-7.594e-06
346	3.586e+10	-7.523e-06
347	3.593e+10	-7.448e-06
348	3.600e+10	-7.407e-06
349	3.615e+10	-7.323e-06
350	3.642e+10	-7.197e-06
351	3.657e+10	-7.066e-06
352	3.671e+10	-6.974e-06
353	3.702e+10	-7.064e-06
354	3.702e+10	-7.272e-06
355	3.702e+10	-7.144e-06
356	3.702e+10	-7.000e-06
357	3.702e+10	-6.878e-06
358	3.702e+10	-6.874e-06
359	3.702e+10	-6.927e-06
360	3.702e+10	-6.938e-06
361	3.703e+10	-6.929e-06
362	3.703e+10	-6.915e-06
363	3.704e+10	-6.905e-06
364	3.704e+10	-6.900e-06
365	3.704e+10	-6.908e-06
366	3.704e+10	-6.894e-06
367	3.704e+10	-6.895e-06
368	3.704e+10	-6.895e-06
369	3.704e+10	-6.873e-06
370	3.704e+10	-6.866e-06
371	3.704e+10	-6.910e-06
372	3.704e+10	-6.909e-06
373	3.704e+10	-6.911e-06
374	3.704e+10	-6.911e-06
375	3.704e+10	-6.911e-06
376	3.704e+10	-6.908e-06
377	3.704e+10	-6.905e-06
378	3.704e+10	-6.899e-06
379	3.705e+10	-6.891e-06
380	3.706e+10	-6.879e-06
381	3.710e+10	-6.864e-06
382	3.717e+10	-6.829e-06
383	3.733e+10	-6.725e-06
384	3.768e+10	-6.494e-06
385	3.794e+10	-6.460e-06
386	3.821e+10	-6.425e-06
387	3.878e+10	-6.352e-06
388	4.000e+10	-6.195e-06
389	4.255e+10	-5.831e-06
390	4.734e+10	-4.986e-06
391	5.233e+10	-4.461e-06
392	6.137e+10	-3.529e-06
393	6.312e+10	-3.244e-06
394	7.707e+10	-2.250e-06
395	7.889e+10	-2.149e-06
396	9.467e+10	-1.517e-06
397	1.113e+11	-1.111e-06
398	1.262e+11	-9.042e-07
399	1.483e+11	-7.117e-07
400	1.578e+11	-6.341e-07
401	1.886e+11	-4.793e-07
402	2.209e+11	-3.864e-07
403	2.645e+11	-2.967e-07
404	3.156e+11	-2.216e-07
405	3.809e+11	-1.637e-07
406	4.837e+11	-1.086e-07
407	6.330e+11	-7.020e-08
408	8.519e+11	-4.285e-08
409	1.181e+12	-2.395e-08
410	1.691e+12	-1.385e-08
411	2.533e+12	-7.073e-09
412	4.020e+12	-3.949e-09
413	6.952e+12	-2.968e-09
414	1.319e+13	-2.655e-09
415	2.693e+13	-2.056e-09
416	3.156e+13	-1.879e-09

Table VI-13. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Gflux_3_5.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.gas summed over connections
```

time (s) flux (kg/s) **(The columns of sequential numbers are time step indices added by the author for reference.)**

1	1.578e+09	0.000e+00	40	1.596e+09	-1.549e-06	79	1.628e+09	-1.463e-06
2	1.578e+09	7.478e-06	41	1.597e+09	-1.585e-06	80	1.629e+09	-1.348e-06
3	1.578e+09	-1.848e-06	42	1.598e+09	-1.645e-06	81	1.629e+09	-1.209e-06
4	1.578e+09	-1.807e-06	43	1.599e+09	-1.684e-06	82	1.630e+09	-1.125e-06
5	1.578e+09	-3.373e-07	44	1.600e+09	-1.720e-06	83	1.631e+09	-9.803e-07
6	1.578e+09	-4.459e-07	45	1.600e+09	-1.731e-06	84	1.633e+09	-9.816e-07
7	1.578e+09	-4.648e-07	46	1.601e+09	-1.739e-06	85	1.635e+09	-9.405e-07
8	1.578e+09	-4.492e-07	47	1.601e+09	-1.804e-06	86	1.637e+09	-1.045e-06
9	1.578e+09	-4.182e-07	48	1.602e+09	-1.901e-06	87	1.641e+09	-1.105e-06
10	1.578e+09	-3.593e-07	49	1.603e+09	-2.040e-06	88	1.642e+09	-1.156e-06
11	1.578e+09	-3.529e-07	50	1.603e+09	-2.127e-06	89	1.643e+09	-1.165e-06
12	1.578e+09	-3.451e-07	51	1.604e+09	-2.195e-06	90	1.645e+09	-1.214e-06
13	1.578e+09	-3.594e-07	52	1.604e+09	-2.225e-06	91	1.647e+09	-1.157e-06
14	1.578e+09	-3.827e-07	53	1.604e+09	-2.264e-06	92	1.649e+09	-1.163e-06
15	1.578e+09	-4.128e-07	54	1.605e+09	-2.321e-06	93	1.651e+09	-1.357e-06
16	1.578e+09	-4.735e-07	55	1.605e+09	-2.386e-06	94	1.653e+09	-1.503e-06
17	1.579e+09	-5.629e-07	56	1.606e+09	-2.303e-06	95	1.654e+09	-1.484e-06
18	1.579e+09	-6.791e-07	57	1.606e+09	-2.249e-06	96	1.655e+09	-1.474e-06
19	1.579e+09	-7.874e-07	58	1.607e+09	-2.076e-06	97	1.657e+09	-1.399e-06
20	1.579e+09	-9.533e-07	59	1.608e+09	-1.873e-06	98	1.658e+09	-1.406e-06
21	1.580e+09	-1.173e-06	60	1.609e+09	-1.675e-06	99	1.660e+09	-1.361e-06
22	1.580e+09	-1.449e-06	61	1.610e+09	-1.586e-06	100	1.663e+09	-1.395e-06
23	1.580e+09	-1.787e-06	62	1.610e+09	-1.543e-06	101	1.666e+09	-1.521e-06
24	1.581e+09	-1.075e-06	63	1.610e+09	-1.482e-06	102	1.669e+09	-1.457e-06
25	1.581e+09	-1.006e-06	64	1.611e+09	-1.426e-06	103	1.672e+09	-1.483e-06
26	1.582e+09	-9.902e-07	65	1.611e+09	-1.376e-06	104	1.677e+09	-1.487e-06
27	1.583e+09	-9.911e-07	66	1.612e+09	-1.345e-06	105	1.682e+09	-1.421e-06
28	1.583e+09	-1.014e-06	67	1.613e+09	-1.298e-06	106	1.687e+09	-1.339e-06
29	1.584e+09	-1.051e-06	68	1.614e+09	-1.260e-06	107	1.692e+09	-1.189e-06
30	1.585e+09	-1.072e-06	69	1.615e+09	-1.180e-06	108	1.698e+09	-1.050e-06
31	1.587e+09	-1.194e-06	70	1.616e+09	-1.100e-06	109	1.704e+09	-1.039e-06
32	1.588e+09	-1.281e-06	71	1.617e+09	-1.052e-06	110	1.710e+09	-1.075e-06
33	1.590e+09	-1.389e-06	72	1.618e+09	-1.054e-06	111	1.716e+09	-1.023e-06
34	1.592e+09	-1.702e-06	73	1.620e+09	-1.092e-06	112	1.722e+09	-8.670e-07
35	1.593e+09	-1.742e-06	74	1.622e+09	-1.234e-06	113	1.726e+09	-8.593e-07
36	1.594e+09	-1.686e-06	75	1.624e+09	-1.502e-06	114	1.730e+09	-8.104e-07
37	1.595e+09	-1.630e-06	76	1.625e+09	-1.692e-06	115	1.736e+09	-7.636e-07
38	1.595e+09	-1.591e-06	77	1.626e+09	-1.690e-06	116	1.742e+09	-7.256e-07
39	1.596e+09	-1.568e-06	78	1.628e+09	-1.532e-06	117	1.749e+09	-7.133e-07

118	1.753e+09	-7.147e-07	181	2.604e+09	-1.203e-07	244	1.681e+10	2.217e-07
119	1.757e+09	-7.132e-07	182	2.617e+09	-1.207e-07	245	1.700e+10	2.212e-07
120	1.762e+09	-6.899e-07	183	2.643e+09	-1.207e-07	246	1.718e+10	2.205e-07
121	1.768e+09	-6.690e-07	184	2.694e+09	-1.189e-07	247	1.751e+10	2.188e-07
122	1.775e+09	-6.683e-07	185	2.722e+09	-1.163e-07	248	1.802e+10	2.257e-07
123	1.782e+09	-6.424e-07	186	2.749e+09	-1.140e-07	249	1.853e+10	2.311e-07
124	1.786e+09	-6.278e-07	187	2.803e+09	-1.102e-07	250	1.882e+10	2.313e-07
125	1.789e+09	-6.346e-07	188	2.897e+09	-1.002e-07	251	1.910e+10	2.695e-07
126	1.792e+09	-6.399e-07	189	3.037e+09	-8.768e-08	252	1.913e+10	2.749e-07
127	1.796e+09	-6.540e-07	190	3.156e+09	-7.661e-08	253	1.915e+10	2.772e-07
128	1.801e+09	-6.438e-07	191	3.338e+09	-6.297e-08	254	1.920e+10	2.895e-07
129	1.807e+09	-6.378e-07	192	3.600e+09	-4.556e-08	255	1.931e+10	3.169e-07
130	1.813e+09	-6.433e-07	193	3.931e+09	-2.341e-08	256	1.935e+10	3.242e-07
131	1.818e+09	-6.467e-07	194	4.299e+09	4.723e-09	257	1.939e+10	3.313e-07
132	1.826e+09	-6.281e-07	195	4.581e+09	2.327e-08	258	1.948e+10	3.605e-07
133	1.835e+09	-5.955e-07	196	4.864e+09	4.093e-08	259	1.953e+10	3.834e-07
134	1.842e+09	-5.610e-07	197	5.232e+09	5.874e-08	260	1.958e+10	3.949e-07
135	1.846e+09	-5.489e-07	198	5.759e+09	8.415e-08	261	1.963e+10	4.138e-07
136	1.850e+09	-5.443e-07	199	5.954e+09	9.427e-08	262	1.968e+10	4.259e-07
137	1.854e+09	-5.402e-07	200	6.052e+09	9.808e-08	263	1.978e+10	4.441e-07
138	1.859e+09	-5.288e-07	201	6.150e+09	1.025e-07	264	1.986e+10	4.665e-07
139	1.866e+09	-5.203e-07	202	6.312e+09	1.106e-07	265	1.993e+10	4.810e-07
140	1.874e+09	-5.168e-07	203	6.503e+09	1.178e-07	266	2.002e+10	4.898e-07
141	1.883e+09	-4.918e-07	204	6.867e+09	1.305e-07	267	2.009e+10	5.055e-07
142	1.890e+09	-4.795e-07	205	7.485e+09	1.457e-07	268	2.016e+10	5.213e-07
143	1.893e+09	-4.925e-07	206	7.935e+09	1.565e-07	269	2.030e+10	5.411e-07
144	1.896e+09	-5.042e-07	207	8.047e+09	1.585e-07	270	2.040e+10	5.454e-07
145	1.900e+09	-5.176e-07	208	8.160e+09	1.606e-07	271	2.051e+10	5.537e-07
146	1.906e+09	-5.168e-07	209	8.392e+09	1.653e-07	272	2.071e+10	5.561e-07
147	1.915e+09	-5.082e-07	210	8.838e+09	1.724e-07	273	2.074e+10	5.555e-07
148	1.927e+09	-5.153e-07	211	9.302e+09	1.749e-07	274	2.077e+10	5.555e-07
149	1.940e+09	-5.209e-07	212	9.467e+09	1.760e-07	275	2.084e+10	5.520e-07
150	1.954e+09	-4.778e-07	213	9.931e+09	1.823e-07	276	2.086e+10	5.507e-07
151	1.960e+09	-4.692e-07	214	1.020e+10	1.894e-07	277	2.088e+10	5.489e-07
152	1.966e+09	-4.666e-07	215	1.046e+10	1.959e-07	278	2.094e+10	5.461e-07
153	1.975e+09	-4.576e-07	216	1.065e+10	1.994e-07	279	2.099e+10	5.452e-07
154	1.986e+09	-4.326e-07	217	1.084e+10	2.020e-07	280	2.103e+10	5.459e-07
155	2.002e+09	-3.828e-07	218	1.102e+10	2.056e-07	281	2.114e+10	5.473e-07
156	2.017e+09	-3.476e-07	219	1.121e+10	2.070e-07	282	2.125e+10	5.466e-07
157	2.029e+09	-3.438e-07	220	1.155e+10	2.090e-07	283	2.136e+10	5.467e-07
158	2.041e+09	-3.400e-07	221	1.206e+10	2.148e-07	284	2.145e+10	5.461e-07
159	2.054e+09	-3.187e-07	222	1.231e+10	2.180e-07	285	2.154e+10	5.444e-07
160	2.074e+09	-2.899e-07	223	1.256e+10	2.206e-07	286	2.173e+10	5.428e-07
161	2.082e+09	-2.852e-07	224	1.262e+10	2.204e-07	287	2.209e+10	5.413e-07
162	2.091e+09	-2.896e-07	225	1.313e+10	2.247e-07	288	2.247e+10	5.389e-07
163	2.102e+09	-2.875e-07	226	1.321e+10	2.250e-07	289	2.320e+10	5.406e-07
164	2.117e+09	-2.685e-07	227	1.330e+10	2.245e-07	290	2.377e+10	5.419e-07
165	2.142e+09	-2.564e-07	228	1.348e+10	2.254e-07	291	2.433e+10	5.368e-07
166	2.175e+09	-2.496e-07	229	1.372e+10	2.249e-07	292	2.467e+10	5.439e-07
167	2.215e+09	-2.098e-07	230	1.396e+10	2.263e-07	293	2.501e+10	5.578e-07
168	2.271e+09	-1.801e-07	231	1.440e+10	2.292e-07	294	2.516e+10	5.648e-07
169	2.341e+09	-1.550e-07	232	1.452e+10	2.292e-07	295	2.524e+10	5.708e-07
170	2.346e+09	-1.534e-07	233	1.465e+10	2.299e-07	296	2.532e+10	5.744e-07
171	2.352e+09	-1.517e-07	234	1.477e+10	2.294e-07	297	2.536e+10	5.749e-07
172	2.364e+09	-1.484e-07	235	1.489e+10	2.287e-07	298	2.541e+10	5.762e-07
173	2.388e+09	-1.410e-07	236	1.514e+10	2.265e-07	299	2.550e+10	5.794e-07
174	2.432e+09	-1.288e-07	237	1.546e+10	2.269e-07	300	2.565e+10	5.829e-07
175	2.507e+09	-1.171e-07	238	1.578e+10	2.254e-07	301	2.573e+10	5.846e-07
176	2.512e+09	-1.176e-07	239	1.594e+10	2.238e-07	302	2.580e+10	5.870e-07
177	2.517e+09	-1.180e-07	240	1.611e+10	2.205e-07	303	2.596e+10	5.899e-07
178	2.527e+09	-1.181e-07	241	1.628e+10	2.215e-07	304	2.630e+10	5.777e-07
179	2.549e+09	-1.177e-07	242	1.645e+10	2.216e-07	305	2.663e+10	5.887e-07
180	2.592e+09	-1.184e-07	243	1.663e+10	2.210e-07	306	2.695e+10	5.934e-07

307	2.757e+10	6.236e-07
308	2.803e+10	6.848e-07
309	2.849e+10	7.618e-07
310	2.873e+10	7.618e-07
311	2.897e+10	7.451e-07
312	2.944e+10	7.109e-07
313	2.985e+10	6.785e-07
314	3.026e+10	6.398e-07
315	3.054e+10	5.006e-07
316	3.082e+10	3.591e-07
317	3.121e+10	3.750e-07
318	3.156e+10	3.487e-07
319	3.173e+10	3.220e-07
320	3.182e+10	3.092e-07
321	3.191e+10	2.958e-07
322	3.209e+10	2.699e-07
323	3.238e+10	2.444e-07
324	3.279e+10	3.597e-07
325	3.316e+10	3.327e-07
326	3.353e+10	5.101e-08
327	3.371e+10	-1.236e-07
328	3.388e+10	-1.962e-07
329	3.423e+10	-3.749e-07
330	3.450e+10	-4.097e-07
331	3.464e+10	-4.171e-07
332	3.478e+10	-3.483e-07
333	3.488e+10	-4.857e-07
334	3.498e+10	-5.283e-07
335	3.501e+10	-5.413e-07
336	3.503e+10	-5.491e-07
337	3.509e+10	-5.701e-07
338	3.516e+10	-5.914e-07
339	3.523e+10	-6.117e-07
340	3.537e+10	-6.547e-07
341	3.549e+10	-6.652e-07
342	3.561e+10	-6.860e-07
343	3.573e+10	-6.966e-07
344	3.576e+10	-7.190e-07
345	3.579e+10	-7.339e-07
346	3.586e+10	-7.594e-07
347	3.593e+10	-7.865e-07
348	3.600e+10	-7.962e-07
349	3.615e+10	-8.150e-07
350	3.642e+10	-8.343e-07
351	3.657e+10	-8.799e-07
352	3.671e+10	-8.980e-07
353	3.702e+10	-8.179e-07
354	3.702e+10	-1.085e-06
355	3.702e+10	-9.458e-07
356	3.702e+10	-8.631e-07
357	3.702e+10	-8.076e-07
358	3.702e+10	-7.910e-07
359	3.702e+10	-8.094e-07
360	3.702e+10	-8.097e-07
361	3.703e+10	-8.381e-07
362	3.703e+10	-8.452e-07
363	3.704e+10	-8.438e-07
364	3.704e+10	-8.459e-07
365	3.704e+10	-8.685e-07
366	3.704e+10	-8.386e-07
367	3.704e+10	-8.419e-07
368	3.704e+10	-8.422e-07
369	3.704e+10	-7.945e-07
370	3.704e+10	-7.817e-07
371	3.704e+10	-8.744e-07
372	3.704e+10	-8.726e-07
373	3.704e+10	-8.769e-07
374	3.704e+10	-8.772e-07
375	3.704e+10	-8.769e-07
376	3.704e+10	-8.759e-07
377	3.704e+10	-8.754e-07
378	3.704e+10	-8.760e-07
379	3.705e+10	-8.786e-07
380	3.706e+10	-8.827e-07
381	3.710e+10	-8.868e-07
382	3.717e+10	-8.934e-07
383	3.733e+10	-9.145e-07
384	3.768e+10	-9.596e-07
385	3.794e+10	-9.349e-07
386	3.821e+10	-9.125e-07
387	3.878e+10	-8.635e-07
388	4.000e+10	-7.599e-07
389	4.255e+10	-5.739e-07
390	4.734e+10	-3.459e-07
391	5.233e+10	-2.528e-07
392	6.137e+10	-1.479e-07
393	6.312e+10	-1.487e-07
394	7.707e+10	-8.140e-08
395	7.889e+10	-7.515e-08
396	9.467e+10	-4.373e-08
397	1.113e+11	-2.778e-08
398	1.262e+11	-2.106e-08
399	1.483e+11	-1.528e-08
400	1.578e+11	-1.137e-08
401	1.886e+11	-8.369e-09
402	2.209e+11	-6.402e-09
403	2.645e+11	-4.679e-09
404	3.156e+11	-3.078e-09
405	3.809e+11	-2.194e-09
406	4.837e+11	-1.286e-09
407	6.330e+11	-7.998e-10
408	8.519e+11	-4.595e-10
409	1.181e+12	-2.918e-10
410	1.691e+12	-2.001e-10
411	2.533e+12	-1.175e-10
412	4.020e+12	-7.705e-11
413	6.952e+12	-6.151e-11
414	1.319e+13	-5.721e-11
415	2.693e+13	-5.089e-11
416	3.156e+13	-4.850e-11

Table VI-14. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Gflux_4_5.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.gas summed over connections
```

(The columns of sequential numbers are time step indices added by the author for reference.)

	time (s)	flux (kg/s)						
1	1.578e+09	0.000e+00	39	1.596e+09	-7.564e-07	77	1.626e+09	-6.318e-07
2	1.578e+09	3.398e-06	40	1.596e+09	-7.458e-07	78	1.628e+09	-5.771e-07
3	1.578e+09	-2.358e-07	41	1.597e+09	-7.605e-07	79	1.628e+09	-5.580e-07
4	1.578e+09	-3.170e-07	42	1.598e+09	-7.840e-07	80	1.629e+09	-5.216e-07
5	1.578e+09	-4.412e-08	43	1.599e+09	-7.972e-07	81	1.629e+09	-4.777e-07
6	1.578e+09	-1.028e-07	44	1.600e+09	-8.058e-07	82	1.630e+09	-4.557e-07
7	1.578e+09	-1.294e-07	45	1.600e+09	-8.071e-07	83	1.631e+09	-4.107e-07
8	1.578e+09	-1.464e-07	46	1.601e+09	-8.063e-07	84	1.633e+09	-4.210e-07
9	1.578e+09	-1.576e-07	47	1.601e+09	-8.242e-07	85	1.635e+09	-4.062e-07
10	1.578e+09	-1.461e-07	48	1.602e+09	-8.658e-07	86	1.637e+09	-4.452e-07
11	1.578e+09	-1.494e-07	49	1.603e+09	-9.299e-07	87	1.641e+09	-4.493e-07
12	1.578e+09	-1.485e-07	50	1.603e+09	-9.694e-07	88	1.642e+09	-4.646e-07
13	1.578e+09	-1.586e-07	51	1.604e+09	-9.961e-07	89	1.643e+09	-4.591e-07
14	1.578e+09	-1.740e-07	52	1.604e+09	-1.009e-06	90	1.645e+09	-4.683e-07
15	1.578e+09	-1.939e-07	53	1.604e+09	-1.027e-06	91	1.647e+09	-4.397e-07
16	1.578e+09	-2.315e-07	54	1.605e+09	-1.053e-06	92	1.649e+09	-4.283e-07
17	1.579e+09	-2.795e-07	55	1.605e+09	-1.083e-06	93	1.651e+09	-4.822e-07
18	1.579e+09	-3.289e-07	56	1.606e+09	-1.048e-06	94	1.653e+09	-5.131e-07
19	1.579e+09	-3.399e-07	57	1.606e+09	-1.026e-06	95	1.654e+09	-5.066e-07
20	1.579e+09	-3.843e-07	58	1.607e+09	-9.494e-07	96	1.655e+09	-5.071e-07
21	1.580e+09	-4.442e-07	59	1.608e+09	-8.590e-07	97	1.657e+09	-4.961e-07
22	1.580e+09	-5.165e-07	60	1.609e+09	-7.646e-07	98	1.658e+09	-5.089e-07
23	1.580e+09	-5.993e-07	61	1.610e+09	-7.036e-07	99	1.660e+09	-4.988e-07
24	1.581e+09	-4.677e-07	62	1.610e+09	-6.765e-07	100	1.663e+09	-5.135e-07
25	1.581e+09	-4.624e-07	63	1.610e+09	-6.467e-07	101	1.666e+09	-5.658e-07
26	1.582e+09	-4.657e-07	64	1.611e+09	-6.181e-07	102	1.669e+09	-5.421e-07
27	1.583e+09	-4.796e-07	65	1.611e+09	-5.915e-07	103	1.672e+09	-5.515e-07
28	1.583e+09	-5.032e-07	66	1.612e+09	-5.713e-07	104	1.677e+09	-5.548e-07
29	1.584e+09	-5.339e-07	67	1.613e+09	-5.431e-07	105	1.682e+09	-5.418e-07
30	1.585e+09	-5.585e-07	68	1.614e+09	-5.160e-07	106	1.687e+09	-5.260e-07
31	1.587e+09	-5.903e-07	69	1.615e+09	-4.741e-07	107	1.692e+09	-4.822e-07
32	1.588e+09	-6.234e-07	70	1.616e+09	-4.335e-07	108	1.698e+09	-4.382e-07
33	1.590e+09	-6.722e-07	71	1.617e+09	-4.042e-07	109	1.704e+09	-4.337e-07
34	1.592e+09	-8.187e-07	72	1.618e+09	-3.978e-07	110	1.710e+09	-4.438e-07
35	1.593e+09	-8.406e-07	73	1.620e+09	-4.130e-07	111	1.716e+09	-4.239e-07
36	1.594e+09	-8.133e-07	74	1.622e+09	-4.783e-07	112	1.722e+09	-3.725e-07
37	1.595e+09	-7.862e-07	75	1.624e+09	-5.830e-07	113	1.726e+09	-3.753e-07
38	1.595e+09	-7.674e-07	76	1.625e+09	-6.380e-07	114	1.730e+09	-3.606e-07

115	1.736e+09	-3.470e-07	178	2.527e+09	-8.340e-08	241	1.628e+10	7.531e-08
116	1.742e+09	-3.358e-07	179	2.549e+09	-8.324e-08	242	1.645e+10	7.540e-08
117	1.749e+09	-3.331e-07	180	2.592e+09	-8.364e-08	243	1.663e+10	7.517e-08
118	1.753e+09	-3.340e-07	181	2.604e+09	-8.445e-08	244	1.681e+10	7.557e-08
119	1.757e+09	-3.337e-07	182	2.617e+09	-8.460e-08	245	1.700e+10	7.544e-08
120	1.762e+09	-3.253e-07	183	2.643e+09	-8.464e-08	246	1.718e+10	7.528e-08
121	1.768e+09	-3.174e-07	184	2.694e+09	-8.398e-08	247	1.751e+10	7.453e-08
122	1.775e+09	-3.149e-07	185	2.722e+09	-8.292e-08	248	1.802e+10	7.792e-08
123	1.782e+09	-3.036e-07	186	2.749e+09	-8.199e-08	249	1.853e+10	8.055e-08
124	1.786e+09	-2.973e-07	187	2.803e+09	-8.044e-08	250	1.882e+10	8.057e-08
125	1.789e+09	-2.990e-07	188	2.897e+09	-7.629e-08	251	1.910e+10	9.787e-08
126	1.792e+09	-3.002e-07	189	3.037e+09	-7.105e-08	252	1.913e+10	1.005e-07
127	1.796e+09	-3.047e-07	190	3.156e+09	-6.633e-08	253	1.915e+10	1.015e-07
128	1.801e+09	-3.007e-07	191	3.338e+09	-6.071e-08	254	1.920e+10	1.077e-07
129	1.807e+09	-2.985e-07	192	3.600e+09	-5.356e-08	255	1.931e+10	1.210e-07
130	1.813e+09	-3.001e-07	193	3.931e+09	-4.429e-08	256	1.935e+10	1.246e-07
131	1.818e+09	-3.006e-07	194	4.299e+09	-3.213e-08	257	1.939e+10	1.277e-07
132	1.826e+09	-2.930e-07	195	4.581e+09	-2.394e-08	258	1.948e+10	1.410e-07
133	1.835e+09	-2.796e-07	196	4.864e+09	-1.630e-08	259	1.953e+10	1.522e-07
134	1.842e+09	-2.653e-07	197	5.232e+09	-8.831e-09	260	1.958e+10	1.580e-07
135	1.846e+09	-2.602e-07	198	5.759e+09	2.292e-09	261	1.963e+10	1.675e-07
136	1.850e+09	-2.579e-07	199	5.954e+09	6.932e-09	262	1.968e+10	1.737e-07
137	1.854e+09	-2.561e-07	200	6.052e+09	8.770e-09	263	1.978e+10	1.837e-07
138	1.859e+09	-2.512e-07	201	6.150e+09	1.083e-08	264	1.986e+10	1.950e-07
139	1.866e+09	-2.470e-07	202	6.312e+09	1.474e-08	265	1.993e+10	2.026e-07
140	1.874e+09	-2.449e-07	203	6.503e+09	1.805e-08	266	2.002e+10	2.074e-07
141	1.883e+09	-2.343e-07	204	6.867e+09	2.400e-08	267	2.009e+10	2.149e-07
142	1.890e+09	-2.286e-07	205	7.485e+09	3.172e-08	268	2.016e+10	2.226e-07
143	1.893e+09	-2.334e-07	206	7.935e+09	3.713e-08	269	2.030e+10	2.344e-07
144	1.896e+09	-2.377e-07	207	8.047e+09	3.814e-08	270	2.040e+10	2.374e-07
145	1.900e+09	-2.426e-07	208	8.160e+09	3.920e-08	271	2.051e+10	2.424e-07
146	1.906e+09	-2.418e-07	209	8.392e+09	4.157e-08	272	2.071e+10	2.454e-07
147	1.915e+09	-2.379e-07	210	8.838e+09	4.538e-08	273	2.074e+10	2.454e-07
148	1.927e+09	-2.401e-07	211	9.302e+09	4.708e-08	274	2.077e+10	2.457e-07
149	1.940e+09	-2.418e-07	212	9.467e+09	4.780e-08	275	2.084e+10	2.450e-07
150	1.954e+09	-2.243e-07	213	9.931e+09	5.111e-08	276	2.086e+10	2.444e-07
151	1.960e+09	-2.209e-07	214	1.020e+10	5.467e-08	277	2.088e+10	2.441e-07
152	1.966e+09	-2.200e-07	215	1.046e+10	5.808e-08	278	2.094e+10	2.439e-07
153	1.975e+09	-2.166e-07	216	1.065e+10	5.995e-08	279	2.099e+10	2.445e-07
154	1.986e+09	-2.069e-07	217	1.084e+10	6.148e-08	280	2.103e+10	2.457e-07
155	2.002e+09	-1.872e-07	218	1.102e+10	6.344e-08	281	2.114e+10	2.473e-07
156	2.017e+09	-1.732e-07	219	1.121e+10	6.431e-08	282	2.125e+10	2.479e-07
157	2.029e+09	-1.721e-07	220	1.155e+10	6.555e-08	283	2.136e+10	2.485e-07
158	2.041e+09	-1.707e-07	221	1.206e+10	6.889e-08	284	2.145e+10	2.486e-07
159	2.054e+09	-1.625e-07	222	1.231e+10	7.069e-08	285	2.154e+10	2.477e-07
160	2.074e+09	-1.507e-07	223	1.256e+10	7.219e-08	286	2.173e+10	2.468e-07
161	2.082e+09	-1.489e-07	224	1.262e+10	7.220e-08	287	2.209e+10	2.456e-07
162	2.091e+09	-1.510e-07	225	1.313e+10	7.471e-08	288	2.247e+10	2.495e-07
163	2.102e+09	-1.504e-07	226	1.321e+10	7.498e-08	289	2.320e+10	2.566e-07
164	2.117e+09	-1.429e-07	227	1.330e+10	7.482e-08	290	2.377e+10	2.593e-07
165	2.142e+09	-1.384e-07	228	1.348e+10	7.543e-08	291	2.433e+10	2.596e-07
166	2.175e+09	-1.363e-07	229	1.372e+10	7.545e-08	292	2.467e+10	2.668e-07
167	2.215e+09	-1.206e-07	230	1.396e+10	7.638e-08	293	2.501e+10	2.744e-07
168	2.271e+09	-1.088e-07	231	1.440e+10	7.807e-08	294	2.516e+10	2.781e-07
169	2.341e+09	-9.881e-08	232	1.452e+10	7.817e-08	295	2.524e+10	2.803e-07
170	2.346e+09	-9.820e-08	233	1.465e+10	7.859e-08	296	2.532e+10	2.820e-07
171	2.352e+09	-9.746e-08	234	1.477e+10	7.845e-08	297	2.536e+10	2.820e-07
172	2.364e+09	-9.605e-08	235	1.489e+10	7.816e-08	298	2.541e+10	2.826e-07
173	2.388e+09	-9.295e-08	236	1.514e+10	7.732e-08	299	2.550e+10	2.839e-07
174	2.432e+09	-8.781e-08	237	1.546e+10	7.766e-08	300	2.565e+10	2.854e-07
175	2.507e+09	-8.296e-08	238	1.578e+10	7.717e-08	301	2.573e+10	2.862e-07
176	2.512e+09	-8.315e-08	239	1.594e+10	7.641e-08	302	2.580e+10	2.872e-07
177	2.517e+09	-8.332e-08	240	1.611e+10	7.476e-08	303	2.596e+10	2.841e-07

304	2.630e+10	2.771e-07
305	2.663e+10	2.797e-07
306	2.695e+10	2.825e-07
307	2.757e+10	2.995e-07
308	2.803e+10	3.233e-07
309	2.849e+10	3.272e-07
310	2.873e+10	3.467e-07
311	2.897e+10	3.597e-07
312	2.944e+10	3.911e-07
313	2.985e+10	4.200e-07
314	3.026e+10	4.426e-07
315	3.054e+10	4.073e-07
316	3.082e+10	3.759e-07
317	3.121e+10	4.467e-07
318	3.156e+10	5.016e-07
319	3.173e+10	5.163e-07
320	3.182e+10	5.229e-07
321	3.191e+10	5.290e-07
322	3.209e+10	5.412e-07
323	3.238e+10	5.756e-07
324	3.279e+10	7.419e-07
325	3.316e+10	6.458e-07
326	3.353e+10	2.807e-07
327	3.371e+10	4.873e-08
328	3.388e+10	-1.894e-08
329	3.423e+10	-1.302e-07
330	3.450e+10	-1.539e-07
331	3.464e+10	-1.591e-07
332	3.478e+10	-1.195e-07
333	3.488e+10	-2.003e-07
334	3.498e+10	-2.254e-07
335	3.501e+10	-2.331e-07
336	3.503e+10	-2.377e-07
337	3.509e+10	-2.501e-07
338	3.516e+10	-2.628e-07
339	3.523e+10	-2.748e-07
340	3.537e+10	-3.004e-07
341	3.549e+10	-3.068e-07
342	3.561e+10	-3.198e-07
343	3.573e+10	-3.263e-07
344	3.576e+10	-3.398e-07
345	3.579e+10	-3.487e-07
346	3.586e+10	-3.638e-07
347	3.593e+10	-3.800e-07
348	3.600e+10	-3.859e-07
349	3.615e+10	-3.974e-07
350	3.642e+10	-4.099e-07
351	3.657e+10	-4.377e-07
352	3.671e+10	-4.490e-07
353	3.702e+10	-4.039e-07
354	3.702e+10	-5.925e-07
355	3.702e+10	-4.908e-07
356	3.702e+10	-4.308e-07
357	3.702e+10	-3.994e-07
358	3.702e+10	-3.904e-07
359	3.702e+10	-4.011e-07
360	3.702e+10	-4.017e-07
361	3.703e+10	-4.174e-07
362	3.703e+10	-4.214e-07
363	3.704e+10	-4.208e-07
364	3.704e+10	-4.220e-07
365	3.704e+10	-4.341e-07
366	3.704e+10	-4.184e-07
367	3.704e+10	-4.198e-07
368	3.704e+10	-4.198e-07
369	3.704e+10	-3.925e-07
370	3.704e+10	-3.855e-07
371	3.704e+10	-4.379e-07
372	3.704e+10	-4.370e-07
373	3.704e+10	-4.394e-07
374	3.704e+10	-4.394e-07
375	3.704e+10	-4.391e-07
376	3.704e+10	-4.384e-07
377	3.704e+10	-4.380e-07
378	3.704e+10	-4.384e-07
379	3.705e+10	-4.399e-07
380	3.706e+10	-4.424e-07
381	3.710e+10	-4.448e-07
382	3.717e+10	-4.490e-07
383	3.733e+10	-4.621e-07
384	3.768e+10	-4.903e-07
385	3.794e+10	-4.774e-07
386	3.821e+10	-4.657e-07
387	3.878e+10	-4.402e-07
388	4.000e+10	-3.852e-07
389	4.255e+10	-2.850e-07
390	4.734e+10	-1.673e-07
391	5.233e+10	-1.184e-07
392	6.137e+10	-7.596e-08
393	6.312e+10	-7.652e-08
394	7.707e+10	-4.800e-08
395	7.889e+10	-4.513e-08
396	9.467e+10	-2.970e-08
397	1.113e+11	-2.152e-08
398	1.262e+11	-1.625e-08
399	1.483e+11	-1.255e-08
400	1.578e+11	-1.045e-08
401	1.886e+11	-8.120e-09
402	2.209e+11	-6.208e-09
403	2.645e+11	-4.656e-09
404	3.156e+11	-3.379e-09
405	3.809e+11	-2.425e-09
406	4.837e+11	-1.500e-09
407	6.330e+11	-9.498e-10
408	8.519e+11	-5.652e-10
409	1.181e+12	-3.473e-10
410	1.691e+12	-1.991e-10
411	2.533e+12	-1.030e-10
412	4.020e+12	-5.968e-11
413	6.952e+12	-4.388e-11
414	1.319e+13	-3.908e-11
415	2.693e+13	-3.060e-11
416	3.156e+13	-2.793e-11

Table VI-15. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-01.Gflux_5_6.dat"

```
NUFT Version 3.0s (SUN/SOLARIS).
Copyright (c) 1992. The NUFT code is copyrighted by the Regents of the
University of California. All rights reserved.
 Operating System:  SunOS s139.es.llnl.gov 5.5.1 Generic_103640-24
sun4u sparc SUNW,Ultra-2
 C Compiler: CC: WorkShop Compilers 4.2 18 Sep 1997 C++ 4.2 patch
104631-04
 Fortran Compiler:  f77: WorkShop Compilers 4.2 04 Mar 1997 FORTRAN 77
4.2 patch 104529-01
 Run Date:  Wed Nov  3 23:00:12 1999

*l4c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
load,AML=60mtu_acre,LDTH601Dds_mi

$flux Q.water.gas summed over connections
```

time (s) flux (kg/s)

(The columns of sequential numbers are time step indices added by the author for reference.)

1	1.578e+09	0.000e+00	40	1.596e+09	-2.288e-06	79	1.628e+09	-1.308e-06
2	1.578e+09	5.570e-06	41	1.597e+09	-2.366e-06	80	1.629e+09	-1.296e-06
3	1.578e+09	1.482e-06	42	1.598e+09	-2.498e-06	81	1.629e+09	-1.272e-06
4	1.578e+09	8.637e-07	43	1.599e+09	-2.698e-06	82	1.630e+09	-1.270e-06
5	1.578e+09	1.766e-07	44	1.600e+09	-2.865e-06	83	1.631e+09	-1.215e-06
6	1.578e+09	1.101e-07	45	1.600e+09	-2.918e-06	84	1.633e+09	-1.227e-06
7	1.578e+09	8.906e-08	46	1.601e+09	-2.968e-06	85	1.635e+09	-1.197e-06
8	1.578e+09	8.316e-08	47	1.601e+09	-3.086e-06	86	1.637e+09	-1.189e-06
9	1.578e+09	8.200e-08	48	1.602e+09	-3.308e-06	87	1.641e+09	-1.081e-06
10	1.578e+09	2.942e-08	49	1.603e+09	-3.670e-06	88	1.642e+09	-1.042e-06
11	1.578e+09	-8.589e-09	50	1.603e+09	-3.895e-06	89	1.643e+09	-9.906e-07
12	1.578e+09	-3.790e-08	51	1.604e+09	-4.042e-06	90	1.645e+09	-9.634e-07
13	1.578e+09	-8.715e-08	52	1.604e+09	-4.100e-06	91	1.647e+09	-8.920e-07
14	1.578e+09	-1.091e-07	53	1.604e+09	-4.157e-06	92	1.649e+09	-8.449e-07
15	1.578e+09	-1.167e-07	54	1.605e+09	-4.261e-06	93	1.651e+09	-8.460e-07
16	1.578e+09	-1.509e-07	55	1.605e+09	-4.381e-06	94	1.653e+09	-8.036e-07
17	1.579e+09	-1.274e-07	56	1.606e+09	-4.222e-06	95	1.654e+09	-7.905e-07
18	1.579e+09	-1.726e-07	57	1.606e+09	-4.078e-06	96	1.655e+09	-7.990e-07
19	1.579e+09	-2.780e-07	58	1.607e+09	-3.723e-06	97	1.657e+09	-8.323e-07
20	1.579e+09	-3.087e-07	59	1.608e+09	-3.300e-06	98	1.658e+09	-8.795e-07
21	1.580e+09	-3.360e-07	60	1.609e+09	-2.844e-06	99	1.660e+09	-8.685e-07
22	1.580e+09	-3.489e-07	61	1.610e+09	-2.562e-06	100	1.663e+09	-8.929e-07
23	1.580e+09	-3.735e-07	62	1.610e+09	-2.463e-06	101	1.666e+09	-9.609e-07
24	1.581e+09	-5.194e-07	63	1.610e+09	-2.370e-06	102	1.669e+09	-9.200e-07
25	1.581e+09	-5.772e-07	64	1.611e+09	-2.279e-06	103	1.672e+09	-8.973e-07
26	1.582e+09	-5.997e-07	65	1.611e+09	-2.187e-06	104	1.677e+09	-8.794e-07
27	1.583e+09	-6.601e-07	66	1.612e+09	-2.108e-06	105	1.682e+09	-8.711e-07
28	1.583e+09	-7.334e-07	67	1.613e+09	-1.996e-06	106	1.687e+09	-8.523e-07
29	1.584e+09	-8.287e-07	68	1.614e+09	-1.866e-06	107	1.692e+09	-7.650e-07
30	1.585e+09	-9.457e-07	69	1.615e+09	-1.705e-06	108	1.698e+09	-6.523e-07
31	1.587e+09	-1.129e-06	70	1.616e+09	-1.553e-06	109	1.704e+09	-6.003e-07
32	1.588e+09	-1.284e-06	71	1.617e+09	-1.422e-06	110	1.710e+09	-6.170e-07
33	1.590e+09	-1.524e-06	72	1.618e+09	-1.334e-06	111	1.716e+09	-5.941e-07
34	1.592e+09	-2.169e-06	73	1.620e+09	-1.305e-06	112	1.722e+09	-5.424e-07
35	1.593e+09	-2.367e-06	74	1.622e+09	-1.359e-06	113	1.726e+09	-5.683e-07
36	1.594e+09	-2.376e-06	75	1.624e+09	-1.454e-06	114	1.730e+09	-5.664e-07
37	1.595e+09	-2.323e-06	76	1.625e+09	-1.459e-06	115	1.736e+09	-5.635e-07
38	1.595e+09	-2.279e-06	77	1.626e+09	-1.375e-06	116	1.742e+09	-5.642e-07
39	1.596e+09	-2.273e-06	78	1.628e+09	-1.308e-06	117	1.749e+09	-5.888e-07

118	1.753e+09	-6.068e-07	181	2.604e+09	-1.663e-07	244	1.681e+10	1.434e-07
119	1.757e+09	-6.178e-07	182	2.617e+09	-1.664e-07	245	1.700e+10	1.423e-07
120	1.762e+09	-6.119e-07	183	2.643e+09	-1.663e-07	246	1.718e+10	1.415e-07
121	1.768e+09	-5.988e-07	184	2.694e+09	-1.643e-07	247	1.751e+10	1.404e-07
122	1.775e+09	-5.905e-07	185	2.722e+09	-1.617e-07	248	1.802e+10	1.452e-07
123	1.782e+09	-5.652e-07	186	2.749e+09	-1.595e-07	249	1.853e+10	1.491e-07
124	1.786e+09	-5.520e-07	187	2.803e+09	-1.558e-07	250	1.882e+10	1.490e-07
125	1.789e+09	-5.533e-07	188	2.897e+09	-1.457e-07	251	1.910e+10	1.791e-07
126	1.792e+09	-5.546e-07	189	3.037e+09	-1.336e-07	252	1.913e+10	1.830e-07
127	1.796e+09	-5.632e-07	190	3.156e+09	-1.231e-07	253	1.915e+10	1.849e-07
128	1.801e+09	-5.601e-07	191	3.338e+09	-1.107e-07	254	1.920e+10	1.940e-07
129	1.807e+09	-5.598e-07	192	3.600e+09	-9.501e-08	255	1.931e+10	2.161e-07
130	1.813e+09	-5.641e-07	193	3.931e+09	-7.611e-08	256	1.935e+10	2.227e-07
131	1.818e+09	-5.647e-07	194	4.299e+09	-5.290e-08	257	1.939e+10	2.293e-07
132	1.826e+09	-5.509e-07	195	4.581e+09	-3.615e-08	258	1.948e+10	2.529e-07
133	1.835e+09	-5.276e-07	196	4.864e+09	-2.027e-08	259	1.953e+10	2.710e-07
134	1.842e+09	-5.040e-07	197	5.232e+09	-4.500e-09	260	1.958e+10	2.812e-07
135	1.846e+09	-4.952e-07	198	5.759e+09	1.763e-08	261	1.963e+10	2.976e-07
136	1.850e+09	-4.888e-07	199	5.954e+09	2.630e-08	262	1.968e+10	3.093e-07
137	1.854e+09	-4.827e-07	200	6.052e+09	3.001e-08	263	1.978e+10	3.298e-07
138	1.859e+09	-4.728e-07	201	6.150e+09	3.392e-08	264	1.986e+10	3.510e-07
139	1.866e+09	-4.628e-07	202	6.312e+09	4.119e-08	265	1.993e+10	3.673e-07
140	1.874e+09	-4.550e-07	203	6.503e+09	4.759e-08	266	2.002e+10	3.770e-07
141	1.883e+09	-4.348e-07	204	6.867e+09	5.861e-08	267	2.009e+10	3.905e-07
142	1.890e+09	-4.217e-07	205	7.485e+09	7.358e-08	268	2.016e+10	4.032e-07
143	1.893e+09	-4.270e-07	206	7.935e+09	8.432e-08	269	2.030e+10	4.203e-07
144	1.896e+09	-4.316e-07	207	8.047e+09	8.638e-08	270	2.040e+10	4.239e-07
145	1.900e+09	-4.363e-07	208	8.160e+09	8.860e-08	271	2.051e+10	4.308e-07
146	1.906e+09	-4.317e-07	209	8.392e+09	9.300e-08	272	2.071e+10	4.345e-07
147	1.915e+09	-4.215e-07	210	8.838e+09	9.990e-08	273	2.074e+10	4.347e-07
148	1.927e+09	-4.193e-07	211	9.302e+09	1.042e-07	274	2.077e+10	4.354e-07
149	1.940e+09	-4.161e-07	212	9.467e+09	1.060e-07	275	2.084e+10	4.349e-07
150	1.954e+09	-3.851e-07	213	9.931e+09	1.127e-07	276	2.086e+10	4.347e-07
151	1.960e+09	-3.779e-07	214	1.020e+10	1.187e-07	277	2.088e+10	4.338e-07
152	1.966e+09	-3.739e-07	215	1.046e+10	1.238e-07	278	2.094e+10	4.329e-07
153	1.975e+09	-3.657e-07	216	1.065e+10	1.268e-07	279	2.099e+10	4.332e-07
154	1.986e+09	-3.485e-07	217	1.084e+10	1.285e-07	280	2.103e+10	4.341e-07
155	2.002e+09	-3.184e-07	218	1.102e+10	1.321e-07	281	2.114e+10	4.352e-07
156	2.017e+09	-2.985e-07	219	1.121e+10	1.337e-07	282	2.125e+10	4.341e-07
157	2.029e+09	-2.963e-07	220	1.155e+10	1.362e-07	283	2.136e+10	4.333e-07
158	2.041e+09	-2.917e-07	221	1.206e+10	1.417e-07	284	2.145e+10	4.309e-07
159	2.054e+09	-2.822e-07	222	1.231e+10	1.444e-07	285	2.154e+10	4.277e-07
160	2.074e+09	-2.651e-07	223	1.256e+10	1.466e-07	286	2.173e+10	4.217e-07
161	2.082e+09	-2.619e-07	224	1.262e+10	1.464e-07	287	2.209e+10	4.150e-07
162	2.091e+09	-2.638e-07	225	1.313e+10	1.502e-07	288	2.247e+10	4.138e-07
163	2.102e+09	-2.617e-07	226	1.321e+10	1.505e-07	289	2.320e+10	4.192e-07
164	2.117e+09	-2.496e-07	227	1.330e+10	1.500e-07	290	2.377e+10	4.220e-07
165	2.142e+09	-2.419e-07	228	1.348e+10	1.513e-07	291	2.433e+10	4.204e-07
166	2.175e+09	-2.374e-07	229	1.372e+10	1.513e-07	292	2.467e+10	4.201e-07
167	2.215e+09	-2.139e-07	230	1.396e+10	1.523e-07	293	2.501e+10	4.248e-07
168	2.271e+09	-1.972e-07	231	1.440e+10	1.542e-07	294	2.516e+10	4.274e-07
169	2.341e+09	-1.817e-07	232	1.452e+10	1.539e-07	295	2.524e+10	4.263e-07
170	2.346e+09	-1.810e-07	233	1.465e+10	1.548e-07	296	2.532e+10	4.263e-07
171	2.352e+09	-1.793e-07	234	1.477e+10	1.544e-07	297	2.536e+10	4.255e-07
172	2.364e+09	-1.780e-07	235	1.489e+10	1.544e-07	298	2.541e+10	4.252e-07
173	2.388e+09	-1.738e-07	236	1.514e+10	1.526e-07	299	2.550e+10	4.247e-07
174	2.432e+09	-1.672e-07	237	1.546e+10	1.520e-07	300	2.565e+10	4.236e-07
175	2.507e+09	-1.624e-07	238	1.578e+10	1.500e-07	301	2.573e+10	4.233e-07
176	2.512e+09	-1.630e-07	239	1.594e+10	1.486e-07	302	2.580e+10	4.232e-07
177	2.517e+09	-1.634e-07	240	1.611e+10	1.452e-07	303	2.596e+10	4.206e-07
178	2.527e+09	-1.639e-07	241	1.628e+10	1.456e-07	304	2.630e+10	4.137e-07
179	2.549e+09	-1.640e-07	242	1.645e+10	1.448e-07	305	2.663e+10	4.048e-07
180	2.592e+09	-1.652e-07	243	1.663e+10	1.436e-07	306	2.695e+10	4.015e-07

307	2.757e+10	3.894e-07
308	2.803e+10	3.908e-07
309	2.849e+10	3.931e-07
310	2.873e+10	3.946e-07
311	2.897e+10	3.995e-07
312	2.944e+10	4.168e-07
313	2.985e+10	4.352e-07
314	3.026e+10	4.565e-07
315	3.054e+10	4.529e-07
316	3.082e+10	4.541e-07
317	3.121e+10	4.649e-07
318	3.156e+10	4.993e-07
319	3.173e+10	5.150e-07
320	3.182e+10	5.244e-07
321	3.191e+10	5.324e-07
322	3.209e+10	5.569e-07
323	3.238e+10	5.969e-07
324	3.279e+10	6.346e-07
325	3.316e+10	6.858e-07
326	3.353e+10	7.948e-07
327	3.371e+10	8.534e-07
328	3.388e+10	9.021e-07
329	3.423e+10	1.248e-06
330	3.450e+10	9.945e-07
331	3.464e+10	9.528e-07
332	3.478e+10	1.162e-06
333	3.488e+10	7.316e-07
334	3.498e+10	6.002e-07
335	3.501e+10	5.588e-07
336	3.503e+10	5.351e-07
337	3.509e+10	4.695e-07
338	3.516e+10	4.017e-07
339	3.523e+10	3.368e-07
340	3.537e+10	1.985e-07
341	3.549e+10	1.567e-07
342	3.561e+10	8.784e-08
343	3.573e+10	5.078e-08
344	3.576e+10	-1.900e-08
345	3.579e+10	-6.391e-08
346	3.586e+10	-1.428e-07
347	3.593e+10	-2.259e-07
348	3.600e+10	-2.591e-07
349	3.615e+10	-3.279e-07
350	3.642e+10	-4.109e-07
351	3.657e+10	-5.583e-07
352	3.671e+10	-6.252e-07
353	3.702e+10	-4.456e-07
354	3.702e+10	-1.676e-06
355	3.702e+10	-9.752e-07
356	3.702e+10	-6.260e-07
357	3.702e+10	-4.868e-07
358	3.702e+10	-4.532e-07
359	3.702e+10	-4.840e-07
360	3.702e+10	-4.922e-07
361	3.703e+10	-5.468e-07
362	3.703e+10	-5.644e-07
363	3.704e+10	-5.652e-07
364	3.704e+10	-5.710e-07
365	3.704e+10	-6.036e-07
366	3.704e+10	-5.664e-07
367	3.704e+10	-5.620e-07
368	3.704e+10	-5.589e-07
369	3.704e+10	-4.561e-07
370	3.704e+10	-4.399e-07
371	3.704e+10	-6.190e-07
372	3.704e+10	-6.199e-07
373	3.704e+10	-6.279e-07
374	3.704e+10	-6.260e-07
375	3.704e+10	-6.229e-07
376	3.704e+10	-6.190e-07
377	3.704e+10	-6.176e-07
378	3.704e+10	-6.204e-07
379	3.705e+10	-6.283e-07
380	3.706e+10	-6.397e-07
381	3.710e+10	-6.518e-07
382	3.717e+10	-6.764e-07
383	3.733e+10	-7.550e-07
384	3.768e+10	-9.301e-07
385	3.794e+10	-8.998e-07
386	3.821e+10	-8.720e-07
387	3.878e+10	-8.088e-07
388	4.000e+10	-6.639e-07
389	4.255e+10	-3.683e-07
390	4.734e+10	-3.157e-08
391	5.233e+10	9.259e-08
392	6.137e+10	1.582e-07
393	6.312e+10	1.175e-07
394	7.707e+10	1.091e-07
395	7.889e+10	1.070e-07
396	9.467e+10	8.489e-08
397	1.113e+11	6.862e-08
398	1.262e+11	5.766e-08
399	1.483e+11	4.500e-08
400	1.578e+11	4.208e-08
401	1.886e+11	3.195e-08
402	2.209e+11	2.512e-08
403	2.645e+11	1.971e-08
404	3.156e+11	1.564e-08
405	3.809e+11	1.213e-08
406	4.837e+11	8.291e-09
407	6.330e+11	5.391e-09
408	8.519e+11	3.299e-09
409	1.181e+12	1.797e-09
410	1.691e+12	1.020e-09
411	2.533e+12	5.032e-10
412	4.020e+12	2.651e-10
413	6.952e+12	1.877e-10
414	1.319e+13	1.629e-10
415	2.693e+13	1.176e-10
416	3.156e+13	1.034e-10

Table VI-16. Listing for Data file "l4c4-LDTH60-1Dds_mc-ui-flux"

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	5.0003803E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2	5.0003803E+01	3.161E-05	9.833E-06	3.062E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.540E-06	-4.681E-05	-5.765E-05	6.710E-06	7.478E-06	3.398E-06	5.570E-06
3	5.0003803E+01	3.161E-05	1.209E-05	1.067E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.496E-06	-7.728E-06	-8.768E-06	-5.404E-07	-1.848E-06	-2.358E-07	1.482E-06
4	5.0003803E+01	3.162E-05	1.291E-05	3.954E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.664E-07	-4.337E-06	-4.881E-06	-3.857E-07	-1.807E-06	-3.170E-07	8.637E-07
5	5.0003803E+01	3.162E-05	1.245E-05	1.840E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.273E-07	-2.374E-06	-2.590E-06	-1.120E-07	-3.373E-07	-4.412E-08	1.766E-07
6	5.0003803E+01	3.162E-05	1.103E-05	1.036E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.379E-07	-1.454E-06	-1.645E-06	-8.227E-08	-4.459E-07	-1.028E-07	1.101E-07
7	5.0003803E+01	3.162E-05	9.115E-06	6.856E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.463E-07	-1.116E-06	-1.296E-06	-6.869E-08	-4.648E-07	-1.294E-07	8.906E-08
8	5.0003803E+01	3.162E-05	7.248E-06	5.130E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.070E-07	-9.110E-07	-1.089E-06	-6.416E-08	-4.492E-07	-1.464E-07	8.316E-08
9	5.0003803E+01	3.162E-05	5.692E-06	4.021E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.789E-07	-7.094E-07	-8.980E-07	-7.691E-08	-4.182E-07	-1.576E-07	8.200E-08
10	5.0003803E+01	3.162E-05	4.802E-06	3.276E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.628E-07	-5.359E-07	-7.452E-07	-9.581E-08	-3.593E-07	-1.461E-07	2.942E-08
11	5.0003803E+01	3.162E-05	4.451E-06	2.682E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.549E-07	-3.940E-07	-6.396E-07	-1.260E-07	-3.529E-07	-1.494E-07	-8.589E-09
12	5.0003803E+01	3.162E-05	4.437E-06	2.202E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.604E-07	-3.408E-07	-6.284E-07	-1.466E-07	-3.451E-07	-1.485E-07	-3.790E-08
13	5.0003803E+01	3.162E-05	4.571E-06	1.789E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.751E-07	-2.838E-07	-6.166E-07	-1.630E-07	-3.594E-07	-1.586E-07	-8.715E-08
14	5.0003803E+01	3.163E-05	4.745E-06	1.464E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.177E-07	-3.400E-07	-7.159E-07	-1.846E-07	-3.827E-07	-1.740E-07	-1.091E-07
15	5.0003803E+01	3.163E-05	4.803E-06	1.232E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.742E-07	-2.416E-07	-6.432E-07	-1.964E-07	-4.128E-07	-1.939E-07	-1.167E-07
16	5.0003803E+01	3.165E-05	4.826E-06	1.059E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.386E-07	-2.561E-07	-6.761E-07	-2.318E-07	-4.735E-07	-2.315E-07	-1.509E-07
17	5.0035491E+01	3.166E-05	4.798E-06	9.284E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.038E-07	-2.738E-07	-7.056E-07	-2.781E-07	-5.629E-07	-2.795E-07	-1.274E-07
18	5.0035491E+01	3.170E-05	4.739E-06	8.158E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.545E-07	-3.740E-07	-8.242E-07	-3.329E-07	-6.791E-07	-3.289E-07	-1.726E-07
19	5.0035491E+01	3.171E-05	4.618E-06	7.207E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.180E-07	-3.079E-07	-7.815E-07	-3.389E-07	-7.874E-07	-3.399E-07	-2.780E-07
20	5.0035491E+01	3.175E-05	4.508E-06	6.508E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.747E-07	-3.478E-07	-8.666E-07	-3.835E-07	-9.533E-07	-3.843E-07	-3.087E-07
21	5.0067179E+01	3.178E-05	4.393E-06	6.020E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.264E-07	-3.629E-07	-9.512E-07	-4.435E-07	-1.173E-06	-4.442E-07	-3.360E-07
22	5.0067179E+01	3.180E-05	4.276E-06	5.653E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.270E-07	-3.509E-07	-1.033E-06	-5.144E-07	-1.449E-06	-5.165E-07	-3.489E-07
23	5.0067179E+01	3.183E-05	4.164E-06	5.399E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.210E-07	-3.334E-07	-1.148E-06	-5.941E-07	-1.787E-06	-5.993E-07	-3.735E-07
24	5.0098867E+01	3.185E-05	4.054E-06	5.256E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.860E-07	-3.399E-07	-1.308E-06	-4.703E-07	-1.075E-06	-4.677E-07	-5.194E-07
25	5.0098867E+01	3.186E-05	3.965E-06	5.193E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.941E-07	-3.746E-07	-1.531E-06	-4.617E-07	-1.006E-06	-4.624E-07	-5.772E-07
26	5.0130555E+01	3.187E-05	3.867E-06	5.223E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.406E-07	-3.696E-07	-1.775E-06	-4.629E-07	-9.902E-07	-4.657E-07	-5.997E-07
27	5.0162243E+01	3.187E-05	3.778E-06	5.343E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.124E-07	-3.794E-07	-2.096E-06	-4.762E-07	-9.911E-07	-4.796E-07	-6.601E-07
28	5.0162243E+01	3.187E-05	3.690E-06	5.614E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.811E-07	-3.904E-07	-2.529E-06	-4.994E-07	-1.014E-06	-5.032E-07	-7.334E-07
29	5.0193931E+01	3.187E-05	3.610E-06	6.058E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.863E-07	-4.241E-07	-3.124E-06	-5.307E-07	-1.051E-06	-5.339E-07	-8.287E-07
30	5.0225619E+01	3.185E-05	3.526E-06	6.820E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.129E-07	-4.270E-07	-3.987E-06	-5.542E-07	-1.072E-06	-5.585E-07	-9.457E-07
31	5.0288995E+01	3.183E-05	3.472E-06	7.504E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.742E-07	-4.294E-07	-4.666E-06	-5.876E-07	-1.194E-06	-5.903E-07	-1.129E-06
32	5.0320683E+01	3.182E-05	3.447E-06	8.782E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.410E-07	-4.500E-07	-5.937E-06	-6.203E-07	-1.281E-06	-6.234E-07	-1.284E-06
33	5.0384060E+01	3.180E-05	3.456E-06	1.081E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.079E-07	-4.608E-07	-7.912E-06	-6.693E-07	-1.389E-06	-6.722E-07	-1.524E-06
34	5.0447436E+01	3.177E-05	3.500E-06	1.437E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.739E-07	-4.104E-07	-1.133E-05	-8.164E-07	-1.702E-06	-8.187E-07	-2.169E-06
35	5.0479124E+01	3.176E-05	3.543E-06	1.706E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.617E-07	-4.078E-07	-1.378E-05	-8.384E-07	-1.742E-06	-8.406E-07	-2.367E-06
36	5.0510812E+01	3.175E-05	3.616E-06	1.972E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.497E-07	-4.202E-07	-1.659E-05	-8.117E-07	-1.686E-06	-8.133E-07	-2.376E-06
37	5.0542500E+01	3.175E-05	3.690E-06	2.181E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.396E-07	-4.116E-07	-1.857E-05	-7.852E-07	-1.630E-06	-7.862E-07	-2.323E-06

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
38	5.0542500E+01	3.174E-05	3.751E-06	2.329E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.330E-07	-4.194E-07	-1.996E-05	-7.667E-07	-1.591E-06	-7.674E-07	-2.279E-06
39	5.0574188E+01	3.174E-05	3.825E-06	2.433E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.343E-07	-5.586E-07	-2.108E-05	-7.561E-07	-1.568E-06	-7.564E-07	-2.273E-06
40	5.0574188E+01	3.173E-05	3.935E-06	2.603E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.212E-07	-7.092E-07	-2.283E-05	-7.453E-07	-1.549E-06	-7.458E-07	-2.288E-06
41	5.0605876E+01	3.173E-05	4.047E-06	2.737E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.150E-07	-8.867E-07	-2.423E-05	-7.602E-07	-1.585E-06	-7.605E-07	-2.366E-06
42	5.0637564E+01	3.172E-05	4.202E-06	2.923E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.163E-07	-1.145E-06	-2.620E-05	-7.837E-07	-1.645E-06	-7.840E-07	-2.498E-06
43	5.0669252E+01	3.171E-05	4.524E-06	3.234E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.014E-07	-1.763E-06	-2.961E-05	-7.968E-07	-1.684E-06	-7.972E-07	-2.698E-06
44	5.0700941E+01	3.171E-05	4.921E-06	3.481E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.966E-07	-2.561E-06	-3.248E-05	-8.055E-07	-1.720E-06	-8.058E-07	-2.865E-06
45	5.0700941E+01	3.171E-05	5.091E-06	3.576E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.974E-07	-2.897E-06	-3.357E-05	-8.070E-07	-1.731E-06	-8.071E-07	-2.918E-06
46	5.0732629E+01	3.170E-05	5.288E-06	3.670E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.961E-07	-3.289E-06	-3.469E-05	-8.063E-07	-1.739E-06	-8.063E-07	-2.968E-06
47	5.0732629E+01	3.170E-05	5.682E-06	3.771E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.907E-07	-4.017E-06	-3.604E-05	-8.240E-07	-1.804E-06	-8.242E-07	-3.086E-06
48	5.0764317E+01	3.170E-05	6.425E-06	3.946E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.873E-07	-5.120E-06	-3.808E-05	-8.656E-07	-1.901E-06	-8.658E-07	-3.308E-06
49	5.0796005E+01	3.169E-05	7.681E-06	4.212E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.841E-07	-6.870E-06	-4.125E-05	-9.297E-07	-2.040E-06	-9.299E-07	-3.670E-06
50	5.0796005E+01	3.169E-05	8.680E-06	4.382E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.851E-07	-8.224E-06	-4.323E-05	-9.694E-07	-2.127E-06	-9.694E-07	-3.895E-06
51	5.0827693E+01	3.169E-05	9.829E-06	4.463E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.802E-07	-9.727E-06	-4.442E-05	-9.959E-07	-2.195E-06	-9.961E-07	-4.042E-06
52	5.0827693E+01	3.169E-05	1.021E-05	4.485E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.800E-07	-1.022E-05	-4.474E-05	-1.009E-06	-2.225E-06	-1.009E-06	-4.100E-06
53	5.0827693E+01	3.169E-05	1.057E-05	4.488E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.794E-07	-1.068E-05	-4.486E-05	-1.027E-06	-2.264E-06	-1.027E-06	-4.157E-06
54	5.0859381E+01	3.169E-05	1.135E-05	4.523E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.804E-07	-1.165E-05	-4.539E-05	-1.054E-06	-2.321E-06	-1.053E-06	-4.261E-06
55	5.0859381E+01	3.169E-05	1.295E-05	4.585E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.801E-07	-1.361E-05	-4.634E-05	-1.083E-06	-2.386E-06	-1.083E-06	-4.381E-06
56	5.0891069E+01	3.169E-05	1.583E-05	4.622E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.791E-07	-1.710E-05	-4.730E-05	-1.047E-06	-2.303E-06	-1.048E-06	-4.222E-06
57	5.0891069E+01	3.168E-05	1.779E-05	4.600E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.773E-07	-1.936E-05	-4.738E-05	-1.026E-06	-2.249E-06	-1.026E-06	-4.078E-06
58	5.0922757E+01	3.168E-05	2.005E-05	4.593E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.769E-07	-2.196E-05	-4.766E-05	-9.499E-07	-2.076E-06	-9.494E-07	-3.723E-06
59	5.0954445E+01	3.168E-05	2.262E-05	4.581E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.747E-07	-2.489E-05	-4.789E-05	-8.593E-07	-1.873E-06	-8.590E-07	-3.300E-06
60	5.0986133E+01	3.168E-05	2.485E-05	4.530E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.718E-07	-2.749E-05	-4.769E-05	-7.645E-07	-1.675E-06	-7.646E-07	-2.844E-06
61	5.1017821E+01	3.168E-05	2.671E-05	4.468E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.735E-07	-2.935E-05	-4.694E-05	-7.036E-07	-1.586E-06	-7.036E-07	-2.562E-06
62	5.1017821E+01	3.168E-05	2.730E-05	4.432E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.721E-07	-2.989E-05	-4.669E-05	-6.767E-07	-1.543E-06	-6.765E-07	-2.463E-06
63	5.1017821E+01	3.168E-05	2.795E-05	4.411E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.717E-07	-3.061E-05	-4.656E-05	-6.469E-07	-1.482E-06	-6.467E-07	-2.370E-06
64	5.1049509E+01	3.168E-05	2.880E-05	4.387E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.717E-07	-3.156E-05	-4.642E-05	-6.183E-07	-1.426E-06	-6.181E-07	-2.279E-06
65	5.1049509E+01	3.168E-05	2.981E-05	4.359E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.718E-07	-3.269E-05	-4.628E-05	-5.917E-07	-1.376E-06	-5.915E-07	-2.187E-06
66	5.1081198E+01	3.168E-05	3.098E-05	4.326E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.720E-07	-3.403E-05	-4.613E-05	-5.715E-07	-1.345E-06	-5.713E-07	-2.108E-06
67	5.1112886E+01	3.168E-05	3.224E-05	4.279E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.702E-07	-3.554E-05	-4.592E-05	-5.432E-07	-1.298E-06	-5.431E-07	-1.996E-06
68	5.1144574E+01	3.168E-05	3.378E-05	4.228E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.735E-07	-3.731E-05	-4.564E-05	-5.163E-07	-1.260E-06	-5.160E-07	-1.866E-06
69	5.1176262E+01	3.168E-05	3.471E-05	4.183E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.736E-07	-3.849E-05	-4.543E-05	-4.744E-07	-1.180E-06	-4.741E-07	-1.705E-06
70	5.1207950E+01	3.168E-05	3.566E-05	4.150E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.724E-07	-3.971E-05	-4.536E-05	-4.337E-07	-1.100E-06	-4.335E-07	-1.553E-06
71	5.1239638E+01	3.168E-05	3.659E-05	4.115E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.735E-07	-4.095E-05	-4.535E-05	-4.043E-07	-1.052E-06	-4.042E-07	-1.422E-06
72	5.1271326E+01	3.168E-05	3.725E-05	4.063E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.750E-07	-4.192E-05	-4.513E-05	-3.979E-07	-1.054E-06	-3.978E-07	-1.334E-06
73	5.1334702E+01	3.168E-05	3.766E-05	3.997E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.771E-07	-4.261E-05	-4.477E-05	-4.131E-07	-1.092E-06	-4.130E-07	-1.305E-06
74	5.1398078E+01	3.168E-05	3.752E-05	3.899E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.801E-07	-4.270E-05	-4.399E-05	-4.781E-07	-1.234E-06	-4.783E-07	-1.359E-06
75	5.1461455E+01	3.169E-05	3.688E-05	3.785E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.847E-07	-4.187E-05	-4.264E-05	-5.830E-07	-1.502E-06	-5.830E-07	-1.454E-06
76	5.1493143E+01	3.169E-05	3.660E-05	3.708E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.861E-07	-4.145E-05	-4.174E-05	-6.381E-07	-1.692E-06	-6.380E-07	-1.459E-06

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
77	5.1524831E+01	3.169E-05	3.671E-05	3.665E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.900E-07	-4.182E-05	-4.158E-05	-6.320E-07	-1.690E-06	-6.318E-07	-1.375E-06
78	5.1588207E+01	3.170E-05	3.664E-05	3.619E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.926E-07	-4.191E-05	-4.127E-05	-5.772E-07	-1.532E-06	-5.771E-07	-1.308E-06
79	5.1588207E+01	3.170E-05	3.631E-05	3.578E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.930E-07	-4.149E-05	-4.077E-05	-5.583E-07	-1.463E-06	-5.580E-07	-1.308E-06
80	5.1619895E+01	3.170E-05	3.625E-05	3.562E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.944E-07	-4.146E-05	-4.063E-05	-5.219E-07	-1.348E-06	-5.216E-07	-1.296E-06
81	5.1619895E+01	3.170E-05	3.610E-05	3.536E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.948E-07	-4.129E-05	-4.035E-05	-4.778E-07	-1.209E-06	-4.777E-07	-1.272E-06
82	5.1651583E+01	3.170E-05	3.579E-05	3.498E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.973E-07	-4.078E-05	-3.975E-05	-4.559E-07	-1.125E-06	-4.557E-07	-1.270E-06
83	5.1683271E+01	3.171E-05	3.568E-05	3.480E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.989E-07	-4.074E-05	-3.965E-05	-4.109E-07	-9.803E-07	-4.107E-07	-1.215E-06
84	5.1746647E+01	3.171E-05	3.492E-05	3.414E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.021E-07	-3.955E-05	-3.852E-05	-4.211E-07	-9.816E-07	-4.210E-07	-1.227E-06
85	5.1810024E+01	3.172E-05	3.453E-05	3.355E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.071E-07	-3.897E-05	-3.776E-05	-4.063E-07	-9.405E-07	-4.062E-07	-1.197E-06
86	5.1873400E+01	3.172E-05	3.355E-05	3.239E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.125E-07	-3.780E-05	-3.640E-05	-4.454E-07	-1.045E-06	-4.452E-07	-1.189E-06
87	5.2000152E+01	3.173E-05	3.308E-05	3.141E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.195E-07	-3.760E-05	-3.567E-05	-4.494E-07	-1.105E-06	-4.493E-07	-1.081E-06
88	5.2031840E+01	3.174E-05	3.248E-05	3.077E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.230E-07	-3.681E-05	-3.472E-05	-4.648E-07	-1.156E-06	-4.646E-07	-1.042E-06
89	5.2063528E+01	3.174E-05	3.209E-05	2.992E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.261E-07	-3.645E-05	-3.395E-05	-4.592E-07	-1.165E-06	-4.591E-07	-9.906E-07
90	5.2126904E+01	3.174E-05	3.125E-05	2.842E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.303E-07	-3.551E-05	-3.238E-05	-4.684E-07	-1.214E-06	-4.683E-07	-9.634E-07
91	5.2190281E+01	3.175E-05	3.110E-05	2.798E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.341E-07	-3.568E-05	-3.214E-05	-4.399E-07	-1.157E-06	-4.397E-07	-8.920E-07
92	5.2253657E+01	3.175E-05	3.042E-05	2.689E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.377E-07	-3.516E-05	-3.130E-05	-4.284E-07	-1.163E-06	-4.283E-07	-8.449E-07
93	5.2317033E+01	3.176E-05	2.876E-05	2.547E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.422E-07	-3.313E-05	-2.955E-05	-4.823E-07	-1.357E-06	-4.822E-07	-8.460E-07
94	5.2380409E+01	3.177E-05	2.729E-05	2.497E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.478E-07	-3.167E-05	-2.906E-05	-5.132E-07	-1.503E-06	-5.131E-07	-8.036E-07
95	5.2412097E+01	3.177E-05	2.671E-05	2.484E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.501E-07	-3.120E-05	-2.896E-05	-5.067E-07	-1.484E-06	-5.066E-07	-7.905E-07
96	5.2443785E+01	3.177E-05	2.613E-05	2.459E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.527E-07	-3.054E-05	-2.869E-05	-5.072E-07	-1.474E-06	-5.071E-07	-7.990E-07
97	5.2507162E+01	3.178E-05	2.550E-05	2.446E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.561E-07	-2.985E-05	-2.836E-05	-4.963E-07	-1.399E-06	-4.961E-07	-8.323E-07
98	5.2538850E+01	3.178E-05	2.490E-05	2.329E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.596E-07	-2.907E-05	-2.696E-05	-5.090E-07	-1.406E-06	-5.089E-07	-8.795E-07
99	5.2602226E+01	3.179E-05	2.462E-05	2.252E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.638E-07	-2.894E-05	-2.628E-05	-4.989E-07	-1.361E-06	-4.988E-07	-8.685E-07
100	5.2697290E+01	3.179E-05	2.395E-05	2.146E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.694E-07	-2.839E-05	-2.546E-05	-5.136E-07	-1.395E-06	-5.135E-07	-8.929E-07
101	5.2792354E+01	3.180E-05	2.267E-05	1.982E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.761E-07	-2.669E-05	-2.331E-05	-5.659E-07	-1.521E-06	-5.658E-07	-9.609E-07
102	5.2887419E+01	3.181E-05	2.218E-05	1.957E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.835E-07	-2.638E-05	-2.326E-05	-5.420E-07	-1.457E-06	-5.421E-07	-9.200E-07
103	5.2982483E+01	3.182E-05	2.094E-05	1.854E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.926E-07	-2.506E-05	-2.192E-05	-5.515E-07	-1.483E-06	-5.515E-07	-8.973E-07
104	5.3140923E+01	3.184E-05	1.958E-05	1.676E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.025E-07	-2.377E-05	-2.022E-05	-5.548E-07	-1.487E-06	-5.548E-07	-8.794E-07
105	5.3299364E+01	3.185E-05	1.847E-05	1.568E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.147E-07	-2.288E-05	-1.901E-05	-5.419E-07	-1.421E-06	-5.418E-07	-8.711E-07
106	5.3457804E+01	3.187E-05	1.736E-05	1.491E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.277E-07	-2.098E-05	-1.773E-05	-5.260E-07	-1.339E-06	-5.260E-07	-8.523E-07
107	5.3616245E+01	3.189E-05	1.637E-05	1.430E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.404E-07	-1.984E-05	-1.681E-05	-4.823E-07	-1.189E-06	-4.822E-07	-7.650E-07
108	5.3806373E+01	3.191E-05	1.629E-05	1.390E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.552E-07	-1.977E-05	-1.626E-05	-4.382E-07	-1.050E-06	-4.382E-07	-6.523E-07
109	5.3996502E+01	3.193E-05	1.579E-05	1.243E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.728E-07	-1.893E-05	-1.458E-05	-4.337E-07	-1.039E-06	-4.337E-07	-6.003E-07
110	5.4186630E+01	3.195E-05	1.480E-05	1.060E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.876E-07	-1.711E-05	-1.258E-05	-4.438E-07	-1.075E-06	-4.438E-07	-6.170E-07
111	5.4376759E+01	3.197E-05	1.295E-05	9.654E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.021E-07	-1.556E-05	-1.096E-05	-4.239E-07	-1.023E-06	-4.239E-07	-5.941E-07
112	5.4566887E+01	3.199E-05	1.149E-05	6.951E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.195E-07	-1.401E-05	-9.016E-06	-3.726E-07	-8.670E-07	-3.725E-07	-5.424E-07
113	5.4693640E+01	3.200E-05	9.946E-06	4.466E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.301E-07	-1.201E-05	-5.887E-06	-3.754E-07	-8.593E-07	-3.753E-07	-5.683E-07
114	5.4820392E+01	3.201E-05	8.391E-06	3.108E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.404E-07	-1.030E-05	-4.447E-06	-3.606E-07	-8.104E-07	-3.606E-07	-5.664E-07
115	5.5010520E+01	3.203E-05	6.397E-06	1.997E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.543E-07	-8.004E-06	-3.251E-06	-3.470E-07	-7.636E-07	-3.470E-07	-5.635E-07

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
116	5.5200649E+01	3.205E-05	4.735E-06	1.248E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.698E-07	-6.442E-06	-2.444E-06	-3.358E-07	-7.256E-07	-3.358E-07	-5.642E-07
117	5.5422466E+01	3.208E-05	4.002E-06	6.327E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.885E-07	-5.200E-06	-1.805E-06	-3.331E-07	-7.133E-07	-3.331E-07	-5.888E-07
118	5.5549218E+01	3.209E-05	2.962E-06	6.098E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-4.986E-07	-4.610E-06	-1.784E-06	-3.340E-07	-7.147E-07	-3.340E-07	-6.068E-07
119	5.5675970E+01	3.210E-05	2.421E-06	5.857E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.086E-07	-4.044E-06	-1.758E-06	-3.337E-07	-7.132E-07	-3.337E-07	-6.178E-07
120	5.5834411E+01	3.212E-05	1.789E-06	5.547E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.218E-07	-3.401E-06	-1.688E-06	-3.254E-07	-6.899E-07	-3.253E-07	-6.119E-07
121	5.6024539E+01	3.214E-05	1.107E-06	5.189E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.393E-07	-2.695E-06	-1.619E-06	-3.174E-07	-6.690E-07	-3.174E-07	-5.988E-07
122	5.6246356E+01	3.217E-05	1.059E-06	4.822E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.580E-07	-2.629E-06	-1.583E-06	-3.149E-07	-6.683E-07	-3.149E-07	-5.905E-07
123	5.6468172E+01	3.219E-05	1.013E-06	4.485E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.766E-07	-2.697E-06	-1.507E-06	-3.036E-07	-6.424E-07	-3.036E-07	-5.652E-07
124	5.6594925E+01	3.221E-05	1.018E-06	4.311E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.879E-07	-2.704E-06	-1.474E-06	-2.973E-07	-6.278E-07	-2.973E-07	-5.520E-07
125	5.6689989E+01	3.222E-05	1.011E-06	4.194E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-5.967E-07	-2.605E-06	-1.501E-06	-2.990E-07	-6.346E-07	-2.990E-07	-5.533E-07
126	5.6785053E+01	3.223E-05	9.884E-07	4.078E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.055E-07	-2.361E-06	-1.847E-06	-3.002E-07	-6.399E-07	-3.002E-07	-5.546E-07
127	5.6911806E+01	3.224E-05	9.138E-07	3.948E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.161E-07	-2.239E-06	-1.688E-06	-3.047E-07	-6.540E-07	-3.047E-07	-5.632E-07
128	5.7070246E+01	3.226E-05	8.288E-07	3.800E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.287E-07	-2.268E-06	-1.453E-06	-3.007E-07	-6.438E-07	-3.007E-07	-5.601E-07
129	5.7260375E+01	3.228E-05	7.467E-07	3.585E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.467E-07	-2.120E-06	-1.415E-06	-2.985E-07	-6.378E-07	-2.985E-07	-5.598E-07
130	5.7450503E+01	3.230E-05	6.638E-07	3.396E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.626E-07	-1.963E-06	-1.400E-06	-3.001E-07	-6.433E-07	-3.001E-07	-5.641E-07
131	5.7608944E+01	3.232E-05	6.056E-07	3.230E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.783E-07	-1.888E-06	-1.392E-06	-3.006E-07	-6.467E-07	-3.006E-07	-5.647E-07
132	5.7862448E+01	3.235E-05	5.864E-07	3.031E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.987E-07	-1.859E-06	-1.339E-06	-2.930E-07	-6.281E-07	-2.930E-07	-5.509E-07
133	5.8147641E+01	3.238E-05	5.493E-07	2.763E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.249E-07	-1.800E-06	-1.270E-06	-2.796E-07	-5.955E-07	-2.796E-07	-5.276E-07
134	5.8369458E+01	3.241E-05	4.980E-07	2.596E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.468E-07	-1.872E-06	-1.186E-06	-2.653E-07	-5.610E-07	-2.653E-07	-5.040E-07
135	5.8496210E+01	3.242E-05	4.895E-07	2.507E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.591E-07	-1.838E-06	-1.291E-06	-2.602E-07	-5.489E-07	-2.602E-07	-4.952E-07
136	5.8622962E+01	3.244E-05	4.800E-07	2.419E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.709E-07	-1.694E-06	-1.239E-06	-2.579E-07	-5.443E-07	-2.579E-07	-4.888E-07
137	5.8749715E+01	3.245E-05	4.678E-07	2.324E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.829E-07	-1.630E-06	-1.479E-06	-2.561E-07	-5.402E-07	-2.561E-07	-4.827E-07
138	5.8908155E+01	3.247E-05	4.688E-07	2.226E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.970E-07	-1.579E-06	-1.097E-06	-2.512E-07	-5.288E-07	-2.512E-07	-4.728E-07
139	5.9129972E+01	3.249E-05	4.656E-07	2.088E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.174E-07	-1.523E-06	-1.096E-06	-2.471E-07	-5.203E-07	-2.470E-07	-4.628E-07
140	5.9383477E+01	3.252E-05	3.717E-07	1.919E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.402E-07	-1.433E-06	-1.048E-06	-2.449E-07	-5.168E-07	-2.449E-07	-4.550E-07
141	5.9668669E+01	3.255E-05	3.306E-07	1.721E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.639E-07	-1.409E-06	-9.963E-07	-2.343E-07	-4.918E-07	-2.343E-07	-4.348E-07
142	5.9890486E+01	3.258E-05	3.399E-07	1.508E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.859E-07	-1.460E-06	-9.671E-07	-2.286E-07	-4.795E-07	-2.286E-07	-4.217E-07
143	5.9985550E+01	3.259E-05	3.478E-07	1.460E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.947E-07	-1.418E-06	-9.754E-07	-2.334E-07	-4.925E-07	-2.334E-07	-4.270E-07
144	6.0080614E+01	3.260E-05	3.479E-07	1.430E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.034E-07	-1.445E-06	-1.184E-06	-2.378E-07	-5.042E-07	-2.377E-07	-4.316E-07
145	6.0207367E+01	3.261E-05	3.426E-07	1.383E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.151E-07	-1.448E-06	-1.111E-06	-2.426E-07	-5.176E-07	-2.426E-07	-4.363E-07
146	6.0397495E+01	3.263E-05	3.435E-07	1.296E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.304E-07	-1.355E-06	-9.916E-07	-2.418E-07	-5.168E-07	-2.418E-07	-4.317E-07
147	6.0682688E+01	3.266E-05	3.365E-07	1.149E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.556E-07	-1.269E-06	-9.846E-07	-2.379E-07	-5.082E-07	-2.379E-07	-4.215E-07
148	6.1062945E+01	3.270E-05	2.483E-07	9.425E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.878E-07	-1.197E-06	-9.502E-07	-2.401E-07	-5.153E-07	-2.401E-07	-4.193E-07
149	6.1474890E+01	3.274E-05	1.990E-07	7.157E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.023E-06	-1.152E-06	-9.430E-07	-2.417E-07	-5.209E-07	-2.418E-07	-4.161E-07
150	6.1918524E+01	3.279E-05	2.391E-07	5.455E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.062E-06	-1.210E-06	-8.485E-07	-2.243E-07	-4.778E-07	-2.243E-07	-3.851E-07
151	6.2108652E+01	3.281E-05	2.520E-07	5.094E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.080E-06	-1.161E-06	-8.743E-07	-2.209E-07	-4.692E-07	-2.209E-07	-3.779E-07
152	6.2298781E+01	3.283E-05	2.210E-07	4.717E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.096E-06	-1.109E-06	-8.239E-07	-2.200E-07	-4.666E-07	-2.200E-07	-3.739E-07
153	6.2583973E+01	3.286E-05	1.764E-07	4.100E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.118E-06	-1.025E-06	-8.032E-07	-2.166E-07	-4.576E-07	-2.166E-07	-3.657E-07
154	6.2932542E+01	3.289E-05	1.411E-07	3.112E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.147E-06	-9.478E-07	-7.624E-07	-2.070E-07	-4.326E-07	-2.069E-07	-3.485E-07

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
155	6.3439552E+01	3.295E-05	1.782E-07	1.083E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.189E-06	-9.637E-07	-6.517E-07	-1.872E-07	-3.828E-07	-1.872E-07	-3.184E-07
156	6.3914873E+01	3.299E-05	2.462E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.227E-06	-1.050E-06	-5.860E-07	-1.732E-07	-3.476E-07	-1.732E-07	-2.985E-07
157	6.4295130E+01	3.303E-05	1.916E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.256E-06	-9.046E-07	-5.839E-07	-1.721E-07	-3.438E-07	-1.721E-07	-2.963E-07
158	6.4675387E+01	3.306E-05	1.048E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.283E-06	-7.332E-07	-6.301E-07	-1.707E-07	-3.400E-07	-1.707E-07	-2.917E-07
159	6.5087332E+01	3.310E-05	6.883E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.315E-06	-6.769E-07	-5.508E-07	-1.625E-07	-3.187E-07	-1.625E-07	-2.822E-07
160	6.5721094E+01	3.315E-05	1.445E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.361E-06	-8.261E-07	-4.883E-07	-1.507E-07	-2.899E-07	-1.507E-07	-2.651E-07
161	6.5974599E+01	3.318E-05	1.742E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.382E-06	-7.712E-07	-5.513E-07	-1.489E-07	-2.852E-07	-1.489E-07	-2.619E-07
162	6.6259792E+01	3.320E-05	1.213E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.403E-06	-6.909E-07	-4.884E-07	-1.510E-07	-2.896E-07	-1.510E-07	-2.638E-07
163	6.6608361E+01	3.323E-05	4.723E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.431E-06	-5.515E-07	-5.141E-07	-1.504E-07	-2.875E-07	-1.504E-07	-2.617E-07
164	6.7083682E+01	3.328E-05	4.533E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.467E-06	-4.577E-07	-4.753E-07	-1.429E-07	-2.685E-07	-1.429E-07	-2.496E-07
165	6.7875884E+01	3.335E-05	7.923E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.526E-06	-4.987E-07	-4.326E-07	-1.384E-07	-2.564E-07	-1.384E-07	-2.419E-07
166	6.8921591E+01	3.344E-05	1.487E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.601E-06	-4.276E-07	-4.218E-07	-1.363E-07	-2.496E-07	-1.363E-07	-2.374E-07
167	7.0189115E+01	3.354E-05	9.660E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.690E-06	-3.600E-07	-3.564E-07	-1.206E-07	-2.098E-07	-1.206E-07	-2.139E-07
168	7.1963647E+01	3.368E-05	8.090E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.808E-06	-3.107E-07	-3.077E-07	-1.088E-07	-1.801E-07	-1.088E-07	-1.972E-07
169	7.4181814E+01	3.385E-05	6.813E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.953E-06	-2.691E-07	-2.666E-07	-9.881E-08	-1.550E-07	-9.881E-08	-1.817E-07
170	7.4340254E+01	3.386E-05	6.721E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.967E-06	-2.696E-07	-2.670E-07	-9.831E-08	-1.534E-07	-9.820E-08	-1.810E-07
171	7.4530383E+01	3.387E-05	6.634E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.978E-06	-2.637E-07	-2.612E-07	-9.746E-08	-1.517E-07	-9.746E-08	-1.793E-07
172	7.4910640E+01	3.390E-05	6.477E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.005E-06	-2.599E-07	-2.584E-07	-9.616E-08	-1.484E-07	-9.605E-08	-1.780E-07
173	7.5671154E+01	3.396E-05	6.239E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.049E-06	-2.452E-07	-2.435E-07	-9.294E-08	-1.410E-07	-9.295E-08	-1.738E-07
174	7.7065430E+01	3.405E-05	5.963E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.135E-06	-2.241E-07	-2.233E-07	-8.781E-08	-1.288E-07	-8.781E-08	-1.672E-07
175	7.9442036E+01	3.420E-05	5.698E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.271E-06	-2.043E-07	-2.045E-07	-8.297E-08	-1.171E-07	-8.296E-08	-1.624E-07
176	7.9600477E+01	3.421E-05	5.681E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.281E-06	-2.031E-07	-2.034E-07	-8.308E-08	-1.176E-07	-8.315E-08	-1.630E-07
177	7.9758917E+01	3.422E-05	5.661E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.290E-06	-2.045E-07	-2.046E-07	-8.328E-08	-1.180E-07	-8.332E-08	-1.634E-07
178	8.0075798E+01	3.424E-05	5.618E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.310E-06	-2.057E-07	-2.058E-07	-8.338E-08	-1.181E-07	-8.340E-08	-1.639E-07
179	8.0772936E+01	3.428E-05	5.529E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.345E-06	-2.056E-07	-2.061E-07	-8.324E-08	-1.177E-07	-8.324E-08	-1.640E-07
180	8.2135524E+01	3.437E-05	5.370E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.420E-06	-2.059E-07	-2.062E-07	-8.364E-08	-1.184E-07	-8.364E-08	-1.652E-07
181	8.2515781E+01	3.439E-05	5.322E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.447E-06	-2.103E-07	-2.106E-07	-8.447E-08	-1.203E-07	-8.445E-08	-1.663E-07
182	8.2927726E+01	3.442E-05	5.278E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.468E-06	-2.105E-07	-2.109E-07	-8.461E-08	-1.207E-07	-8.460E-08	-1.664E-07
183	8.3751616E+01	3.447E-05	5.204E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.516E-06	-2.123E-07	-2.124E-07	-8.476E-08	-1.207E-07	-8.464E-08	-1.663E-07
184	8.5367709E+01	3.456E-05	5.111E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.602E-06	-2.129E-07	-2.137E-07	-8.422E-08	-1.189E-07	-8.398E-08	-1.643E-07
185	8.6254975E+01	3.459E-05	5.063E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.634E-06	-2.050E-07	-2.055E-07	-8.301E-08	-1.163E-07	-8.292E-08	-1.617E-07
186	8.7110553E+01	3.464E-05	5.031E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.674E-06	-1.990E-07	-2.016E-07	-8.205E-08	-1.140E-07	-8.199E-08	-1.595E-07
187	8.8821710E+01	3.471E-05	5.005E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.752E-06	-1.948E-07	-2.009E-07	-8.060E-08	-1.102E-07	-8.044E-08	-1.558E-07
188	9.1800390E+01	3.479E-05	5.030E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.829E-06	-1.765E-07	-1.781E-07	-7.628E-08	-1.002E-07	-7.629E-08	-1.457E-07
189	9.6236723E+01	3.487E-05	5.233E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.912E-06	-1.561E-07	-1.581E-07	-7.105E-08	-8.768E-08	-7.105E-08	-1.336E-07
190	1.0000761E+02	3.491E-05	5.493E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.956E-06	-1.382E-07	-1.404E-07	-6.632E-08	-7.661E-08	-6.633E-08	-1.231E-07
191	1.0577484E+02	3.505E-05	5.691E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.111E-06	-1.171E-07	-1.184E-07	-6.071E-08	-6.297E-08	-6.071E-08	-1.107E-07
192	1.1407712E+02	3.527E-05	6.024E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.335E-06	-8.908E-08	-9.048E-08	-5.355E-08	-4.556E-08	-5.356E-08	-9.501E-08
193	1.2456587E+02	3.535E-05	6.912E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.436E-06	-5.285E-08	-5.477E-08	-4.429E-08	-2.341E-08	-4.429E-08	-7.611E-08

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
194	1.3622709E+02	3.512E-05	8.877E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-3.219E-06	-6.386E-09	-8.934E-09	-3.212E-08	4.723E-09	-3.213E-08	-5.290E-08
195	1.4516313E+02	3.478E-05	1.154E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.885E-06	2.438E-08	2.118E-08	-2.393E-08	2.327E-08	-2.394E-08	-3.615E-08
196	1.5413086E+02	3.450E-05	1.507E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.616E-06	5.291E-08	4.988E-08	-1.629E-08	4.093E-08	-1.630E-08	-2.027E-08
197	1.6579208E+02	3.437E-05	1.909E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.490E-06	8.041E-08	7.841E-08	-8.850E-09	5.874E-08	-8.831E-09	-4.500E-09
198	1.8249170E+02	3.422E-05	2.792E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.319E-06	1.220E-07	1.198E-07	2.285E-09	8.415E-08	2.292E-09	1.763E-08
199	1.8867087E+02	3.415E-05	3.292E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.247E-06	1.393E-07	1.368E-07	6.935E-09	9.427E-08	6.932E-09	2.630E-08
200	1.9177631E+02	3.412E-05	3.595E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.211E-06	1.446E-07	1.421E-07	8.730E-09	9.808E-08	8.770E-09	3.001E-08
201	1.9488174E+02	3.409E-05	3.948E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.170E-06	1.531E-07	1.503E-07	1.084E-08	1.025E-07	1.083E-08	3.392E-08
202	2.0001521E+02	3.402E-05	4.803E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.101E-06	1.651E-07	1.622E-07	1.470E-08	1.106E-07	1.474E-08	4.119E-08
203	2.0606764E+02	3.399E-05	5.840E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.054E-06	1.778E-07	1.757E-07	1.805E-08	1.178E-07	1.805E-08	4.759E-08
204	2.1760210E+02	3.397E-05	9.539E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-2.008E-06	1.984E-07	1.966E-07	2.400E-08	1.305E-07	2.400E-08	5.861E-08
205	2.3718534E+02	3.391E-05	7.966E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.913E-06	2.233E-07	2.220E-07	3.172E-08	1.457E-07	3.172E-08	7.358E-08
206	2.5144498E+02	3.386E-05	1.228E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.832E-06	2.285E-07	2.382E-07	3.705E-08	1.565E-07	3.713E-08	8.432E-08
207	2.5499404E+02	3.386E-05	1.812E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.818E-06	2.279E-07	2.429E-07	3.813E-08	1.585E-07	3.814E-08	8.638E-08
208	2.5857480E+02	3.385E-05	2.467E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.808E-06	2.251E-07	2.465E-07	3.920E-08	1.606E-07	3.920E-08	8.860E-08
209	2.6592643E+02	3.385E-05	3.700E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.794E-06	2.211E-07	2.544E-07	4.157E-08	1.653E-07	4.157E-08	9.300E-08
210	2.8005932E+02	3.385E-05	5.685E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.764E-06	2.179E-07	2.659E-07	4.537E-08	1.724E-07	4.538E-08	9.990E-08
211	2.9476259E+02	3.384E-05	6.636E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.728E-06	2.193E-07	2.706E-07	4.708E-08	1.749E-07	4.708E-08	1.042E-07
212	2.9999113E+02	3.383E-05	6.450E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.713E-06	2.248E-07	2.721E-07	4.780E-08	1.760E-07	4.780E-08	1.060E-07
213	3.1469440E+02	3.383E-05	8.325E-08	2.164E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.693E-06	2.127E-07	2.612E-07	5.111E-08	1.823E-07	5.111E-08	1.127E-07
214	3.2321850E+02	3.383E-05	1.046E-07	4.129E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.683E-06	1.990E-07	2.534E-07	5.466E-08	1.894E-07	5.467E-08	1.187E-07
215	3.3145740E+02	3.382E-05	1.225E-07	5.662E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.669E-06	1.886E-07	2.494E-07	5.808E-08	1.959E-07	5.808E-08	1.238E-07
216	3.3747814E+02	3.382E-05	3.314E-07	6.499E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.658E-06	1.814E-07	2.469E-07	5.994E-08	1.994E-07	5.995E-08	1.268E-07
217	3.4349887E+02	3.386E-05	5.207E-07	7.134E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.685E-06	-6.101E-08	2.134E-07	6.101E-08	2.020E-07	6.148E-08	1.285E-07
218	3.4920273E+02	3.381E-05	6.146E-07	7.687E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.633E-06	-1.024E-08	2.470E-07	6.343E-08	2.056E-07	6.344E-08	1.321E-07
219	3.5522346E+02	3.380E-05	5.555E-07	8.297E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.624E-06	-2.213E-07	2.390E-07	6.431E-08	2.070E-07	6.431E-08	1.337E-07
220	3.6599741E+02	3.380E-05	7.201E-07	9.471E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.616E-06	-3.863E-07	2.305E-07	6.545E-08	2.090E-07	6.555E-08	1.362E-07
221	3.8215834E+02	3.378E-05	9.783E-07	2.851E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.591E-06	-6.342E-07	1.707E-07	6.888E-08	2.148E-07	6.889E-08	1.417E-07
222	3.9008036E+02	3.377E-05	1.133E-06	3.071E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.578E-06	-7.501E-07	3.704E-08	7.069E-08	2.180E-07	7.069E-08	1.444E-07
223	3.9800238E+02	3.375E-05	1.331E-06	4.203E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.564E-06	-9.787E-07	-7.169E-08	7.219E-08	2.206E-07	7.219E-08	1.466E-07
224	3.9990367E+02	3.376E-05	1.408E-06	4.567E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.573E-06	-1.054E-06	-1.106E-07	7.213E-08	2.204E-07	7.220E-08	1.464E-07
225	4.1606459E+02	3.372E-05	1.775E-06	6.399E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.536E-06	-1.415E-06	-2.840E-07	7.471E-08	2.247E-07	7.471E-08	1.502E-07
226	4.1859964E+02	3.372E-05	1.837E-06	6.712E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.532E-06	-1.476E-06	-3.148E-07	7.498E-08	2.250E-07	7.498E-08	1.505E-07
227	4.2145157E+02	3.373E-05	1.916E-06	7.097E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.545E-06	-1.554E-06	-3.609E-07	7.475E-08	2.245E-07	7.482E-08	1.500E-07
228	4.2715542E+02	3.370E-05	2.243E-06	4.948E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.518E-06	-1.600E-06	-4.434E-07	7.543E-08	2.254E-07	7.543E-08	1.513E-07
229	4.3476056E+02	3.369E-05	2.119E-06	9.383E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.506E-06	-1.754E-06	-5.845E-07	7.539E-08	2.249E-07	7.545E-08	1.513E-07
230	4.4236571E+02	3.367E-05	2.307E-06	1.960E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.491E-06	-1.940E-06	-7.827E-07	7.637E-08	2.263E-07	7.638E-08	1.523E-07
231	4.5630846E+02	3.364E-05	2.583E-06	1.533E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.465E-06	-2.215E-06	-1.169E-06	7.804E-08	2.292E-07	7.807E-08	1.542E-07
232	4.6011104E+02	3.365E-05	2.677E-06	1.666E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.481E-06	-2.314E-06	-1.305E-06	7.785E-08	2.292E-07	7.817E-08	1.539E-07

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
233	4.6423049E+02	3.362E-05	2.725E-06	1.740E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.454E-06	-2.359E-06	-1.377E-06	7.848E-08	2.299E-07	7.859E-08	1.548E-07
234	4.6803306E+02	3.363E-05	2.806E-06	1.856E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.467E-06	-2.444E-06	-1.481E-06	7.814E-08	2.294E-07	7.845E-08	1.544E-07
235	4.7183563E+02	3.360E-05	2.813E-06	1.847E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.440E-06	-2.441E-06	-1.479E-06	7.817E-08	2.287E-07	7.816E-08	1.544E-07
236	4.7975765E+02	3.358E-05	3.166E-06	7.522E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.426E-06	-2.505E-06	-1.669E-06	7.732E-08	2.265E-07	7.732E-08	1.526E-07
237	4.8989784E+02	3.356E-05	3.211E-06	2.952E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.407E-06	-2.662E-06	-1.911E-06	7.766E-08	2.269E-07	7.766E-08	1.520E-07
238	5.0003803E+02	3.353E-05	3.218E-06	2.510E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.387E-06	-2.853E-06	-2.150E-06	7.717E-08	2.254E-07	7.717E-08	1.500E-07
239	5.0510812E+02	3.352E-05	3.285E-06	2.563E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.378E-06	-2.920E-06	-2.204E-06	7.641E-08	2.238E-07	7.641E-08	1.486E-07
240	5.1049509E+02	3.352E-05	3.368E-06	2.613E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.390E-06	-3.008E-06	-2.285E-06	7.447E-08	2.205E-07	7.476E-08	1.452E-07
241	5.1588207E+02	3.349E-05	3.428E-06	2.693E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.359E-06	-3.070E-06	-2.339E-06	7.531E-08	2.215E-07	7.531E-08	1.456E-07
242	5.2126904E+02	3.347E-05	3.518E-06	2.770E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.350E-06	-3.142E-06	-2.416E-06	7.536E-08	2.216E-07	7.540E-08	1.448E-07
243	5.2697290E+02	3.346E-05	3.588E-06	2.850E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.343E-06	-3.232E-06	-2.499E-06	7.512E-08	2.210E-07	7.517E-08	1.436E-07
244	5.3267676E+02	3.344E-05	3.641E-06	3.173E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.329E-06	-3.281E-06	-2.612E-06	7.558E-08	2.217E-07	7.557E-08	1.434E-07
245	5.3869749E+02	3.342E-05	3.672E-06	3.075E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.318E-06	-3.308E-06	-2.719E-06	7.545E-08	2.212E-07	7.544E-08	1.423E-07
246	5.4440135E+02	3.341E-05	3.690E-06	3.159E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.307E-06	-3.323E-06	-2.802E-06	7.527E-08	2.205E-07	7.528E-08	1.415E-07
247	5.5485842E+02	3.338E-05	3.681E-06	3.182E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.286E-06	-3.310E-06	-2.822E-06	7.451E-08	2.188E-07	7.453E-08	1.404E-07
248	5.7101934E+02	3.333E-05	3.710E-06	3.272E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.258E-06	-3.338E-06	-2.907E-06	7.791E-08	2.257E-07	7.792E-08	1.452E-07
249	5.8718027E+02	3.328E-05	3.844E-06	3.353E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.228E-06	-3.433E-06	-2.980E-06	8.055E-08	2.311E-07	8.055E-08	1.491E-07
250	5.9636981E+02	3.329E-05	3.986E-06	3.404E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.243E-06	-3.564E-06	-3.036E-06	8.038E-08	2.313E-07	8.057E-08	1.490E-07
251	6.0524248E+02	3.580E-05	4.435E-06	3.716E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.197E-06	-3.965E-06	-3.177E-06	9.787E-08	2.695E-07	9.787E-08	1.791E-07
252	6.0619312E+02	3.604E-05	4.476E-06	3.705E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.198E-06	-4.004E-06	-3.241E-06	1.005E-07	2.749E-07	1.005E-07	1.830E-07
253	6.0682688E+02	3.632E-05	4.509E-06	3.763E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.198E-06	-4.019E-06	-3.277E-06	1.015E-07	2.772E-07	1.015E-07	1.849E-07
254	6.0841129E+02	3.703E-05	4.611E-06	3.928E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.197E-06	-4.108E-06	-3.436E-06	1.075E-07	2.895E-07	1.077E-07	1.940E-07
255	6.1189698E+02	3.895E-05	4.952E-06	5.676E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.192E-06	-4.362E-06	-3.812E-06	1.210E-07	3.169E-07	1.210E-07	2.161E-07
256	6.1316450E+02	3.977E-05	5.052E-06	4.454E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.191E-06	-4.459E-06	-3.884E-06	1.246E-07	3.242E-07	1.246E-07	2.227E-07
257	6.1443202E+02	4.066E-05	5.171E-06	4.515E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.189E-06	-4.547E-06	-3.921E-06	1.277E-07	3.313E-07	1.277E-07	2.293E-07
258	6.1728395E+02	4.261E-05	5.554E-06	4.766E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.188E-06	-4.883E-06	-4.118E-06	1.410E-07	3.605E-07	1.410E-07	2.529E-07
259	6.1886836E+02	4.382E-05	5.752E-06	5.770E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.189E-06	-5.050E-06	-4.366E-06	1.522E-07	3.834E-07	1.522E-07	2.710E-07
260	6.2045276E+02	4.504E-05	5.899E-06	5.231E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.188E-06	-5.162E-06	-4.516E-06	1.580E-07	3.949E-07	1.580E-07	2.812E-07
261	6.2203716E+02	4.627E-05	6.070E-06	8.933E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.188E-06	-5.312E-06	-4.789E-06	1.675E-07	4.138E-07	1.675E-07	2.976E-07
262	6.2362157E+02	4.748E-05	6.211E-06	5.803E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.186E-06	-5.415E-06	-5.015E-06	1.737E-07	4.259E-07	1.737E-07	3.093E-07
263	6.2679038E+02	4.969E-05	6.422E-06	6.000E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.184E-06	-5.579E-06	-5.204E-06	1.837E-07	4.441E-07	1.837E-07	3.298E-07
264	6.2932542E+02	5.124E-05	7.194E-06	6.201E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.183E-06	-6.017E-06	-5.391E-06	1.950E-07	4.665E-07	1.950E-07	3.510E-07
265	6.3154359E+02	5.265E-05	7.295E-06	6.374E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.181E-06	-6.417E-06	-5.548E-06	2.026E-07	4.810E-07	2.026E-07	3.673E-07
266	6.3439552E+02	5.416E-05	7.562E-06	6.544E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.176E-06	-6.670E-06	-5.648E-06	2.073E-07	4.898E-07	2.074E-07	3.770E-07
267	6.3661368E+02	5.518E-05	7.792E-06	6.833E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.172E-06	-6.875E-06	-5.932E-06	2.149E-07	5.055E-07	2.149E-07	3.905E-07
268	6.3883185E+02	5.608E-05	7.971E-06	8.246E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.168E-06	-7.038E-06	-6.233E-06	2.226E-07	5.213E-07	2.226E-07	4.032E-07
269	6.4326818E+02	5.748E-05	8.197E-06	1.405E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.161E-06	-7.241E-06	-6.579E-06	2.344E-07	5.411E-07	2.344E-07	4.203E-07
270	6.4643699E+02	5.831E-05	8.292E-06	7.615E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.153E-06	-7.321E-06	-6.672E-06	2.374E-07	5.454E-07	2.374E-07	4.239E-07
271	6.4992268E+02	5.899E-05	8.379E-06	7.731E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.146E-06	-7.418E-06	-6.798E-06	2.424E-07	5.537E-07	2.424E-07	4.308E-07

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
272	6.5626030E+02	5.991E-05	8.490E-06	7.901E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.130E-06	-7.527E-06	-6.963E-06	2.454E-07	5.561E-07	2.454E-07	4.345E-07
273	6.5721094E+02	6.004E-05	8.505E-06	7.928E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.130E-06	-7.545E-06	-6.989E-06	2.452E-07	5.555E-07	2.454E-07	4.347E-07
274	6.5816158E+02	6.017E-05	8.520E-06	7.954E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.127E-06	-7.563E-06	-7.016E-06	2.456E-07	5.555E-07	2.457E-07	4.354E-07
275	6.6037975E+02	6.041E-05	8.549E-06	8.003E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.124E-06	-7.596E-06	-7.065E-06	2.447E-07	5.520E-07	2.450E-07	4.349E-07
276	6.6101351E+02	6.048E-05	8.557E-06	8.017E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.116E-06	-7.594E-06	-7.069E-06	2.444E-07	5.507E-07	2.444E-07	4.347E-07
277	6.6164727E+02	6.055E-05	8.564E-06	8.024E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.116E-06	-7.601E-06	-7.077E-06	2.439E-07	5.489E-07	2.441E-07	4.338E-07
278	6.6354856E+02	6.069E-05	8.572E-06	8.030E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.113E-06	-7.614E-06	-7.092E-06	2.436E-07	5.461E-07	2.439E-07	4.329E-07
279	6.6513296E+02	6.081E-05	8.579E-06	8.041E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.109E-06	-7.630E-06	-7.110E-06	2.443E-07	5.452E-07	2.445E-07	4.332E-07
280	6.6640049E+02	6.092E-05	8.592E-06	8.059E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.106E-06	-7.653E-06	-7.134E-06	2.455E-07	5.459E-07	2.457E-07	4.341E-07
281	6.6988618E+02	6.110E-05	8.624E-06	8.106E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.094E-06	-7.698E-06	-7.191E-06	2.473E-07	5.473E-07	2.473E-07	4.352E-07
282	6.7337187E+02	6.126E-05	8.655E-06	8.150E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.093E-06	-7.746E-06	-7.247E-06	2.473E-07	5.466E-07	2.479E-07	4.341E-07
283	6.7685756E+02	6.137E-05	8.680E-06	8.184E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.076E-06	-7.765E-06	-7.276E-06	2.485E-07	5.467E-07	2.485E-07	4.333E-07
284	6.7970948E+02	6.146E-05	8.702E-06	8.213E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.074E-06	-7.796E-06	-7.312E-06	2.482E-07	5.461E-07	2.486E-07	4.309E-07
285	6.8256141E+02	6.152E-05	8.720E-06	8.237E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.067E-06	-7.812E-06	-7.334E-06	2.473E-07	5.444E-07	2.477E-07	4.277E-07
286	6.8858215E+02	6.160E-05	8.756E-06	8.285E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.045E-06	-7.841E-06	-7.377E-06	2.468E-07	5.428E-07	2.468E-07	4.217E-07
287	6.9998986E+02	6.169E-05	8.819E-06	8.374E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-1.014E-06	-7.901E-06	-7.462E-06	2.456E-07	5.413E-07	2.456E-07	4.150E-07
288	7.1203133E+02	6.175E-05	8.835E-06	8.415E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.847E-07	-7.924E-06	-7.503E-06	2.495E-07	5.389E-07	2.495E-07	4.138E-07
289	7.3516364E+02	6.178E-05	8.937E-06	8.550E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-9.329E-07	-8.032E-06	-7.647E-06	2.566E-07	5.406E-07	2.566E-07	4.192E-07
290	7.5322585E+02	6.179E-05	9.034E-06	8.676E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.943E-07	-8.127E-06	-7.770E-06	2.593E-07	5.419E-07	2.593E-07	4.220E-07
291	7.7097118E+02	6.179E-05	9.137E-06	8.804E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.592E-07	-8.235E-06	-7.904E-06	2.596E-07	5.368E-07	2.596E-07	4.204E-07
292	7.8174513E+02	6.179E-05	9.180E-06	8.845E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.394E-07	-8.261E-06	-7.931E-06	2.668E-07	5.439E-07	2.668E-07	4.201E-07
293	7.9251908E+02	6.179E-05	9.255E-06	8.923E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.200E-07	-8.319E-06	-7.990E-06	2.744E-07	5.578E-07	2.744E-07	4.248E-07
294	7.9727229E+02	6.179E-05	9.289E-06	8.958E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.177E-07	-8.354E-06	-8.024E-06	2.775E-07	5.648E-07	2.781E-07	4.274E-07
295	7.9980734E+02	6.178E-05	9.309E-06	8.976E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.074E-07	-8.356E-06	-8.024E-06	2.803E-07	5.708E-07	2.803E-07	4.263E-07
296	8.0234238E+02	6.179E-05	9.327E-06	8.995E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.059E-07	-8.373E-06	-8.041E-06	2.817E-07	5.744E-07	2.820E-07	4.263E-07
297	8.0360991E+02	6.178E-05	9.336E-06	9.005E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-8.021E-07	-8.374E-06	-8.044E-06	2.819E-07	5.749E-07	2.820E-07	4.255E-07
298	8.0519431E+02	6.178E-05	9.343E-06	9.013E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.997E-07	-8.379E-06	-8.051E-06	2.824E-07	5.762E-07	2.826E-07	4.252E-07
299	8.0804624E+02	6.178E-05	9.358E-06	9.033E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.966E-07	-8.393E-06	-8.068E-06	2.836E-07	5.794E-07	2.839E-07	4.247E-07
300	8.1279945E+02	6.178E-05	9.382E-06	9.064E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.853E-07	-8.406E-06	-8.089E-06	2.854E-07	5.829E-07	2.854E-07	4.236E-07
301	8.1533450E+02	6.178E-05	9.395E-06	9.081E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.814E-07	-8.415E-06	-8.102E-06	2.862E-07	5.846E-07	2.862E-07	4.233E-07
302	8.1755267E+02	6.178E-05	9.409E-06	9.109E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.801E-07	-8.430E-06	-8.120E-06	2.870E-07	5.870E-07	2.872E-07	4.232E-07
303	8.2262276E+02	6.178E-05	9.443E-06	9.146E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.746E-07	-8.453E-06	-8.153E-06	2.836E-07	5.899E-07	2.841E-07	4.206E-07
304	8.3339671E+02	6.177E-05	9.518E-06	9.245E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.517E-07	-8.518E-06	-8.246E-06	2.771E-07	5.777E-07	2.771E-07	4.137E-07
305	8.4385378E+02	6.176E-05	9.589E-06	9.338E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.358E-07	-8.580E-06	-8.329E-06	2.797E-07	5.887E-07	2.797E-07	4.048E-07
306	8.5399397E+02	6.176E-05	9.632E-06	9.421E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-7.200E-07	-8.618E-06	-8.408E-06	2.825E-07	5.934E-07	2.825E-07	4.015E-07
307	8.7364058E+02	6.175E-05	9.724E-06	9.675E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.913E-07	-8.654E-06	-8.513E-06	2.995E-07	6.236E-07	2.995E-07	3.894E-07
308	8.8821710E+02	6.174E-05	9.796E-06	9.689E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	-6.709E-07	-8.645E-06	-8.541E-06	3.233E-07	6.848E-07	3.233E-07	3.908E-07
309	9.0279362E+02	6.172E-05	9.869E-06	9.811E-06	0.000E+00	2.165E-13	0.000E+00	0.000E+00	-6.512E-07	-8.634E-06	-8.576E-06	3.272E-07	7.618E-07	3.272E-07	3.931E-07
310	9.1039876E+02	6.172E-05	9.882E-06	9.871E-06	0.000E+00	2.676E-08	0.000E+00	0.000E+00	-6.421E-07	-8.631E-06	-8.621E-06	3.467E-07	7.618E-07	3.467E-07	3.946E-07

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
311	9.1800390E+02	6.171E-05	9.899E-06	9.945E-06	0.000E+00	6.039E-08	0.000E+00	0.000E+00	-6.331E-07	-8.618E-06	-8.663E-06	3.597E-07	7.451E-07	3.597E-07	3.995E-07
312	9.3289731E+02	6.170E-05	9.969E-06	1.014E-05	4.265E-09	1.849E-07	0.000E+00	0.000E+00	-6.154E-07	-8.576E-06	-8.745E-06	3.868E-07	7.109E-07	3.911E-07	4.168E-07
313	9.4588942E+02	6.169E-05	1.003E-05	1.033E-05	1.940E-07	3.058E-07	0.000E+00	0.000E+00	-6.007E-07	-8.541E-06	-8.834E-06	2.260E-07	6.785E-07	4.200E-07	4.352E-07
314	9.5888154E+02	6.168E-05	1.009E-05	1.052E-05	5.866E-07	4.519E-07	0.000E+00	0.000E+00	-5.864E-07	-8.480E-06	-8.907E-06	-1.429E-07	6.398E-07	4.426E-07	4.565E-07
315	9.6775420E+02	6.168E-05	1.012E-05	1.064E-05	9.426E-07	7.236E-07	0.000E+00	0.000E+00	-5.764E-07	-8.414E-06	-8.930E-06	-5.285E-07	5.006E-07	4.073E-07	4.529E-07
316	9.7662687E+02	6.167E-05	1.016E-05	1.076E-05	1.573E-06	1.001E-06	0.000E+00	0.000E+00	-5.669E-07	-8.377E-06	-8.975E-06	-1.067E-06	3.591E-07	3.759E-07	4.541E-07
317	9.8898522E+02	6.166E-05	1.022E-05	1.091E-05	3.074E-06	1.000E-06	0.000E+00	0.000E+00	-5.556E-07	-8.332E-06	-9.031E-06	-2.628E-06	3.750E-07	4.467E-07	4.649E-07
318	1.0000761E+03	6.165E-05	1.026E-05	1.105E-05	4.773E-06	1.039E-06	0.000E+00	0.000E+00	-5.465E-07	-8.308E-06	-9.096E-06	-4.271E-06	3.487E-07	5.016E-07	4.993E-07
319	1.0054630E+03	6.165E-05	1.029E-05	1.111E-05	5.512E-06	1.084E-06	0.000E+00	0.000E+00	-5.424E-07	-8.298E-06	-9.127E-06	-4.996E-06	3.220E-07	5.163E-07	5.150E-07
320	1.0083150E+03	6.165E-05	1.030E-05	1.115E-05	5.858E-06	1.107E-06	0.000E+00	0.000E+00	-5.403E-07	-8.290E-06	-9.140E-06	-5.335E-06	3.092E-07	5.229E-07	5.244E-07
321	1.0111669E+03	6.165E-05	1.031E-05	1.118E-05	6.209E-06	1.131E-06	0.000E+00	0.000E+00	-5.397E-07	-8.285E-06	-9.155E-06	-5.672E-06	2.958E-07	5.290E-07	5.324E-07
322	1.0168707E+03	6.164E-05	1.032E-05	1.124E-05	6.868E-06	1.180E-06	0.000E+00	0.000E+00	-5.344E-07	-8.261E-06	-9.176E-06	-6.327E-06	2.699E-07	5.412E-07	5.569E-07
323	1.0260603E+03	6.164E-05	1.035E-05	1.134E-05	8.018E-06	1.223E-06	0.000E+00	0.000E+00	-5.283E-07	-8.232E-06	-9.219E-06	-7.442E-06	2.444E-07	5.756E-07	5.969E-07
324	1.0390524E+03	6.163E-05	1.038E-05	1.147E-05	9.821E-06	1.001E-06	0.000E+00	0.000E+00	-5.196E-07	-8.179E-06	-9.276E-06	-9.075E-06	3.597E-07	7.419E-07	6.346E-07
325	1.0507770E+03	6.163E-05	1.038E-05	1.159E-05	1.051E-05	1.203E-06	1.219E-09	0.000E+00	-5.113E-07	-8.078E-06	-9.288E-06	-9.883E-06	3.327E-07	6.458E-07	6.858E-07
326	1.0625016E+03	6.161E-05	1.025E-05	1.165E-05	1.005E-05	1.784E-06	3.178E-07	0.000E+00	-4.989E-07	-7.715E-06	-9.109E-06	-9.431E-06	5.101E-08	2.807E-07	7.948E-07
327	1.0682054E+03	6.161E-05	1.017E-05	1.166E-05	9.830E-06	2.040E-06	6.189E-07	0.000E+00	-4.927E-07	-7.510E-06	-9.005E-06	-9.153E-06	-1.236E-07	4.873E-08	8.534E-07
328	1.0735924E+03	6.160E-05	1.009E-05	1.170E-05	9.678E-06	2.243E-06	6.800E-07	0.000E+00	-4.869E-07	-7.316E-06	-8.922E-06	-9.007E-06	-1.962E-07	-1.894E-08	9.021E-07
329	1.0846832E+03	6.159E-05	9.864E-06	1.173E-05	9.349E-06	2.662E-06	8.451E-07	0.000E+00	-4.749E-07	-6.829E-06	-8.697E-06	-8.630E-06	-3.749E-07	-1.302E-07	1.248E-06
330	1.0932390E+03	6.158E-05	9.718E-06	1.178E-05	9.242E-06	2.864E-06	8.614E-07	4.478E-07	-4.670E-07	-6.534E-06	-8.597E-06	-8.529E-06	-4.097E-07	-1.539E-07	9.945E-07
331	1.0976754E+03	6.158E-05	9.642E-06	1.180E-05	9.191E-06	2.955E-06	8.514E-07	4.151E-07	-4.632E-07	-6.386E-06	-8.548E-06	-8.492E-06	-4.171E-07	-1.591E-07	9.528E-07
332	1.1021117E+03	6.157E-05	9.607E-06	1.183E-05	9.209E-06	2.900E-06	6.862E-07	-1.498E-09	-4.608E-07	-6.354E-06	-8.579E-06	-8.614E-06	-3.483E-07	-1.195E-07	1.162E-06
333	1.1052805E+03	6.157E-05	9.409E-06	1.178E-05	8.957E-06	3.214E-06	8.414E-07	9.153E-07	-4.563E-07	-6.023E-06	-8.395E-06	-8.306E-06	-4.857E-07	-2.003E-07	7.316E-07
334	1.1084493E+03	6.157E-05	9.300E-06	1.177E-05	8.866E-06	3.335E-06	8.973E-07	8.589E-07	-4.536E-07	-5.840E-06	-8.315E-06	-8.203E-06	-5.283E-07	-2.254E-07	6.002E-07
335	1.1094000E+03	6.156E-05	9.261E-06	1.177E-05	8.848E-06	3.358E-06	9.087E-07	1.242E-06	-4.516E-07	-5.780E-06	-8.286E-06	-8.167E-06	-5.413E-07	-2.331E-07	5.588E-07
336	1.1100337E+03	6.156E-05	9.233E-06	1.177E-05	8.834E-06	3.384E-06	9.210E-07	1.300E-06	-4.509E-07	-5.735E-06	-8.268E-06	-8.147E-06	-5.491E-07	-2.377E-07	5.351E-07
337	1.1119350E+03	6.156E-05	9.165E-06	1.176E-05	8.790E-06	3.439E-06	9.474E-07	1.400E-06	-4.491E-07	-5.626E-06	-8.220E-06	-8.091E-06	-5.701E-07	-2.501E-07	4.695E-07
338	1.1141532E+03	6.156E-05	9.089E-06	1.175E-05	8.745E-06	3.495E-06	9.744E-07	1.539E-06	-4.469E-07	-5.508E-06	-8.168E-06	-8.033E-06	-5.914E-07	-2.628E-07	4.017E-07
339	1.1163713E+03	6.156E-05	9.013E-06	1.174E-05	8.703E-06	3.548E-06	1.000E-06	1.738E-06	-4.447E-07	-5.390E-06	-8.117E-06	-7.976E-06	-6.117E-07	-2.748E-07	3.368E-07
340	1.1208077E+03	6.155E-05	8.846E-06	1.172E-05	8.607E-06	3.662E-06	1.057E-06	2.123E-06	-4.408E-07	-5.134E-06	-8.004E-06	-7.855E-06	-6.547E-07	-3.004E-07	1.985E-07
341	1.1246102E+03	6.155E-05	8.717E-06	1.169E-05	8.565E-06	3.705E-06	1.070E-06	2.300E-06	-4.359E-07	-4.950E-06	-7.926E-06	-7.800E-06	-6.652E-07	-3.068E-07	1.567E-07
342	1.1284128E+03	6.154E-05	8.604E-06	1.167E-05	8.522E-06	3.767E-06	1.095E-06	2.611E-06	-4.326E-07	-4.790E-06	-7.859E-06	-7.742E-06	-6.860E-07	-3.198E-07	8.784E-08
343	1.1322154E+03	6.154E-05	8.467E-06	1.164E-05	8.472E-06	3.816E-06	1.109E-06	2.576E-06	-4.292E-07	-4.598E-06	-7.773E-06	-7.682E-06	-6.966E-07	-3.263E-07	5.078E-08
344	1.1331660E+03	6.154E-05	8.424E-06	1.163E-05	8.432E-06	3.862E-06	1.133E-06	2.509E-06	-4.286E-07	-4.539E-06	-7.740E-06	-7.634E-06	-7.190E-07	-3.398E-07	-1.900E-08
345	1.1341167E+03	6.154E-05	8.376E-06	1.161E-05	8.400E-06	3.896E-06	1.151E-06	2.560E-06	-4.276E-07	-4.471E-06	-7.704E-06	-7.594E-06	-7.339E-07	-3.487E-07	-6.391E-08
346	1.1363348E+03	6.153E-05	8.282E-06	1.158E-05	8.343E-06	3.953E-06	1.181E-06	2.661E-06	-4.251E-07	-4.339E-06	-7.636E-06	-7.523E-06	-7.594E-07	-3.638E-07	-1.428E-07
347	1.1385530E+03	6.153E-05	8.182E-06	1.155E-05	8.282E-06	4.012E-06	1.213E-06	2.898E-06	-4.233E-07	-4.199E-06	-7.563E-06	-7.448E-06	-7.865E-07	-3.800E-07	-2.259E-07
348	1.1407712E+03	6.153E-05	8.099E-06	1.152E-05	8.253E-06	4.049E-06	1.231E-06	2.938E-06	-4.211E-07	-4.082E-06	-7.506E-06	-7.407E-06	-7.962E-07	-3.859E-07	-2.591E-07
349	1.1455244E+03	6.152E-05	7.938E-06	1.147E-05	8.192E-06	4.116E-06	1.266E-06	3.088E-06	-4.161E-07	-3.855E-06	-7.389E-06	-7.323E-06	-8.150E-07	-3.974E-07	-3.279E-07

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
350	1.1540802E+03	6.151E-05	7.661E-06	1.137E-05	8.103E-06	4.212E-06	1.316E-06	3.372E-06	-4.092E-07	-3.474E-06	-7.183E-06	-7.197E-06	-8.343E-07	-4.099E-07	-4.109E-07
351	1.1588334E+03	6.151E-05	7.491E-06	1.128E-05	7.987E-06	4.289E-06	1.356E-06	4.647E-06	-4.042E-07	-3.251E-06	-7.042E-06	-7.066E-06	-8.799E-07	-4.377E-07	-5.583E-07
352	1.1632697E+03	6.150E-05	7.334E-06	1.120E-05	7.913E-06	4.347E-06	1.385E-06	4.427E-06	-3.998E-07	-3.043E-06	-6.906E-06	-6.974E-06	-8.980E-07	-4.490E-07	-6.252E-07
353	1.1730930E+03	6.150E-05	7.210E-06	1.119E-05	8.026E-06	4.333E-06	1.367E-06	3.700E-06	-3.935E-07	-2.840E-06	-6.822E-06	-7.064E-06	-8.179E-07	-4.039E-07	-4.456E-07
354	1.1730930E+03	6.150E-05	7.283E-06	1.134E-05	8.077E-06	4.299E-06	1.347E-06	3.546E-06	-3.985E-07	-3.021E-06	-7.108E-06	-7.272E-06	-1.085E-06	-5.925E-07	-1.676E-06
355	1.1730930E+03	6.150E-05	7.271E-06	1.131E-05	8.065E-06	4.301E-06	1.348E-06	3.591E-06	-3.945E-07	-2.918E-06	-6.947E-06	-7.144E-06	-9.458E-07	-4.908E-07	-9.752E-07
356	1.1730930E+03	6.150E-05	7.235E-06	1.123E-05	8.018E-06	4.302E-06	1.350E-06	3.570E-06	-3.887E-07	-2.848E-06	-6.830E-06	-7.000E-06	-8.631E-07	-4.308E-07	-6.260E-07
357	1.1730930E+03	6.149E-05	7.198E-06	1.115E-05	7.942E-06	4.304E-06	1.356E-06	3.527E-06	-3.830E-07	-2.807E-06	-6.750E-06	-6.878E-06	-8.076E-07	-3.994E-07	-4.868E-07
358	1.1730930E+03	6.149E-05	7.170E-06	1.109E-05	7.902E-06	4.300E-06	1.360E-06	3.520E-06	-3.765E-07	-2.781E-06	-6.700E-06	-6.874E-06	-7.910E-07	-3.904E-07	-4.532E-07
359	1.1730930E+03	6.149E-05	7.157E-06	1.109E-05	7.910E-06	4.299E-06	1.362E-06	3.557E-06	-3.748E-07	-2.772E-06	-6.707E-06	-6.927E-06	-8.094E-07	-4.011E-07	-4.840E-07
360	1.1730930E+03	6.148E-05	7.128E-06	1.108E-05	7.912E-06	4.305E-06	1.365E-06	3.621E-06	-3.705E-07	-2.737E-06	-6.688E-06	-6.938E-06	-8.097E-07	-4.017E-07	-4.922E-07
361	1.1734099E+03	6.149E-05	7.122E-06	1.109E-05	7.899E-06	4.330E-06	1.377E-06	3.713E-06	-3.790E-07	-2.729E-06	-6.697E-06	-6.929E-06	-8.381E-07	-4.174E-07	-5.468E-07
362	1.1734099E+03	6.149E-05	7.105E-06	1.108E-05	7.888E-06	4.350E-06	1.387E-06	3.766E-06	-3.796E-07	-2.708E-06	-6.683E-06	-6.915E-06	-8.452E-07	-4.214E-07	-5.644E-07
363	1.1737268E+03	6.149E-05	7.099E-06	1.107E-05	7.883E-06	4.361E-06	1.393E-06	3.786E-06	-3.800E-07	-2.699E-06	-6.672E-06	-6.905E-06	-8.438E-07	-4.208E-07	-5.652E-07
364	1.1737268E+03	6.149E-05	7.092E-06	1.107E-05	7.879E-06	4.369E-06	1.397E-06	3.808E-06	-3.795E-07	-2.691E-06	-6.667E-06	-6.900E-06	-8.459E-07	-4.220E-07	-5.710E-07
365	1.1737268E+03	6.149E-05	7.113E-06	1.109E-05	7.879E-06	4.374E-06	1.399E-06	3.812E-06	-3.911E-07	-2.716E-06	-6.696E-06	-6.908E-06	-8.685E-07	-4.341E-07	-6.036E-07
366	1.1737268E+03	6.148E-05	7.082E-06	1.105E-05	7.878E-06	4.371E-06	1.398E-06	3.811E-06	-3.679E-07	-2.683E-06	-6.651E-06	-6.894E-06	-8.386E-07	-4.184E-07	-5.664E-07
367	1.1737268E+03	6.149E-05	7.090E-06	1.106E-05	7.878E-06	4.371E-06	1.398E-06	3.814E-06	-3.780E-07	-2.687E-06	-6.658E-06	-6.895E-06	-8.419E-07	-4.198E-07	-5.620E-07
368	1.1737268E+03	6.149E-05	7.094E-06	1.107E-05	7.878E-06	4.372E-06	1.398E-06	3.816E-06	-3.786E-07	-2.688E-06	-6.661E-06	-6.895E-06	-8.422E-07	-4.198E-07	-5.589E-07
369	1.1737268E+03	6.149E-05	7.083E-06	1.105E-05	7.878E-06	4.372E-06	1.399E-06	3.819E-06	-3.630E-07	-2.663E-06	-6.623E-06	-6.873E-06	-7.945E-07	-3.925E-07	-4.561E-07
370	1.1737268E+03	6.149E-05	7.074E-06	1.103E-05	7.877E-06	4.372E-06	1.398E-06	3.818E-06	-3.557E-07	-2.655E-06	-6.610E-06	-6.866E-06	-7.817E-07	-3.855E-07	-4.399E-07
371	1.1737268E+03	6.149E-05	7.102E-06	1.108E-05	7.877E-06	4.372E-06	1.399E-06	3.816E-06	-3.876E-07	-2.704E-06	-6.687E-06	-6.910E-06	-8.744E-07	-4.379E-07	-6.190E-07
372	1.1737268E+03	6.149E-05	7.102E-06	1.108E-05	7.877E-06	4.372E-06	1.399E-06	3.816E-06	-3.868E-07	-2.705E-06	-6.689E-06	-6.909E-06	-8.726E-07	-4.370E-07	-6.199E-07
373	1.1737268E+03	6.149E-05	7.104E-06	1.109E-05	7.877E-06	4.373E-06	1.399E-06	3.817E-06	-3.890E-07	-2.708E-06	-6.693E-06	-6.911E-06	-8.769E-07	-4.394E-07	-6.279E-07
374	1.1737268E+03	6.149E-05	7.106E-06	1.109E-05	7.877E-06	4.373E-06	1.399E-06	3.818E-06	-3.891E-07	-2.710E-06	-6.696E-06	-6.911E-06	-8.772E-07	-4.394E-07	-6.260E-07
375	1.1737268E+03	6.149E-05	7.108E-06	1.109E-05	7.877E-06	4.375E-06	1.400E-06	3.820E-06	-3.893E-07	-2.712E-06	-6.699E-06	-6.911E-06	-8.769E-07	-4.391E-07	-6.229E-07
376	1.1737268E+03	6.149E-05	7.109E-06	1.109E-05	7.877E-06	4.377E-06	1.401E-06	3.824E-06	-3.903E-07	-2.713E-06	-6.699E-06	-6.908E-06	-8.759E-07	-4.384E-07	-6.190E-07
377	1.1737268E+03	6.149E-05	7.109E-06	1.109E-05	7.876E-06	4.382E-06	1.403E-06	3.833E-06	-3.914E-07	-2.712E-06	-6.697E-06	-6.905E-06	-8.754E-07	-4.380E-07	-6.176E-07
378	1.1737268E+03	6.149E-05	7.104E-06	1.109E-05	7.873E-06	4.389E-06	1.407E-06	3.852E-06	-3.916E-07	-2.706E-06	-6.690E-06	-6.899E-06	-8.760E-07	-4.384E-07	-6.204E-07
379	1.1740437E+03	6.149E-05	7.094E-06	1.108E-05	7.867E-06	4.400E-06	1.412E-06	3.885E-06	-3.915E-07	-2.693E-06	-6.680E-06	-6.891E-06	-8.786E-07	-4.399E-07	-6.283E-07
380	1.1743605E+03	6.149E-05	7.077E-06	1.107E-05	7.858E-06	4.414E-06	1.420E-06	3.925E-06	-3.910E-07	-2.670E-06	-6.664E-06	-6.879E-06	-8.827E-07	-4.424E-07	-6.397E-07
381	1.1756281E+03	6.149E-05	7.047E-06	1.105E-05	7.847E-06	4.428E-06	1.427E-06	3.965E-06	-3.901E-07	-2.633E-06	-6.637E-06	-6.864E-06	-8.868E-07	-4.448E-07	-6.518E-07
382	1.1778462E+03	6.149E-05	6.984E-06	1.101E-05	7.819E-06	4.447E-06	1.438E-06	4.036E-06	-3.882E-07	-2.554E-06	-6.577E-06	-6.829E-06	-8.934E-07	-4.490E-07	-6.764E-07
383	1.1829163E+03	6.148E-05	6.837E-06	1.089E-05	7.732E-06	4.497E-06	1.469E-06	4.274E-06	-3.840E-07	-2.364E-06	-6.422E-06	-6.725E-06	-9.145E-07	-4.621E-07	-7.550E-07
384	1.1940071E+03	6.147E-05	6.531E-06	1.064E-05	7.535E-06	4.604E-06	1.537E-06	4.957E-06	-3.749E-07	-1.967E-06	-6.074E-06	-6.494E-06	-9.596E-07	-4.903E-07	-9.301E-07
385	1.2022461E+03	6.146E-05	6.412E-06	1.050E-05	7.516E-06	4.595E-06	1.533E-06	4.823E-06	-3.671E-07	-1.824E-06	-5.916E-06	-6.460E-06	-9.349E-07	-4.774E-07	-8.998E-07
386	1.2108018E+03	6.146E-05	6.292E-06	1.038E-05	7.492E-06	4.593E-06	1.533E-06	5.203E-06	-3.614E-07	-1.673E-06	-5.758E-06	-6.425E-06	-9.125E-07	-4.657E-07	-8.720E-07
387	1.2288640E+03	6.144E-05	6.092E-06	1.009E-05	7.439E-06	4.575E-06	1.527E-06	4.808E-06	-3.497E-07	-1.421E-06	-5.420E-06	-6.352E-06	-8.635E-07	-4.402E-07	-8.088E-07
388	1.2675235E+03	6.141E-05	5.800E-06	9.462E-06	7.317E-06	4.510E-06	1.507E-06	5.093E-06	-3.259E-07	-1.052E-06	-4.713E-06	-6.195E-06	-7.599E-07	-3.852E-07	-6.639E-07

Column 1	Column 2 (Time, yr)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
389	1.3483281E+03	6.133E-05	5.455E-06	8.373E-06	7.009E-06	4.337E-06	1.455E-06	4.952E-06	-2.755E-07	-6.286E-07	-3.544E-06	-5.831E-06	-5.739E-07	-2.850E-07	-3.683E-07
390	1.5001141E+03	6.121E-05	5.193E-06	6.892E-06	6.210E-06	4.060E-06	1.397E-06	4.796E-06	-1.977E-07	-3.174E-07	-2.013E-06	-4.986E-06	-3.459E-07	-1.673E-07	-3.157E-08
391	1.6582376E+03	6.111E-05	5.092E-06	6.157E-06	5.721E-06	3.902E-06	1.373E-06	4.661E-06	-1.515E-07	-2.227E-07	-1.337E-06	-4.461E-06	-2.528E-07	-1.184E-07	9.259E-08
392	1.9446979E+03	6.099E-05	5.008E-06	5.495E-06	4.760E-06	3.734E-06	1.383E-06	4.702E-06	-1.109E-07	-1.366E-07	-7.114E-07	-3.529E-06	-1.479E-07	-7.596E-08	1.582E-07
393	2.0001521E+03	6.103E-05	5.034E-06	5.646E-06	4.575E-06	3.746E-06	1.410E-06	4.678E-06	-9.476E-08	-1.369E-07	-7.431E-07	-3.244E-06	-1.487E-07	-7.652E-08	1.175E-07
394	2.4422009E+03	1.028E-04	8.449E-06	8.725E-06	4.714E-06	5.971E-06	2.534E-06	8.706E-06	-6.243E-08	-7.987E-08	-3.613E-07	-2.250E-06	-8.140E-08	-4.800E-08	1.091E-07
395	2.4998732E+03	1.041E-04	8.556E-06	8.813E-06	4.681E-06	6.039E-06	2.577E-06	8.312E-06	-5.396E-08	-7.320E-08	-3.310E-07	-2.149E-06	-7.515E-08	-4.513E-08	1.070E-07
396	2.9999113E+03	1.047E-04	8.604E-06	8.750E-06	4.121E-06	6.004E-06	2.633E-06	8.399E-06	-3.444E-08	-4.735E-08	-1.921E-07	-1.517E-06	-4.373E-08	-2.970E-08	8.489E-08
397	3.5268842E+03	1.045E-04	8.591E-06	8.673E-06	3.813E-06	5.949E-06	2.663E-06	8.443E-06	-3.798E-08	-3.421E-08	-1.264E-07	-1.111E-06	-2.778E-08	-2.152E-08	6.862E-08
398	3.9990367E+03	1.047E-04	8.612E-06	8.671E-06	3.608E-06	5.949E-06	2.681E-06	8.392E-06	-1.636E-08	-2.524E-08	-9.466E-08	-9.042E-07	-2.106E-08	-1.625E-08	5.766E-08
399	4.6993434E+03	1.047E-04	8.616E-06	8.652E-06	3.372E-06	5.927E-06	2.701E-06	8.382E-06	-1.744E-08	-1.919E-08	-6.811E-08	-7.117E-07	-1.528E-08	-1.255E-08	4.500E-08
400	5.0003803E+03	1.049E-04	8.639E-06	8.684E-06	3.352E-06	5.930E-06	2.717E-06	8.376E-06	-7.421E-09	-1.629E-08	-6.031E-08	-6.341E-07	-1.137E-08	-1.045E-08	4.208E-08
401	5.9763734E+03	1.048E-04	8.632E-06	8.661E-06	3.245E-06	5.905E-06	2.731E-06	8.371E-06	-1.403E-08	-1.330E-08	-4.505E-08	-4.793E-07	-8.369E-09	-8.120E-09	3.195E-08
402	6.9998986E+03	1.049E-04	8.648E-06	8.671E-06	3.053E-06	5.902E-06	2.748E-06	8.332E-06	-9.320E-09	-1.009E-08	-3.387E-08	-3.864E-07	-6.402E-09	-6.208E-09	2.512E-08
403	8.3814992E+03	1.049E-04	8.655E-06	8.673E-06	2.987E-06	5.896E-06	2.761E-06	8.293E-06	-8.440E-09	-7.475E-09	-2.529E-08	-2.967E-07	-4.679E-09	-4.656E-09	1.971E-08
404	1.0000761E+04	1.050E-04	8.666E-06	8.676E-06	2.969E-06	5.895E-06	2.770E-06	8.261E-06	-4.907E-09	-5.425E-09	-1.899E-08	-2.216E-07	-3.078E-09	-3.379E-09	1.564E-08
405	1.2069993E+04	1.051E-04	8.687E-06	8.697E-06	2.943E-06	5.907E-06	2.782E-06	8.223E-06	-2.828E-09	-4.297E-09	-1.436E-08	-1.637E-07	-2.194E-09	-2.425E-09	1.213E-08
406	1.5327528E+04	1.049E-04	8.676E-06	8.679E-06	2.910E-06	5.890E-06	2.782E-06	8.175E-06	8.604E-10	-2.451E-09	-9.212E-09	-1.086E-07	-1.286E-09	-1.500E-09	8.291E-09
407	2.0058560E+04	1.049E-04	8.685E-06	8.686E-06	2.872E-06	5.893E-06	2.788E-06	8.120E-06	1.067E-09	-1.522E-09	-5.980E-09	-7.020E-08	-7.998E-10	-9.498E-10	5.391E-09
408	2.6995082E+04	1.050E-04	8.696E-06	8.697E-06	2.845E-06	5.899E-06	2.792E-06	8.069E-06	9.190E-10	-9.303E-10	-3.612E-09	-4.285E-08	-4.595E-10	-5.652E-10	3.299E-09
409	3.7423632E+04	1.050E-04	8.707E-06	8.707E-06	2.826E-06	5.907E-06	2.795E-06	8.025E-06	9.787E-10	-3.114E-10	-1.957E-09	-2.395E-08	-2.918E-10	-3.473E-10	1.797E-09
410	5.3584556E+04	1.050E-04	8.720E-06	8.719E-06	2.815E-06	5.919E-06	2.798E-06	7.991E-06	8.979E-10	-8.896E-11	-1.039E-09	-1.385E-08	-2.001E-10	-1.991E-10	1.020E-09
411	8.0265926E+04	1.051E-04	8.729E-06	8.729E-06	2.809E-06	5.928E-06	2.800E-06	7.951E-06	6.684E-10	1.541E-11	-4.675E-10	-7.073E-09	-1.175E-10	-1.030E-10	5.032E-10
412	1.2738611E+05	1.051E-04	8.737E-06	8.737E-06	2.807E-06	5.936E-06	2.802E-06	7.936E-06	4.201E-10	3.191E-11	-2.296E-10	-3.949E-09	-7.705E-11	-5.968E-11	2.651E-10
413	2.2029559E+05	1.051E-04	8.740E-06	8.740E-06	2.806E-06	5.939E-06	2.803E-06	7.930E-06	4.752E-11	-4.335E-11	-2.293E-10	-2.968E-09	-6.151E-11	-4.388E-11	1.877E-10
414	4.1796588E+05	1.052E-04	8.741E-06	8.741E-06	2.806E-06	5.939E-06	2.803E-06	7.927E-06	-5.119E-11	-6.171E-11	-2.245E-10	-2.655E-09	-5.721E-11	-3.908E-11	1.629E-10
415	8.5336020E+05	1.052E-04	8.741E-06	8.741E-06	2.805E-06	5.940E-06	2.803E-06	7.924E-06	-6.994E-12	-3.360E-11	-1.574E-10	-2.056E-09	-5.089E-11	-3.060E-11	1.176E-10
416	1.0000761E+06	1.052E-04	8.742E-06	8.742E-06	2.805E-06	5.940E-06	2.803E-06	7.922E-06	-6.268E-11	-4.417E-11	-1.549E-10	-1.879E-09	-4.850E-11	-2.793E-11	1.034E-10

ATTACHMENT VII SOFTWARE ROUTINE DOCUMENTATION FOR NUFT POST PROCESSOR: ZONEAVG V1.2

ROUTINE PURPOSE AND DESCRIPTION

This attachment describes the initial issue of routine: ZONEAVG V1.2. This routine processes NUFT output files ("*.ext") to produce zone-averaged output of scalar variables at each time step. The routine is written in the "perl" scripting language for Unix, and is compatible with any 5.x version of the perl compiler. The program listing of the ZONEAVG V1.2 is provided in Table VII-1. The routine was run on a Sun Ultra 2 workstation with SunOS 5.5.1 operating system.

As discussed in Section 6.1 of this report, the thermal-hydrology NUFT model was divided into six sub-domains (Zone 1 to Zone 6), plus one additional boundary zone (Zone 0). This software routine reads the NUFT output file and produces another output file, which contains a table of zone-averaged values for each zone, for each scalar variable output by NUFT, and for each time step for which NUFT output was requested.

Importantly, it is necessary that the NUFT input file is structured using specialized grid block names which identify the grid blocks within each zone. The identifying syntax within each grid block name is the letter "A" followed by a single digit designating the zone number.

VALIDATION TEST CASE

Description and validation of routine ZONEAVG V1.2 is facilitated using a test case. This case consists of one NUFT output file ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext"). This file is an important intermediate product in development of the Engineered Barrier System (EBS) Physical and Chemical Environment Analysis/Model Report. The file is too large to list in this Attachment, however, selected portions are shown in Table VII-2. For purposes of hand calculation and validation, the NUFT output file was imported to an Excel 97 spreadsheet ("AttachmentVIIRev00BCompleteTable2.xls") so that line numbers could be added. The following discussion refers to line numbers within Table VII-2, which match the line numbers shown in the spreadsheet file.

The NUFT file ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext") and the Excel spreadsheet version with line numbers ("AttachmentVIIRev00BCompleteTable2.xls") are available in electronic form (DTN MO9911EBSM0001.000; electronic submittal described in Attachment XIX.)

Zone-averaged scalar variables (e.g. as shown in Lines 125 to 129 of Table VII-2: temperature, liquid saturation, air mass-fraction, evaporation rate per unit volume, evaporation rate per grid block) describe the state of each zone as a function of time. Within each zone, for each time step, the value for each grid block is weighted by its volume according to:

$$\overline{x} = \frac{\sum_{\text{grid blocks}} v_i x_i}{\sum_{\text{grid blocks}} v_i} \qquad \text{(VII-1)}$$

where $\overline{x}$ = zone average of scalar field for one zone
v_i = volume of the ith grid block in that zone (m^3/m)

x_i = scalar field value for the ith grid block

For the test case, the ZONEAVG output file ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext.zavg") is listed in Table VII-3.

Validation of the ZONEAVG routine was completed by manually checking the input and output files. The following documentation illustrates the correct relationship of the input and output files. As noted above, in the following discussion the information within the NUFT output file ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext") is referenced by line number.

It is shown from the input file "l4c4-LDTH60-1Dds_mc-ui-01.f.ext" that the 2-D model plane (with thickness y = 1 m) is defined by a 15 x 85 mesh. There are 15 grid blocks in the horizontal (x) direction and 85 grid blocks in the vertical (z) direction. The widths of 15 grid blocks in the x-direction are given in Rows 15 through 29 of Table VII-2, while the heights of 85 grid blocks in the z-direction are given in Rows 33 through 117 of Table VII-2.

The ZONEAVG routine first calculates the volume for all grid blocks within each zone using the process shown in Table VII-4. The process is repeated for each grid block. The volumes of the calculated by ZONEAVG for the test case are listed in the output file (Table VII-3) in Rows 7 through 429. The volume data are used in subsequent calculations for zone-average scalar variables.

In the NUFT output file, the names of the 1,275 grid block names are listed in a format of eighty-five 15-element horizontal strips from the top to the bottom in Rows 133 through 1,407 of Table VII-2. In the NUFT output file, all the grid block names are then listed again in the format of a vertical strip (Rows 1,409 through 3858 in file: "Attachment VII Table 2.xls").

In the test case, there are 17 time-steps from 50 years (1.57788e+09 sec) to 1,000,000 years (3.15576e+13 sec). Within each time-step, the list of data are in the same sequence defined in Rows 125 to 129 (Table VII-2):

- "T" (1275 values)
- "S.liquid" (1275 values)
- "X.air.gas" (1275 values)
- "qPhChg.water.gas" (1275 values)
- "QphChg.water.gas" (1275 values)
- "q.gas" (2450 values)

The hand calculation illustrates the correct function of ZONEAVG V1.2 for the zone-average temperature (variable "T" above) for Zone A0 and Zone A6 at the 50-yr time step (1.577880e+09 sec). The data block for temperature at this time step is shown in Table VII-2, Rows 3892 to 5166. The results of the hand calculation for Zone 0 are in Table VII-5, and the results for Zone 6 are in Table VII-6.

Similar hand calculations were performed for the other zones and time-steps. Representative data values in the output files were manually checked and compared against the input data. It was found that all the selected output data were in agreement with the input data. Therefore,

the software routine ZONEAVG V1.2 is valid for its intended use within the validation range of 50 to 1,000,000 years.

This routine is valid for parsing the "*.ext" output file from NUFT V3.0s, for any simulation problem that includes zoning of grid blocks, defined in the NUFT input file. This routine provides correct results for the range of parameters obtained from NUFT outputs.

Table VII-1 Program Listing for Software Routine ZONEAVG V1.2

```
#!/usr/local/bin/perl -s

$_version = "zoneavg.sh 1.2 10/15/99 12:06:51 LLNL";

print "$_version\n";

# loop all files for individual extraction/reduction of information
foreach $file (@ARGV) {
    print "Parsing file $file...\n";
    $pardata=&getPVals($file,$x,$y);
    foreach $param (keys(%{$pardata})) {
      next if $param eq 'zones';
      print "\nVariable: $param\n";
      &writeHeader(STDOUT,@{$pardata->{'zones'}});
      $vdat=$pardata->{$param};
      foreach $i (0..$#{$vdat}) {
          &writeData(STDOUT,$i,$vdat->[$i],@{$pardata->{'zones'}});
      }
    }
}

#
# write single ouput data line
sub writeData
{
    my($fl,$tidx,$data,@zone)=@_;
    my($i);

    printf $fl "%d\t%e",$tidx,$data->{'time'};
    foreach $i (0..$#zone) {
      printf $fl "\t% 12e",$data->{$zone[$i]};
    }
    printf $fl "\n";
}

#
# header information output for each output table
sub writeHeader
{
    my($fl,@z)=@_;
    my($num);

    printf $fl "\t   Zone";
    foreach $i (0..$#z) {
      printf $fl "\t%12s",$z[$i];
    }
    printf $fl "\n      Time\n";
}

#
# full read and parameter calculation for one file
sub getPVals
{
    my($fl)=@_[0];
    my(%idx,%blkvol,$par,$info,@zones,$zone,$var,$data,$pdata);

    open(RES,"<$fl")||die "Unable to open $fl: $!\n";
    $info=&getFileInfo(RES);
    @zones=&getZones(@{$info->{'sblk'}});
    foreach $zone (@zones) {
```

```
        $idx{$zone}=&getIndices("_".$zone."[\.\#]",@{$info->{'sblk'}});
        $blkvol{$zone}=&getVolumes($info->{'sblk'},$info->{'grid'},$idx{$zone});
     }
     $par->{'zones'}=[];
     @{$par->{'zones'}}=@zones;
     foreach $var (@{$info->{'svar'}}) {
        $par->{$var}=[];
     }
     while ($data=&getData(RES)) {
        next if $data->{'var'}>$#{$info->{'svar'}};
        $var=$info->{'svar'}->[$data->{'var'}];
        $pdata={};
        $pdata->{'time'}=$data->{'time'};
        print "Time: $pdata->{'time'}\n";
        foreach $zone (@zones) {
            print "  Zone: $zone\n";
            $pdata->{$zone}=getAvg($data->{'data'},$idx{$zone},$blkvol{$zone});
        }
        push @{$par->{$var}}, $pdata;
     }
     close(RES);
     return $par;
}

#
# extract list of zone names from array
# zone names are expected to match '_<zone>.' or '_<zone>#'
sub getZones
{
     my(@blk)=@_;
     my($i,@zon);

     foreach $i (0..$#blk) {
        if ($blk[$i]=~/^[^\#]*_([^\.\#]*)/) {
            $zon{$1}=1;
        }
     }
     return keys(%zon);
}

#
# weighted average over given array of data and weights
sub getAvg
{
     my($data,$idx,$w)=@_;
     my($wtot,$sum,$i);

     $wtot=0.0;
     foreach $i (0..$#{$idx}) {
        $wtot+=$w->[$i];
        $sum+=$data->[$idx->[$i]]*$w->[$i];
     }
     return $sum/$wtot;
}

#
# Pack all ext header info into one structure
sub getFileInfo
{
     my($in)=@_[0];
     my($info,$grd);

     $grd=&readGrid($in);
```

```
    die "Could not find grid\n" unless $grd;
    $info=&readDesc($in);
    die "Unable to parse block descriptions\n" unless $info;
    $info->{'grid'}=$grd;
    return $info;
}

#
# Read a single timestep, single variable data block
sub getData
{
    my($in)=@_[0];
    my($out,$vidx,$data,$time);

    return if eof $in;
    $out={};
    $time=<$in>+0.0;
    $vidx=<$in>-1;
    $name=$nlst->[$vidx];
    $data=&readDataBlk($in,<$in>+0);
    $out->{'data'}=$data;
    $out->{'var'}=$vidx;
    $out->{'time'}=$time;
    return $out;
}

#
# calculate volumes for array of block indices
sub getVolumes
{
    my($blk,$grd,$idx)=@_;
    my($vols,@x,@y,@z,$i,@bijk);

    @x=@{$grd->{'x'}};
    @y=@{$grd->{'y'}};
    @z=@{$grd->{'z'}};
    $vols=[];
    foreach $i (0..$#{$idx}) {
       @bijk=split(/:/,(split('#',$blk->[$idx->[$i]]))[1]);
       $vols->[$i]=$x[$bijk[0]-1]*$y[$bijk[1]-1]*$z[$bijk[2]-1];
       print "$blk->[$idx->[$i]] Volume: $vols->[$i]\n";
    }
    return $vols;
}

#
# Extract a list of indices into the date blocks for
# block names matching a given (RE) pattern
sub getIndices
{
    my($pat,@sb)=@_;
    my($i,$idx);

    $idx=[];
    foreach $i (0..$#sb) {
       if ($sb[$i] =~ /$pat/) {
           push(@{$idx},$i);
       }
    }
    return $idx;
}

#
```

```
# Read the variable and block descriptions from the file
# Information stored in hash table:
# $out->{'svar'}==ordered array of scalar variable names
# $out->{'vvar'}==ordered array of connection variable names
# $out->{'sblk'}==ordered array of block names for scalar (element) variables
# $out->{'vblk'}==ordered array of block connections for vector (connection)
varibles
# $out->{'vnames'}==ordered array of all varible names
sub readDesc
{
    my($in)=@_[0];
    my($out,$line,$num);

    $out={};
    do {
       $line=<$in>;
    } while $line=~/^\$/;
    $out->{'svar'}=&readDataBlk($in,$line+0);
    $out->{'vvar'}=&readDataBlk($in,<$in>+0);
    $out->{'sblk'}=&readDataBlk($in,<$in>+0);
    $out->{'vblk'}=&readDataBlk($in,<$in>+0);
    $out->{'vnames'}=[];
    @{$out->{'vnames'}}=@{$out->{'svar'}};
    push(@{$out->{'vnames'}},@{$out->{'vvar'}});
    $num=0;
    $num+=scalar(@{$out->{'svar'}}) if defined(@{$out->{'svar'}});
    $num+=scalar(@{$out->{'vvar'}}) if defined(@{$out->{'vvar'}});
    print "num variables $num\n";
    die "No variables found in file\n" unless $num;
    foreach $i (1..5*$num) {
       $line=<$in>;
    }
    return $out;
}

#
# Read one block from extfile of $num lines
# return reference to array of lines
sub readDataBlk
{
    my($in,$num)=@_;
    my($out,$i,$line);

    $out=[] if $num;
    foreach $i (1..$num) {
       $line=<$in>;
       chomp $line;
       push(@{$out}, $line);
    }
    return $out;
}

#
# Read the grid definition from the file into data area
# for rectangular ext file grid will result in
# $grd->{'type'}=='rect'
# $grd->{'nx'}=value from $nx line
#    similar from 'ny','nz'
# $grd->{'x'}=array of values from $dx block
# similar for 'y','z'
# return reference to structure
#
sub readGrid
```

```
{
    my($in)=@_[0];
    my($line,$grd,$gptr,@tok);

    $line=<$in> until $line=~s/^\$//;
    chomp($line);
    $grd={};
    $grd->{'type'}=$line;
    $gptr=$grd;
    while ($line=<$in>) {
       chomp($line);
       $line=~/^\$continuum/ && do {
           @tok=split(/ /,$line);
           $grd->{$tok[1]}={};
           $gptr=$grd->{$tok[1]};
           next;
       };
       $line=~s/^\$n// && do {
           @tok=split(/ /,$line);
           $gptr->{"n$tok[0]"}=0+$tok[1];
           next;
       };
       $line=~s/^\$d// && do {
           $gptr->{$line}=&readDataBlk($in,$gptr->{"n$line"});
           next;
       };
       $line=~/^\$end/ && last;
    }
    return $grd;

}
```

Table VII-2 Selected Lines from ZONEAVG V1.2 Input File (NUFT Output File: "14c4-LDTH60-1Dds_mc-ui-01.f.ext") Used for Validation

Line #	Value or Contents from NUFT Output File
1	1
2	*14c4-LDTH60-1Dds_mc-ui-01* 1.0130000e+01mm_yr,line-
3	10
4	internal
5	NUFT version 3.0s (SUN/SOLARIS)
6	0
7	VARIABLE
8	$gdef
9	$type rect
10	$nx 15
11	$ny 1
12	$nz 85
13	$order yxz
14	$dx
15	0.57
16	0.35
17	0.331
18	3.60E-01
19	0.3797
20	0.42
21	3.39E-01
22	5.00E-01
23	9.00E-01
24	1.50E+00
25	2.50E+00
26	4.00E+00
27	6.00E+00
28	9.00E+00
29	1.34E+01
30	$dy
31	1.00E+00
32	$dz
33	1.00E-30
34	1.65E+01
35	1.65E+01
36	2.90E+01
37	3.00E+01
38	3.00E+01
39	4.95E+00
40	5.95E+00
41	2.49E+00
42	2.37E+00
43	6.53E+00
44	1.44E+01
45	1.55E+01
46	1.99E+00
47	2.10E+01
48	2.10E+01
49	2.87E+01
50	3.00E+01
51	3.00E+01
52	1.03E+01
53	2.00E+01
54	9.67E+00
55	9.67E+00

Line #	Value or Contents from NUFT Output File
56	1.00E+01
57	6.00E+00
58	4.00E+00
59	3.00E+00
60	3.00E+00
61	2.40E+00
62	2.00E+00
63	1.00E+00
64	1.00E+00
65	5.00E-01
66	3.00E-01
67	2.00E-01
68	2.00E-01
69	2.00E-01
70	2.00E-01
71	2.00E-01
72	2.00E-01
73	2.00E-01
74	2.00E-01
75	2.74E-01
76	2.00E-01
77	2.00E-01
78	2.54E-01
79	2.37E-01
80	3.82E-01
81	6.47E-01
82	7.86E-01
83	5.14E-01
84	3.03E-01
85	3.03E-01
86	8.00E-01
87	1.00E+00
88	1.50E+00
89	2.00E+00
90	2.00E+00
91	2.50E+00
92	3.00E+00
93	4.00E+00
94	6.00E+00
95	1.00E+01
96	1.50E+01
97	5.86E+00
98	2.00E+01
99	7.12E+00
100	1.36E+01
101	2.34E+01
102	3.78E+00
103	1.02E+01
104	1.44E+01
105	1.44E+01
106	1.44E+01
107	1.44E+01
108	1.96E+01
109	8.09E+00
110	3.00E+01
111	3.69E+00
112	1.47E+01

Line #	Value or Contents from NUFT Output File
113	3.00E+01
114	3.00E+01
115	1.06E+00
116	1.74E+01
117	1.00E-30
118	$end_internal_grid
119	$OperatingSystem SunOS s139.es.llnl.gov 5.5.1
120	$C-Compiler CC: WorkShop Compilers 4.2 18 Sep 1997
121	$FortranCompiler f77: WorkShop Compilers 4.2 04 Mar
122	$RunID
123	$RunDate Wed Nov 3 23:00:11 1999
124	5.00E+00
125	T
126	S.liquid
127	X.air.gas
128	qPhChg.water.gas
129	QPhChg.water.gas
130	1.00E+00
131	q.gas
132	1275
133	atm.f#1:1:1
134	atm.f#2:1:1
135	atm.f#3:1:1
136	atm.f#4:1:1
137	atm.f#5:1:1
138	atm.f#6:1:1
139	atm.f#7:1:1
140	atm.f#8:1:1
141	atm.f#9:1:1
142	atm.f#10:1:1
143	atm.f#11:1:1
144	atm.f#12:1:1
145	atm.f#13:1:1
146	atm.f#14:1:1
147	atm.f#15:1:1
148	tcw11.f#1:1:2
149	tcw11.f#2:1:2
150	tcw11.f#3:1:2
151	tcw11.f#4:1:2
152	tcw11.f#5:1:2
153	tcw11.f#6:1:2
154	tcw11.f#7:1:2
155	tcw11.f#8:1:2
156	tcw11.f#9:1:2
157	tcw11.f#10:1:2
158	tcw11.f#11:1:2
159	tcw11.f#12:1:2
160	tcw11.f#13:1:2
161	tcw11.f#14:1:2
162	tcw11.f#15:1:2
163	tcw11.f#1:1:3
164	tcw11.f#2:1:3
165	tcw11.f#3:1:3
166	tcw11.f#4:1:3
167	tcw11.f#5:1:3
168	tcw11.f#6:1:3
169	tcw11.f#7:1:3

Line #	Value or Contents from NUFT Output File
170	tcw11.f#8:1:3
171	tcw11.f#9:1:3
172	tcw11.f#10:1:3
173	tcw11.f#11:1:3
174	tcw11.f#12:1:3
175	tcw11.f#13:1:3
176	tcw11.f#14:1:3
177	tcw11.f#15:1:3
178	tcw12.f#1:1:4
179	tcw12.f#2:1:4
180	tcw12.f#3:1:4
181	tcw12.f#4:1:4
182	tcw12.f#5:1:4
183	tcw12.f#6:1:4
184	tcw12.f#7:1:4
185	tcw12.f#8:1:4
186	tcw12.f#9:1:4
187	tcw12.f#10:1:4
188	tcw12.f#11:1:4
189	tcw12.f#12:1:4
190	tcw12.f#13:1:4
191	tcw12.f#14:1:4
192	tcw12.f#15:1:4
193	tcw12.f#1:1:5
194	tcw12.f#2:1:5
195	tcw12.f#3:1:5
196	tcw12.f#4:1:5
197	tcw12.f#5:1:5
198	tcw12.f#6:1:5
199	tcw12.f#7:1:5
200	tcw12.f#8:1:5
201	tcw12.f#9:1:5
202	tcw12.f#10:1:5
203	tcw12.f#11:1:5
204	tcw12.f#12:1:5
205	tcw12.f#13:1:5
206	tcw12.f#14:1:5
207	tcw12.f#15:1:5
208	tcw12.f#1:1:6
209	tcw12.f#2:1:6
210	tcw12.f#3:1:6
211	tcw12.f#4:1:6
212	tcw12.f#5:1:6
213	tcw12.f#6:1:6
214	tcw12.f#7:1:6
215	tcw12.f#8:1:6
216	tcw12.f#9:1:6
217	tcw12.f#10:1:6
218	tcw12.f#11:1:6
219	tcw12.f#12:1:6
220	tcw12.f#13:1:6
221	tcw12.f#14:1:6
222	tcw12.f#15:1:6
223	tcw13.f#1:1:7
224	tcw13.f#2:1:7
225	tcw13.f#3:1:7
226	tcw13.f#4:1:7

Line #	Value or Contents from NUFT Output File
227	tcw13.f#5:1:7
228	tcw13.f#6:1:7
229	tcw13.f#7:1:7
230	tcw13.f#8:1:7
231	tcw13.f#9:1:7
232	tcw13.f#10:1:7
233	tcw13.f#11:1:7
234	tcw13.f#12:1:7
235	tcw13.f#13:1:7
236	tcw13.f#14:1:7
237	tcw13.f#15:1:7
238	ptn21.f#1:1:8
239	ptn21.f#2:1:8
240	ptn21.f#3:1:8
241	ptn21.f#4:1:8
242	ptn21.f#5:1:8
243	ptn21.f#6:1:8
244	ptn21.f#7:1:8
245	ptn21.f#8:1:8
246	ptn21.f#9:1:8
247	ptn21.f#10:1:8
248	ptn21.f#11:1:8
249	ptn21.f#12:1:8
250	ptn21.f#13:1:8
251	ptn21.f#14:1:8
252	ptn21.f#15:1:8
253	ptn22.f#1:1:9
254	ptn22.f#2:1:9
255	ptn22.f#3:1:9
256	ptn22.f#4:1:9
257	ptn22.f#5:1:9
258	ptn22.f#6:1:9
259	ptn22.f#7:1:9
260	ptn22.f#8:1:9
261	ptn22.f#9:1:9
262	ptn22.f#10:1:9
263	ptn22.f#11:1:9
264	ptn22.f#12:1:9
265	ptn22.f#13:1:9
266	ptn22.f#14:1:9
267	ptn22.f#15:1:9
268	ptn23.f#1:1:10
269	ptn23.f#2:1:10
270	ptn23.f#3:1:10
271	ptn23.f#4:1:10
272	ptn23.f#5:1:10
273	ptn23.f#6:1:10
274	ptn23.f#7:1:10
275	ptn23.f#8:1:10
276	ptn23.f#9:1:10
277	ptn23.f#10:1:10
278	ptn23.f#11:1:10
279	ptn23.f#12:1:10
280	ptn23.f#13:1:10
281	ptn23.f#14:1:10
282	ptn23.f#15:1:10
283	ptn24.f#1:1:11

Line #	Value or Contents from NUFT Output File
284	ptn24.f#2:1:11
285	ptn24.f#3:1:11
286	ptn24.f#4:1:11
287	ptn24.f#5:1:11
288	ptn24.f#6:1:11
289	ptn24.f#7:1:11
290	ptn24.f#8:1:11
291	ptn24.f#9:1:11
292	ptn24.f#10:1:11
293	ptn24.f#11:1:11
294	ptn24.f#12:1:11
295	ptn24.f#13:1:11
296	ptn24.f#14:1:11
297	ptn24.f#15:1:11
298	ptn25.f#1:1:12
299	ptn25.f#2:1:12
300	ptn25.f#3:1:12
301	ptn25.f#4:1:12
302	ptn25.f#5:1:12
303	ptn25.f#6:1:12
304	ptn25.f#7:1:12
305	ptn25.f#8:1:12
306	ptn25.f#9:1:12
307	ptn25.f#10:1:12
308	ptn25.f#11:1:12
309	ptn25.f#12:1:12
310	ptn25.f#13:1:12
311	ptn25.f#14:1:12
312	ptn25.f#15:1:12
313	ptn26.f#1:1:13
314	ptn26.f#2:1:13
315	ptn26.f#3:1:13
316	ptn26.f#4:1:13
317	ptn26.f#5:1:13
318	ptn26.f#6:1:13
319	ptn26.f#7:1:13
320	ptn26.f#8:1:13
321	ptn26.f#9:1:13
322	ptn26.f#10:1:13
323	ptn26.f#11:1:13
324	ptn26.f#12:1:13
325	ptn26.f#13:1:13
326	ptn26.f#14:1:13
327	ptn26.f#15:1:13
328	tsw31.f#1:1:14
329	tsw31.f#2:1:14
330	tsw31.f#3:1:14
331	tsw31.f#4:1:14
332	tsw31.f#5:1:14
333	tsw31.f#6:1:14
334	tsw31.f#7:1:14
335	tsw31.f#8:1:14
336	tsw31.f#9:1:14
337	tsw31.f#10:1:14
338	tsw31.f#11:1:14
339	tsw31.f#12:1:14
340	tsw31.f#13:1:14

Line #	Value or Contents from NUFT Output File
341	tsw31.f#14:1:14
342	tsw31.f#15:1:14
343	tsw32.f#1:1:15
344	tsw32.f#2:1:15
345	tsw32.f#3:1:15
346	tsw32.f#4:1:15
347	tsw32.f#5:1:15
348	tsw32.f#6:1:15
349	tsw32.f#7:1:15
350	tsw32.f#8:1:15
351	tsw32.f#9:1:15
352	tsw32.f#10:1:15
353	tsw32.f#11:1:15
354	tsw32.f#12:1:15
355	tsw32.f#13:1:15
356	tsw32.f#14:1:15
357	tsw32.f#15:1:15
358	tsw32.f#1:1:16
359	tsw32.f#2:1:16
360	tsw32.f#3:1:16
361	tsw32.f#4:1:16
362	tsw32.f#5:1:16
363	tsw32.f#6:1:16
364	tsw32.f#7:1:16
365	tsw32.f#8:1:16
366	tsw32.f#9:1:16
367	tsw32.f#10:1:16
368	tsw32.f#11:1:16
369	tsw32.f#12:1:16
370	tsw32.f#13:1:16
371	tsw32.f#14:1:16
372	tsw32.f#15:1:16
373	tsw33.f#1:1:17
374	tsw33.f#2:1:17
375	tsw33.f#3:1:17
376	tsw33.f#4:1:17
377	tsw33.f#5:1:17
378	tsw33.f#6:1:17
379	tsw33.f#7:1:17
380	tsw33.f#8:1:17
381	tsw33.f#9:1:17
382	tsw33.f#10:1:17
383	tsw33.f#11:1:17
384	tsw33.f#12:1:17
385	tsw33.f#13:1:17
386	tsw33.f#14:1:17
387	tsw33.f#15:1:17
388	tsw33.f#1:1:18
389	tsw33.f#2:1:18
390	tsw33.f#3:1:18
391	tsw33.f#4:1:18
392	tsw33.f#5:1:18
393	tsw33.f#6:1:18
394	tsw33.f#7:1:18
395	tsw33.f#8:1:18
396	tsw33.f#9:1:18
397	tsw33.f#10:1:18

Line #	Value or Contents from NUFT Output File
398	tsw33.f#11:1:18
399	tsw33.f#12:1:18
400	tsw33.f#13:1:18
401	tsw33.f#14:1:18
402	tsw33.f#15:1:18
403	tsw33.f#1:1:19
404	tsw33.f#2:1:19
405	tsw33.f#3:1:19
406	tsw33.f#4:1:19
407	tsw33.f#5:1:19
408	tsw33.f#6:1:19
409	tsw33.f#7:1:19
410	tsw33.f#8:1:19
411	tsw33.f#9:1:19
412	tsw33.f#10:1:19
413	tsw33.f#11:1:19
414	tsw33.f#12:1:19
415	tsw33.f#13:1:19
416	tsw33.f#14:1:19
417	tsw33.f#15:1:19
418	tsw34.f#1:1:20
419	tsw34.f#2:1:20
420	tsw34.f#3:1:20
421	tsw34.f#4:1:20
422	tsw34.f#5:1:20
423	tsw34.f#6:1:20
424	tsw34.f#7:1:20
425	tsw34.f#8:1:20
426	tsw34.f#9:1:20
427	tsw34.f#10:1:20
428	tsw34.f#11:1:20
429	tsw34.f#12:1:20
430	tsw34.f#13:1:20
431	tsw34.f#14:1:20
432	tsw34.f#15:1:20
433	tsw34.f#1:1:21
434	tsw34.f#2:1:21
435	tsw34.f#3:1:21
436	tsw34.f#4:1:21
437	tsw34.f#5:1:21
438	tsw34.f#6:1:21
439	tsw34.f#7:1:21
440	tsw34.f#8:1:21
441	tsw34.f#9:1:21
442	tsw34.f#10:1:21
443	tsw34.f#11:1:21
444	tsw34.f#12:1:21
445	tsw34.f#13:1:21
446	tsw34.f#14:1:21
447	tsw34.f#15:1:21
448	tsw35.f#1:1:22
449	tsw35.f#2:1:22
450	tsw35.f#3:1:22
451	tsw35.f#4:1:22
452	tsw35.f#5:1:22
453	tsw35.f#6:1:22
454	tsw35.f#7:1:22

Line #	Value or Contents from NUFT Output File
455	tsw35.f#8:1:22
456	tsw35.f#9:1:22
457	tsw35.f#10:1:22
458	tsw35.f#11:1:22
459	tsw35.f#12:1:22
460	tsw35.f#13:1:22
461	tsw35.f#14:1:22
462	tsw35.f#15:1:22
463	tsw35.f#1:1:23
464	tsw35.f#2:1:23
465	tsw35.f#3:1:23
466	tsw35.f#4:1:23
467	tsw35.f#5:1:23
468	tsw35.f#6:1:23
469	tsw35.f#7:1:23
470	tsw35.f#8:1:23
471	tsw35.f#9:1:23
472	tsw35.f#10:1:23
473	tsw35.f#11:1:23
474	tsw35.f#12:1:23
475	tsw35.f#13:1:23
476	tsw35.f#14:1:23
477	tsw35.f#15:1:23
478	tsw35.f#1:1:24
479	tsw35.f#2:1:24
480	tsw35.f#3:1:24
481	tsw35.f#4:1:24
482	tsw35.f#5:1:24
483	tsw35.f#6:1:24
484	tsw35.f#7:1:24
485	tsw35.f#8:1:24
486	tsw35.f#9:1:24
487	tsw35.f#10:1:24
488	tsw35.f#11:1:24
489	tsw35.f#12:1:24
490	tsw35.f#13:1:24
491	tsw35.f#14:1:24
492	tsw35.f#15:1:24
493	tsw35.f#1:1:25
494	tsw35.f#2:1:25
495	tsw35.f#3:1:25
496	tsw35.f#4:1:25
497	tsw35.f#5:1:25
498	tsw35.f#6:1:25
499	tsw35.f#7:1:25
500	tsw35.f#8:1:25
501	tsw35.f#9:1:25
502	tsw35.f#10:1:25
503	tsw35.f#11:1:25
504	tsw35.f#12:1:25
505	tsw35.f#13:1:25
506	tsw35.f#14:1:25
507	tsw35.f#15:1:25
508	tsw35.f#1:1:26
509	tsw35.f#2:1:26
510	tsw35.f#3:1:26
511	tsw35.f#4:1:26

Line #	Value or Contents from NUFT Output File
512	tsw35.f#5:1:26
513	tsw35.f#6:1:26
514	tsw35.f#7:1:26
515	tsw35.f#8:1:26
516	tsw35.f#9:1:26
517	tsw35.f#10:1:26
518	tsw35.f#11:1:26
519	tsw35.f#12:1:26
520	tsw35.f#13:1:26
521	tsw35.f#14:1:26
522	tsw35.f#15:1:26
523	tsw35.f#1:1:27
524	tsw35.f#2:1:27
525	tsw35.f#3:1:27
526	tsw35.f#4:1:27
527	tsw35.f#5:1:27
528	tsw35.f#6:1:27
529	tsw35.f#7:1:27
530	tsw35.f#8:1:27
531	tsw35.f#9:1:27
532	tsw35.f#10:1:27
533	tsw35.f#11:1:27
534	tsw35.f#12:1:27
535	tsw35.f#13:1:27
536	tsw35.f#14:1:27
537	tsw35.f#15:1:27
538	tsw35_A0.f#1:1:28
539	tsw35_A0.f#2:1:28
540	tsw35_A0.f#3:1:28
541	tsw35_A0.f#4:1:28
542	tsw35_A0.f#5:1:28
543	tsw35_A0.f#6:1:28
544	tsw35_A0.f#7:1:28
545	tsw35_A0.f#8:1:28
546	tsw35_A0.f#9:1:28
547	tsw35_A0.f#10:1:28
548	tsw35_A0.f#11:1:28
549	tsw35_A0.f#12:1:28
550	tsw35_A0.f#13:1:28
551	tsw35_A0.f#14:1:28
552	tsw35_A0.f#15:1:28
553	hstrk_A1.f#1:1:29
554	hstrk_A1.f#2:1:29
555	hstrk_A1.f#3:1:29
556	hstrk_A1.f#4:1:29
557	hstrk_A1.f#5:1:29
558	hstrk_A1.f#6:1:29
559	hstrk_A1.f#7:1:29
560	hstrk_A1.f#8:1:29
561	hstrk_A1.f#9:1:29
562	hstrk_A1.f#10:1:29
563	hstrk_A1.f#11:1:29
564	hstrk_A1.f#12:1:29
565	hstrk_A1.f#13:1:29
566	hstrk_A1.f#14:1:29
567	hstrk_A1.f#15:1:29
568	hstrk_A1.f#1:1:30

Line #	Value or Contents from NUFT Output File
569	hstrk_A1.f#2:1:30
570	hstrk_A1.f#3:1:30
571	hstrk_A1.f#4:1:30
572	hstrk_A1.f#5:1:30
573	hstrk_A1.f#6:1:30
574	hstrk_A1.f#7:1:30
575	hstrk_A1.f#8:1:30
576	hstrk_A1.f#9:1:30
577	hstrk_A1.f#10:1:30
578	hstrk_A1.f#11:1:30
579	hstrk_A1.f#12:1:30
580	hstrk_A1.f#13:1:30
581	hstrk_A1.f#14:1:30
582	hstrk_A1.f#15:1:30
583	hstrk_A1.f#1:1:31
584	hstrk_A1.f#2:1:31
585	hstrk_A1.f#3:1:31
586	hstrk_A1.f#4:1:31
587	hstrk_A1.f#5:1:31
588	hstrk_A1.f#6:1:31
589	hstrk_A1.f#7:1:31
590	hstrk_A1.f#8:1:31
591	hstrk_A1.f#9:1:31
592	hstrk_A1.f#10:1:31
593	hstrk_A1.f#11:1:31
594	hstrk_A1.f#12:1:31
595	hstrk_A1.f#13:1:31
596	hstrk_A1.f#14:1:31
597	hstrk_A1.f#15:1:31
598	hstrk_A1.f#1:1:32
599	hstrk_A1.f#2:1:32
600	hstrk_A1.f#3:1:32
601	hstrk_A1.f#4:1:32
602	hstrk_A1.f#5:1:32
603	hstrk_A1.f#6:1:32
604	hstrk_A1.f#7:1:32
605	hstrk_A1.f#8:1:32
606	hstrk_A1.f#9:1:32
607	hstrk_A1.f#10:1:32
608	hstrk_A1.f#11:1:32
609	hstrk_A1.f#12:1:32
610	hstrk_A1.f#13:1:32
611	hstrk_A1.f#14:1:32
612	hstrk_A1.f#15:1:32
613	hstrk_A1.f#1:1:33
614	hstrk_A1.f#2:1:33
615	hstrk_A1.f#3:1:33
616	hstrk_A1.f#4:1:33
617	hstrk_A1.f#5:1:33
618	hstrk_A1.f#6:1:33
619	hstrk_A1.f#7:1:33
620	hstrk_A1.f#8:1:33
621	hstrk_A1.f#9:1:33
622	hstrk_A1.f#10:1:33
623	hstrk_A1.f#11:1:33
624	hstrk_A1.f#12:1:33
625	hstrk_A1.f#13:1:33

Line #	Value or Contents from NUFT Output File
626	hstrk_A1.f#14:1:33
627	hstrk_A1.f#15:1:33
628	hstrk_A1.f#1:1:34
629	hstrk_A1.f#2:1:34
630	hstrk_A1.f#3:1:34
631	hstrk_A1.f#4:1:34
632	hstrk_A1.f#5:1:34
633	hstrk_A1.f#6:1:34
634	hstrk_A1.f#7:1:34
635	hstrk_A1.f#8:1:34
636	hstrk_A1.f#9:1:34
637	hstrk_A1.f#10:1:34
638	hstrk_A1.f#11:1:34
639	hstrk_A1.f#12:1:34
640	hstrk_A1.f#13:1:34
641	hstrk_A1.f#14:1:34
642	hstrk_A1.f#15:1:34
643	hstrk_A2.f#1:1:35
644	hstrk_A1.f#2:1:35
645	hstrk_A1.f#3:1:35
646	hstrk_A1.f#4:1:35
647	hstrk_A1.f#5:1:35
648	hstrk_A1.f#6:1:35
649	hstrk_A1.f#7:1:35
650	hstrk_A1.f#8:1:35
651	hstrk_A1.f#9:1:35
652	hstrk_A1.f#10:1:35
653	hstrk_A1.f#11:1:35
654	hstrk_A1.f#12:1:35
655	hstrk_A1.f#13:1:35
656	hstrk_A1.f#14:1:35
657	hstrk_A1.f#15:1:35
658	dr_A3.f#1:1:36
659	hstrk_A2.f#2:1:36
660	hstrk_A2.f#3:1:36
661	hstrk_A1.f#4:1:36
662	hstrk_A1.f#5:1:36
663	hstrk_A1.f#6:1:36
664	hstrk_A1.f#7:1:36
665	hstrk_A1.f#8:1:36
666	hstrk_A1.f#9:1:36
667	hstrk_A1.f#10:1:36
668	hstrk_A1.f#11:1:36
669	hstrk_A1.f#12:1:36
670	hstrk_A1.f#13:1:36
671	hstrk_A1.f#14:1:36
672	hstrk_A1.f#15:1:36
673	dr_A3.f#1:1:37
674	dr_A3.f#2:1:37
675	dr_A3.f#3:1:37
676	hstrk_A2.f#4:1:37
677	hstrk_A1.f#5:1:37
678	hstrk_A1.f#6:1:37
679	hstrk_A1.f#7:1:37
680	hstrk_A1.f#8:1:37
681	hstrk_A1.f#9:1:37
682	hstrk_A1.f#10:1:37

Line #	Value or Contents from NUFT Output File
683	hstrk_A1.f#11:1:37
684	hstrk_A1.f#12:1:37
685	hstrk_A1.f#13:1:37
686	hstrk_A1.f#14:1:37
687	hstrk_A1.f#15:1:37
688	dr_A3.f#1:1:38
689	dr_A3.f#2:1:38
690	dr_A3.f#3:1:38
691	dr_A3.f#4:1:38
692	hstrk_A2.f#5:1:38
693	hstrk_A1.f#6:1:38
694	hstrk_A1.f#7:1:38
695	hstrk_A1.f#8:1:38
696	hstrk_A1.f#9:1:38
697	hstrk_A1.f#10:1:38
698	hstrk_A1.f#11:1:38
699	hstrk_A1.f#12:1:38
700	hstrk_A1.f#13:1:38
701	hstrk_A1.f#14:1:38
702	hstrk_A1.f#15:1:38
703	bf_A3.f#1:1:39
704	dr_A3.f#2:1:39
705	dr_A3.f#3:1:39
706	dr_A3.f#4:1:39
707	hstrk_A2.f#5:1:39
708	hstrk_A1.f#6:1:39
709	hstrk_A1.f#7:1:39
710	hstrk_A1.f#8:1:39
711	hstrk_A1.f#9:1:39
712	hstrk_A1.f#10:1:39
713	hstrk_A1.f#11:1:39
714	hstrk_A1.f#12:1:39
715	hstrk_A1.f#13:1:39
716	hstrk_A1.f#14:1:39
717	hstrk_A1.f#15:1:39
718	bf_A3.f#1:1:40
719	bf_A3.f#2:1:40
720	dr_A3.f#3:1:40
721	dr_A3.f#4:1:40
722	dr_A3.f#5:1:40
723	hstrk_A2.f#6:1:40
724	hstrk_A1.f#7:1:40
725	hstrk_A1.f#8:1:40
726	hstrk_A1.f#9:1:40
727	hstrk_A1.f#10:1:40
728	hstrk_A1.f#11:1:40
729	hstrk_A1.f#12:1:40
730	hstrk_A1.f#13:1:40
731	hstrk_A1.f#14:1:40
732	hstrk_A1.f#15:1:40
733	bf_A3.f#1:1:41
734	bf_A3.f#2:1:41
735	bf_A3.f#3:1:41
736	dr_A3.f#4:1:41
737	dr_A3.f#5:1:41
738	hstrk_A2.f#6:1:41
739	hstrk_A1.f#7:1:41

Line #	Value or Contents from NUFT Output File
740	hstrk_A1.f#8:1:41
741	hstrk_A1.f#9:1:41
742	hstrk_A1.f#10:1:41
743	hstrk_A1.f#11:1:41
744	hstrk_A1.f#12:1:41
745	hstrk_A1.f#13:1:41
746	hstrk_A1.f#14:1:41
747	hstrk_A1.f#15:1:41
748	bf_A3.f#1:1:42
749	bf_A3.f#2:1:42
750	bf_A3.f#3:1:42
751	bf_A3.f#4:1:42
752	dr_A3.f#5:1:42
753	dr_A3.f#6:1:42
754	hstrk_A2.f#7:1:42
755	hstrk_A1.f#8:1:42
756	hstrk_A1.f#9:1:42
757	hstrk_A1.f#10:1:42
758	hstrk_A1.f#11:1:42
759	hstrk_A1.f#12:1:42
760	hstrk_A1.f#13:1:42
761	hstrk_A1.f#14:1:42
762	hstrk_A1.f#15:1:42
763	bf_A3.f#1:1:43
764	bf_A3.f#2:1:43
765	bf_A3.f#3:1:43
766	bf_A3.f#4:1:43
767	bf_A3.f#5:1:43
768	dr_A3.f#6:1:43
769	hstrk_A2.f#7:1:43
770	hstrk_A1.f#8:1:43
771	hstrk_A1.f#9:1:43
772	hstrk_A1.f#10:1:43
773	hstrk_A1.f#11:1:43
774	hstrk_A1.f#12:1:43
775	hstrk_A1.f#13:1:43
776	hstrk_A1.f#14:1:43
777	hstrk_A1.f#15:1:43
778	bf_A3.f#1:1:44
779	bf_A3.f#2:1:44
780	bf_A3.f#3:1:44
781	bf_A3.f#4:1:44
782	bf_A3.f#5:1:44
783	bf_A3.f#6:1:44
784	hstrk_A2.f#7:1:44
785	hstrk_A1.f#8:1:44
786	hstrk_A1.f#9:1:44
787	hstrk_A1.f#10:1:44
788	hstrk_A1.f#11:1:44
789	hstrk_A1.f#12:1:44
790	hstrk_A1.f#13:1:44
791	hstrk_A1.f#14:1:44
792	hstrk_A1.f#15:1:44
793	bf_A3.f#1:1:45
794	bf_A3.f#2:1:45
795	bf_A3.f#3:1:45
796	bf_A3.f#4:1:45

Line #	Value or Contents from NUFT Output File
797	bf_A3.f#5:1:45
798	bf_A3.f#6:1:45
799	bf_A3.f#7:1:45
800	hstrk_A2.f#8:1:45
801	hstrk_A1.f#9:1:45
802	hstrk_A1.f#10:1:45
803	hstrk_A1.f#11:1:45
804	hstrk_A1.f#12:1:45
805	hstrk_A1.f#13:1:45
806	hstrk_A1.f#14:1:45
807	hstrk_A1.f#15:1:45
808	dr_A4.f#1:1:46
809	bf_A3.f#2:1:46
810	bf_A3.f#3:1:46
811	bf_A3.f#4:1:46
812	bf_A3.f#5:1:46
813	bf_A3.f#6:1:46
814	bf_A3.f#7:1:46
815	hstrk_A2.f#8:1:46
816	hstrk_A1.f#9:1:46
817	hstrk_A1.f#10:1:46
818	hstrk_A1.f#11:1:46
819	hstrk_A1.f#12:1:46
820	hstrk_A1.f#13:1:46
821	hstrk_A1.f#14:1:46
822	hstrk_A1.f#15:1:46
823	wp.f#1:1:47
824	dr_A4.f#2:1:47
825	bf_A3.f#3:1:47
826	bf_A3.f#4:1:47
827	bf_A3.f#5:1:47
828	bf_A3.f#6:1:47
829	bf_A3.f#7:1:47
830	hstrk_A2.f#8:1:47
831	hstrk_A1.f#9:1:47
832	hstrk_A1.f#10:1:47
833	hstrk_A1.f#11:1:47
834	hstrk_A1.f#12:1:47
835	hstrk_A1.f#13:1:47
836	hstrk_A1.f#14:1:47
837	hstrk_A1.f#15:1:47
838	wp.f#1:1:48
839	wp.f#2:1:48
840	dr_A4.f#3:1:48
841	bf_A3.f#4:1:48
842	bf_A3.f#5:1:48
843	bf_A3.f#6:1:48
844	bf_A3.f#7:1:48
845	hstrk_A2.f#8:1:48
846	hstrk_A1.f#9:1:48
847	hstrk_A1.f#10:1:48
848	hstrk_A1.f#11:1:48
849	hstrk_A1.f#12:1:48
850	hstrk_A1.f#13:1:48
851	hstrk_A1.f#14:1:48
852	hstrk_A1.f#15:1:48
853	wp.f#1:1:49

Line #	Value or Contents from NUFT Output File
854	wp.f#2:1:49
855	wp.f#3:1:49
856	dr_A4.f#4:1:49
857	bf_A3.f#5:1:49
858	bf_A3.f#6:1:49
859	bf_A3.f#7:1:49
860	hstrk_A2.f#8:1:49
861	hstrk_A1.f#9:1:49
862	hstrk_A1.f#10:1:49
863	hstrk_A1.f#11:1:49
864	hstrk_A1.f#12:1:49
865	hstrk_A1.f#13:1:49
866	hstrk_A1.f#14:1:49
867	hstrk_A1.f#15:1:49
868	wp.f#1:1:50
869	wp.f#2:1:50
870	wp.f#3:1:50
871	dr_A5.f#4:1:50
872	dr_A5.f#5:1:50
873	dr_A5.f#6:1:50
874	hstrk_A1.f#7:1:50
875	hstrk_A1.f#8:1:50
876	hstrk_A1.f#9:1:50
877	hstrk_A1.f#10:1:50
878	hstrk_A1.f#11:1:50
879	hstrk_A1.f#12:1:50
880	hstrk_A1.f#13:1:50
881	hstrk_A1.f#14:1:50
882	hstrk_A1.f#15:1:50
883	wp.f#1:1:51
884	wp.f#2:1:51
885	wp.f#3:1:51
886	dr_A5.f#4:1:51
887	dr_A5.f#5:1:51
888	hstrk_A1.f#6:1:51
889	hstrk_A1.f#7:1:51
890	hstrk_A1.f#8:1:51
891	hstrk_A1.f#9:1:51
892	hstrk_A1.f#10:1:51
893	hstrk_A1.f#11:1:51
894	hstrk_A1.f#12:1:51
895	hstrk_A1.f#13:1:51
896	hstrk_A1.f#14:1:51
897	hstrk_A1.f#15:1:51
898	in_A6.f#1:1:52
899	in_A6.f#2:1:52
900	in_A6.f#3:1:52
901	in_A6.f#4:1:52
902	hstrk_A1.f#5:1:52
903	hstrk_A1.f#6:1:52
904	hstrk_A1.f#7:1:52
905	hstrk_A1.f#8:1:52
906	hstrk_A1.f#9:1:52
907	hstrk_A1.f#10:1:52
908	hstrk_A1.f#11:1:52
909	hstrk_A1.f#12:1:52
910	hstrk_A1.f#13:1:52

Line #	Value or Contents from NUFT Output File
911	hstrk_A1.f#14:1:52
912	hstrk_A1.f#15:1:52
913	in_A6.f#1:1:53
914	in_A6.f#2:1:53
915	hstrk_A1.f#3:1:53
916	hstrk_A1.f#4:1:53
917	hstrk_A1.f#5:1:53
918	hstrk_A1.f#6:1:53
919	hstrk_A1.f#7:1:53
920	hstrk_A1.f#8:1:53
921	hstrk_A1.f#9:1:53
922	hstrk_A1.f#10:1:53
923	hstrk_A1.f#11:1:53
924	hstrk_A1.f#12:1:53
925	hstrk_A1.f#13:1:53
926	hstrk_A1.f#14:1:53
927	hstrk_A1.f#15:1:53
928	hstrk_A1.f#1:1:54
929	hstrk_A1.f#2:1:54
930	hstrk_A1.f#3:1:54
931	hstrk_A1.f#4:1:54
932	hstrk_A1.f#5:1:54
933	hstrk_A1.f#6:1:54
934	hstrk_A1.f#7:1:54
935	hstrk_A1.f#8:1:54
936	hstrk_A1.f#9:1:54
937	hstrk_A1.f#10:1:54
938	hstrk_A1.f#11:1:54
939	hstrk_A1.f#12:1:54
940	hstrk_A1.f#13:1:54
941	hstrk_A1.f#14:1:54
942	hstrk_A1.f#15:1:54
943	hstrk_A1.f#1:1:55
944	hstrk_A1.f#2:1:55
945	hstrk_A1.f#3:1:55
946	hstrk_A1.f#4:1:55
947	hstrk_A1.f#5:1:55
948	hstrk_A1.f#6:1:55
949	hstrk_A1.f#7:1:55
950	hstrk_A1.f#8:1:55
951	hstrk_A1.f#9:1:55
952	hstrk_A1.f#10:1:55
953	hstrk_A1.f#11:1:55
954	hstrk_A1.f#12:1:55
955	hstrk_A1.f#13:1:55
956	hstrk_A1.f#14:1:55
957	hstrk_A1.f#15:1:55
958	hstrk_A1.f#1:1:56
959	hstrk_A1.f#2:1:56
960	hstrk_A1.f#3:1:56
961	hstrk_A1.f#4:1:56
962	hstrk_A1.f#5:1:56
963	hstrk_A1.f#6:1:56
964	hstrk_A1.f#7:1:56
965	hstrk_A1.f#8:1:56
966	hstrk_A1.f#9:1:56
967	hstrk_A1.f#10:1:56

Line #	Value or Contents from NUFT Output File
968	hstrk_A1.f#11:1:56
969	hstrk_A1.f#12:1:56
970	hstrk_A1.f#13:1:56
971	hstrk_A1.f#14:1:56
972	hstrk_A1.f#15:1:56
973	tsw35.f#1:1:57
974	tsw35.f#2:1:57
975	tsw35.f#3:1:57
976	tsw35.f#4:1:57
977	tsw35.f#5:1:57
978	tsw35.f#6:1:57
979	tsw35.f#7:1:57
980	tsw35.f#8:1:57
981	tsw35.f#9:1:57
982	tsw35.f#10:1:57
983	tsw35.f#11:1:57
984	tsw35.f#12:1:57
985	tsw35.f#13:1:57
986	tsw35.f#14:1:57
987	tsw35.f#15:1:57
988	tsw35.f#1:1:58
989	tsw35.f#2:1:58
990	tsw35.f#3:1:58
991	tsw35.f#4:1:58
992	tsw35.f#5:1:58
993	tsw35.f#6:1:58
994	tsw35.f#7:1:58
995	tsw35.f#8:1:58
996	tsw35.f#9:1:58
997	tsw35.f#10:1:58
998	tsw35.f#11:1:58
999	tsw35.f#12:1:58
1000	tsw35.f#13:1:58
1001	tsw35.f#14:1:58
1002	tsw35.f#15:1:58
1003	tsw35.f#1:1:59
1004	tsw35.f#2:1:59
1005	tsw35.f#3:1:59
1006	tsw35.f#4:1:59
1007	tsw35.f#5:1:59
1008	tsw35.f#6:1:59
1009	tsw35.f#7:1:59
1010	tsw35.f#8:1:59
1011	tsw35.f#9:1:59
1012	tsw35.f#10:1:59
1013	tsw35.f#11:1:59
1014	tsw35.f#12:1:59
1015	tsw35.f#13:1:59
1016	tsw35.f#14:1:59
1017	tsw35.f#15:1:59
1018	tsw35.f#1:1:60
1019	tsw35.f#2:1:60
1020	tsw35.f#3:1:60
1021	tsw35.f#4:1:60
1022	tsw35.f#5:1:60
1023	tsw35.f#6:1:60
1024	tsw35.f#7:1:60

Line #	Value or Contents from NUFT Output File
1025	tsw35.f#8:1:60
1026	tsw35.f#9:1:60
1027	tsw35.f#10:1:60
1028	tsw35.f#11:1:60
1029	tsw35.f#12:1:60
1030	tsw35.f#13:1:60
1031	tsw35.f#14:1:60
1032	tsw35.f#15:1:60
1033	tsw35.f#1:1:61
1034	tsw35.f#2:1:61
1035	tsw35.f#3:1:61
1036	tsw35.f#4:1:61
1037	tsw35.f#5:1:61
1038	tsw35.f#6:1:61
1039	tsw35.f#7:1:61
1040	tsw35.f#8:1:61
1041	tsw35.f#9:1:61
1042	tsw35.f#10:1:61
1043	tsw35.f#11:1:61
1044	tsw35.f#12:1:61
1045	tsw35.f#13:1:61
1046	tsw35.f#14:1:61
1047	tsw35.f#15:1:61
1048	tsw35.f#1:1:62
1049	tsw35.f#2:1:62
1050	tsw35.f#3:1:62
1051	tsw35.f#4:1:62
1052	tsw35.f#5:1:62
1053	tsw35.f#6:1:62
1054	tsw35.f#7:1:62
1055	tsw35.f#8:1:62
1056	tsw35.f#9:1:62
1057	tsw35.f#10:1:62
1058	tsw35.f#11:1:62
1059	tsw35.f#12:1:62
1060	tsw35.f#13:1:62
1061	tsw35.f#14:1:62
1062	tsw35.f#15:1:62
1063	tsw35.f#1:1:63
1064	tsw35.f#2:1:63
1065	tsw35.f#3:1:63
1066	tsw35.f#4:1:63
1067	tsw35.f#5:1:63
1068	tsw35.f#6:1:63
1069	tsw35.f#7:1:63
1070	tsw35.f#8:1:63
1071	tsw35.f#9:1:63
1072	tsw35.f#10:1:63
1073	tsw35.f#11:1:63
1074	tsw35.f#12:1:63
1075	tsw35.f#13:1:63
1076	tsw35.f#14:1:63
1077	tsw35.f#15:1:63
1078	tsw35.f#1:1:64
1079	tsw35.f#2:1:64
1080	tsw35.f#3:1:64
1081	tsw35.f#4:1:64

Line #	Value or Contents from NUFT Output File
1082	tsw35.f#5:1:64
1083	tsw35.f#6:1:64
1084	tsw35.f#7:1:64
1085	tsw35.f#8:1:64
1086	tsw35.f#9:1:64
1087	tsw35.f#10:1:64
1088	tsw35.f#11:1:64
1089	tsw35.f#12:1:64
1090	tsw35.f#13:1:64
1091	tsw35.f#14:1:64
1092	tsw35.f#15:1:64
1093	tsw35.f#1:1:65
1094	tsw35.f#2:1:65
1095	tsw35.f#3:1:65
1096	tsw35.f#4:1:65
1097	tsw35.f#5:1:65
1098	tsw35.f#6:1:65
1099	tsw35.f#7:1:65
1100	tsw35.f#8:1:65
1101	tsw35.f#9:1:65
1102	tsw35.f#10:1:65
1103	tsw35.f#11:1:65
1104	tsw35.f#12:1:65
1105	tsw35.f#13:1:65
1106	tsw35.f#14:1:65
1107	tsw35.f#15:1:65
1108	tsw36.f#1:1:66
1109	tsw36.f#2:1:66
1110	tsw36.f#3:1:66
1111	tsw36.f#4:1:66
1112	tsw36.f#5:1:66
1113	tsw36.f#6:1:66
1114	tsw36.f#7:1:66
1115	tsw36.f#8:1:66
1116	tsw36.f#9:1:66
1117	tsw36.f#10:1:66
1118	tsw36.f#11:1:66
1119	tsw36.f#12:1:66
1120	tsw36.f#13:1:66
1121	tsw36.f#14:1:66
1122	tsw36.f#15:1:66
1123	tsw36.f#1:1:67
1124	tsw36.f#2:1:67
1125	tsw36.f#3:1:67
1126	tsw36.f#4:1:67
1127	tsw36.f#5:1:67
1128	tsw36.f#6:1:67
1129	tsw36.f#7:1:67
1130	tsw36.f#8:1:67
1131	tsw36.f#9:1:67
1132	tsw36.f#10:1:67
1133	tsw36.f#11:1:67
1134	tsw36.f#12:1:67
1135	tsw36.f#13:1:67
1136	tsw36.f#14:1:67
1137	tsw36.f#15:1:67
1138	tsw37.f#1:1:68

Line #	Value or Contents from NUFT Output File
1139	tsw37.f#2:1:68
1140	tsw37.f#3:1:68
1141	tsw37.f#4:1:68
1142	tsw37.f#5:1:68
1143	tsw37.f#6:1:68
1144	tsw37.f#7:1:68
1145	tsw37.f#8:1:68
1146	tsw37.f#9:1:68
1147	tsw37.f#10:1:68
1148	tsw37.f#11:1:68
1149	tsw37.f#12:1:68
1150	tsw37.f#13:1:68
1151	tsw37.f#14:1:68
1152	tsw37.f#15:1:68
1153	tsw38.f#1:1:69
1154	tsw38.f#2:1:69
1155	tsw38.f#3:1:69
1156	tsw38.f#4:1:69
1157	tsw38.f#5:1:69
1158	tsw38.f#6:1:69
1159	tsw38.f#7:1:69
1160	tsw38.f#8:1:69
1161	tsw38.f#9:1:69
1162	tsw38.f#10:1:69
1163	tsw38.f#11:1:69
1164	tsw38.f#12:1:69
1165	tsw38.f#13:1:69
1166	tsw38.f#14:1:69
1167	tsw38.f#15:1:69
1168	tsw39.f#1:1:70
1169	tsw39.f#2:1:70
1170	tsw39.f#3:1:70
1171	tsw39.f#4:1:70
1172	tsw39.f#5:1:70
1173	tsw39.f#6:1:70
1174	tsw39.f#7:1:70
1175	tsw39.f#8:1:70
1176	tsw39.f#9:1:70
1177	tsw39.f#10:1:70
1178	tsw39.f#11:1:70
1179	tsw39.f#12:1:70
1180	tsw39.f#13:1:70
1181	tsw39.f#14:1:70
1182	tsw39.f#15:1:70
1183	ch1v.f#1:1:71
1184	ch1v.f#2:1:71
1185	ch1v.f#3:1:71
1186	ch1v.f#4:1:71
1187	ch1v.f#5:1:71
1188	ch1v.f#6:1:71
1189	ch1v.f#7:1:71
1190	ch1v.f#8:1:71
1191	ch1v.f#9:1:71
1192	ch1v.f#10:1:71
1193	ch1v.f#11:1:71
1194	ch1v.f#12:1:71
1195	ch1v.f#13:1:71

Line #	Value or Contents from NUFT Output File
1196	ch1v.f#14:1:71
1197	ch1v.f#15:1:71
1198	ch2z.f#1:1:72
1199	ch2z.f#2:1:72
1200	ch2z.f#3:1:72
1201	ch2z.f#4:1:72
1202	ch2z.f#5:1:72
1203	ch2z.f#6:1:72
1204	ch2z.f#7:1:72
1205	ch2z.f#8:1:72
1206	ch2z.f#9:1:72
1207	ch2z.f#10:1:72
1208	ch2z.f#11:1:72
1209	ch2z.f#12:1:72
1210	ch2z.f#13:1:72
1211	ch2z.f#14:1:72
1212	ch2z.f#15:1:72
1213	ch3z.f#1:1:73
1214	ch3z.f#2:1:73
1215	ch3z.f#3:1:73
1216	ch3z.f#4:1:73
1217	ch3z.f#5:1:73
1218	ch3z.f#6:1:73
1219	ch3z.f#7:1:73
1220	ch3z.f#8:1:73
1221	ch3z.f#9:1:73
1222	ch3z.f#10:1:73
1223	ch3z.f#11:1:73
1224	ch3z.f#12:1:73
1225	ch3z.f#13:1:73
1226	ch3z.f#14:1:73
1227	ch3z.f#15:1:73
1228	ch4z.f#1:1:74
1229	ch4z.f#2:1:74
1230	ch4z.f#3:1:74
1231	ch4z.f#4:1:74
1232	ch4z.f#5:1:74
1233	ch4z.f#6:1:74
1234	ch4z.f#7:1:74
1235	ch4z.f#8:1:74
1236	ch4z.f#9:1:74
1237	ch4z.f#10:1:74
1238	ch4z.f#11:1:74
1239	ch4z.f#12:1:74
1240	ch4z.f#13:1:74
1241	ch4z.f#14:1:74
1242	ch4z.f#15:1:74
1243	ch5z.f#1:1:75
1244	ch5z.f#2:1:75
1245	ch5z.f#3:1:75
1246	ch5z.f#4:1:75
1247	ch5z.f#5:1:75
1248	ch5z.f#6:1:75
1249	ch5z.f#7:1:75
1250	ch5z.f#8:1:75
1251	ch5z.f#9:1:75
1252	ch5z.f#10:1:75

Line #	Value or Contents from NUFT Output File
1253	ch5z.f#11:1:75
1254	ch5z.f#12:1:75
1255	ch5z.f#13:1:75
1256	ch5z.f#14:1:75
1257	ch5z.f#15:1:75
1258	ch6.f#1:1:76
1259	ch6.f#2:1:76
1260	ch6.f#3:1:76
1261	ch6.f#4:1:76
1262	ch6.f#5:1:76
1263	ch6.f#6:1:76
1264	ch6.f#7:1:76
1265	ch6.f#8:1:76
1266	ch6.f#9:1:76
1267	ch6.f#10:1:76
1268	ch6.f#11:1:76
1269	ch6.f#12:1:76
1270	ch6.f#13:1:76
1271	ch6.f#14:1:76
1272	ch6.f#15:1:76
1273	pp4.f#1:1:77
1274	pp4.f#2:1:77
1275	pp4.f#3:1:77
1276	pp4.f#4:1:77
1277	pp4.f#5:1:77
1278	pp4.f#6:1:77
1279	pp4.f#7:1:77
1280	pp4.f#8:1:77
1281	pp4.f#9:1:77
1282	pp4.f#10:1:77
1283	pp4.f#11:1:77
1284	pp4.f#12:1:77
1285	pp4.f#13:1:77
1286	pp4.f#14:1:77
1287	pp4.f#15:1:77
1288	pp3.f#1:1:78
1289	pp3.f#2:1:78
1290	pp3.f#3:1:78
1291	pp3.f#4:1:78
1292	pp3.f#5:1:78
1293	pp3.f#6:1:78
1294	pp3.f#7:1:78
1295	pp3.f#8:1:78
1296	pp3.f#9:1:78
1297	pp3.f#10:1:78
1298	pp3.f#11:1:78
1299	pp3.f#12:1:78
1300	pp3.f#13:1:78
1301	pp3.f#14:1:78
1302	pp3.f#15:1:78
1303	pp3.f#1:1:79
1304	pp3.f#2:1:79
1305	pp3.f#3:1:79
1306	pp3.f#4:1:79
1307	pp3.f#5:1:79
1308	pp3.f#6:1:79
1309	pp3.f#7:1:79

Line #	Value or Contents from NUFT Output File
1310	pp3.f#8:1:79
1311	pp3.f#9:1:79
1312	pp3.f#10:1:79
1313	pp3.f#11:1:79
1314	pp3.f#12:1:79
1315	pp3.f#13:1:79
1316	pp3.f#14:1:79
1317	pp3.f#15:1:79
1318	pp2.f#1:1:80
1319	pp2.f#2:1:80
1320	pp2.f#3:1:80
1321	pp2.f#4:1:80
1322	pp2.f#5:1:80
1323	pp2.f#6:1:80
1324	pp2.f#7:1:80
1325	pp2.f#8:1:80
1326	pp2.f#9:1:80
1327	pp2.f#10:1:80
1328	pp2.f#11:1:80
1329	pp2.f#12:1:80
1330	pp2.f#13:1:80
1331	pp2.f#14:1:80
1332	pp2.f#15:1:80
1333	pp1.f#1:1:81
1334	pp1.f#2:1:81
1335	pp1.f#3:1:81
1336	pp1.f#4:1:81
1337	pp1.f#5:1:81
1338	pp1.f#6:1:81
1339	pp1.f#7:1:81
1340	pp1.f#8:1:81
1341	pp1.f#9:1:81
1342	pp1.f#10:1:81
1343	pp1.f#11:1:81
1344	pp1.f#12:1:81
1345	pp1.f#13:1:81
1346	pp1.f#14:1:81
1347	pp1.f#15:1:81
1348	pp1.f#1:1:82
1349	pp1.f#2:1:82
1350	pp1.f#3:1:82
1351	pp1.f#4:1:82
1352	pp1.f#5:1:82
1353	pp1.f#6:1:82
1354	pp1.f#7:1:82
1355	pp1.f#8:1:82
1356	pp1.f#9:1:82
1357	pp1.f#10:1:82
1358	pp1.f#11:1:82
1359	pp1.f#12:1:82
1360	pp1.f#13:1:82
1361	pp1.f#14:1:82
1362	pp1.f#15:1:82
1363	pp1.f#1:1:83
1364	pp1.f#2:1:83
1365	pp1.f#3:1:83
1366	pp1.f#4:1:83

Line #	Value or Contents from NUFT Output File
1367	pp1.f#5:1:83
1368	pp1.f#6:1:83
1369	pp1.f#7:1:83
1370	pp1.f#8:1:83
1371	pp1.f#9:1:83
1372	pp1.f#10:1:83
1373	pp1.f#11:1:83
1374	pp1.f#12:1:83
1375	pp1.f#13:1:83
1376	pp1.f#14:1:83
1377	pp1.f#15:1:83
1378	bf3.f#1:1:84
1379	bf3.f#2:1:84
1380	bf3.f#3:1:84
1381	bf3.f#4:1:84
1382	bf3.f#5:1:84
1383	bf3.f#6:1:84
1384	bf3.f#7:1:84
1385	bf3.f#8:1:84
1386	bf3.f#9:1:84
1387	bf3.f#10:1:84
1388	bf3.f#11:1:84
1389	bf3.f#12:1:84
1390	bf3.f#13:1:84
1391	bf3.f#14:1:84
1392	bf3.f#15:1:84
1393	wt.f#1:1:85
1394	wt.f#2:1:85
1395	wt.f#3:1:85
1396	wt.f#4:1:85
1397	wt.f#5:1:85
1398	wt.f#6:1:85
1399	wt.f#7:1:85
1400	wt.f#8:1:85
1401	wt.f#9:1:85
1402	wt.f#10:1:85
1403	wt.f#11:1:85
1404	wt.f#12:1:85
1405	wt.f#13:1:85
1406	wt.f#14:1:85
1407	wt.f#15:1:85
Break	
3889	1.5779E+09
3890	1
3891	1275
3892	15.91000
3893	15.91000
3894	15.91000
3895	15.91000
3896	15.91000
3897	15.91000
3898	15.91000
3899	15.91000
3900	15.91000
3901	15.91000
3902	15.91000
3903	15.91000

Line #	Value or Contents from NUFT Output File
3904	15.91000
3905	15.91000
3906	15.91000
3907	15.96869
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3909	15.96869
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3921	15.96869
3922	16.08107
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3951	16.24011
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3957	16.46212
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3959	16.46212
3960	16.46212

Line #	Value or Contents from NUFT Output File
3961	16.46212
3962	16.46212
3963	16.46212
3964	16.46212
3965	16.46212
3966	16.46212
3967	16.70019
3968	16.70019
3969	16.70019
3970	16.70019
3971	16.70019
3972	16.70019
3973	16.70019
3974	16.70019
3975	16.70019
3976	16.70019
3977	16.70019
3978	16.70019
3979	16.70019
3980	16.70019
3981	16.70019
3982	16.86466
3983	16.86466
3984	16.86466
3985	16.86466
3986	16.86466
3987	16.86466
3988	16.86466
3989	16.86466
3990	16.86466
3991	16.86466
3992	16.86466
3993	16.86466
3994	16.86466
3995	16.86466
3996	16.86466
3997	16.95939
3998	16.95939
3999	16.95939
4000	16.95939
4001	16.95939
4002	16.95939
4003	16.95939
4004	16.95939
4005	16.95939
4006	16.95939
4007	16.95939
4008	16.95939
4009	16.95939
4010	16.95939
4011	16.95939
4012	17.06151
4013	17.06151
4014	17.06151
4015	17.06151
4016	17.06151
4017	17.06151

Line #	Value or Contents from NUFT Output File
4018	17.06151
4019	17.06151
4020	17.06151
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4041	17.13378
4042	17.22386
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4066	17.50157
4067	17.50157
4068	17.50157
4069	17.50157
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4071	17.50157
4072	18.00614
4073	18.00614
4074	18.00614

Line #	Value or Contents from NUFT Output File
4075	18.00614
4076	18.00614
4077	18.00614
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4086	18.00614
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4088	18.34796
4089	18.34796
4090	18.34796
4091	18.34796
4092	18.34796
4093	18.34796
4094	18.34796
4095	18.34796
4096	18.34796
4097	18.34796
4098	18.34796
4099	18.34796
4100	18.34796
4101	18.34795
4102	18.53079
4103	18.53079
4104	18.53079
4105	18.53079
4106	18.53079
4107	18.53079
4108	18.53079
4109	18.53079
4110	18.53079
4111	18.53079
4112	18.53079
4113	18.53079
4114	18.53079
4115	18.53078
4116	18.53078
4117	18.84190
4118	18.84190
4119	18.84190
4120	18.84190
4121	18.84190
4122	18.84190
4123	18.84190
4124	18.84190
4125	18.84190
4126	18.84190
4127	18.84190
4128	18.84189
4129	18.84188
4130	18.84186
4131	18.84183

Line #	Value or Contents from NUFT Output File
4132	19.22345
4133	19.22345
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4135	19.22345
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4139	19.22345
4140	19.22345
4141	19.22344
4142	19.22343
4143	19.22340
4144	19.22334
4145	19.22322
4146	19.22306
4147	19.81914
4148	19.81914
4149	19.81914
4150	19.81914
4151	19.81913
4152	19.81912
4153	19.81912
4154	19.81911
4155	19.81909
4156	19.81904
4157	19.81895
4158	19.81873
4159	19.81826
4160	19.81739
4161	19.81621
4162	21.02266
4163	21.02264
4164	21.02262
4165	21.02259
4166	21.02255
4167	21.02250
4168	21.02244
4169	21.02237
4170	21.02222
4171	21.02191
4172	21.02120
4173	21.01960
4174	21.01619
4175	21.00984
4176	21.00129
4177	23.06939
4178	23.06931
4179	23.06921
4180	23.06908
4181	23.06890
4182	23.06866
4183	23.06838
4184	23.06803
4185	23.06734
4186	23.06584
4187	23.06248
4188	23.05488

Line #	Value or Contents from NUFT Output File
4189	23.03875
4190	23.00883
4191	22.96871
4192	24.87262
4193	24.87243
4194	24.87221
4195	24.87190
4196	24.87147
4197	24.87091
4198	24.87026
4199	24.86944
4200	24.86782
4201	24.86432
4202	24.85648
4203	24.83873
4204	24.80118
4205	24.73187
4206	24.63979
4207	28.42035
4208	28.41972
4209	28.41896
4210	28.41791
4211	28.41647
4212	28.41455
4213	28.41235
4214	28.40957
4215	28.40412
4216	28.39228
4217	28.36582
4218	28.30608
4219	28.18071
4220	27.95281
4221	27.65833
4222	31.85312
4223	31.85179
4224	31.85020
4225	31.84801
4226	31.84500
4227	31.84098
4228	31.83637
4229	31.83057
4230	31.81917
4231	31.79444
4232	31.73933
4233	31.61546
4234	31.35831
4235	30.90059
4236	30.32893
4237	36.49836
4238	36.49543
4239	36.49193
4240	36.48711
4241	36.48047
4242	36.47162
4243	36.46148
4244	36.44873
4245	36.42371

Line #	Value or Contents from NUFT Output File
4246	36.36952
4247	36.24934
4248	35.98214
4249	35.44012
4250	34.51568
4251	33.43032
4252	41.71055
4253	41.70417
4254	41.69655
4255	41.68607
4256	41.67166
4257	41.65247
4258	41.63049
4259	41.60289
4260	41.54888
4261	41.43245
4262	41.17692
4263	40.62157
4264	39.54707
4265	37.85344
4266	36.04738
4267	45.86840
4268	45.85721
4269	45.84388
4270	45.82554
4271	45.80035
4272	45.76685
4273	45.72857
4274	45.68061
4275	45.58703
4276	45.38672
4277	44.95345
4278	44.04043
4279	42.37501
4280	39.95853
4281	37.58144
4282	49.43220
4283	49.41443
4284	49.39327
4285	49.36419
4286	49.32433
4287	49.27142
4288	49.21115
4289	49.13581
4290	48.98951
4291	48.67927
4292	48.02114
4293	46.68792
4294	44.41345
4295	41.36393
4296	38.55228
4297	53.11517
4298	53.08694
4299	53.05336
4300	53.00732
4301	52.94435
4302	52.86107

Line #	Value or Contents from NUFT Output File
4303	52.76662
4304	52.64904
4305	52.42227
4306	51.94830
4307	50.97080
4308	49.09311
4309	46.13511
4310	42.47522
4311	39.29050
4312	57.29754
4313	57.24956
4314	57.19266
4315	57.11493
4316	57.00919
4317	56.87017
4318	56.71380
4319	56.52061
4320	56.15252
4321	55.40214
4322	53.92533
4323	51.30754
4324	47.58020
4325	43.34464
4326	39.84859
4327	61.64925
4328	61.56651
4329	61.46892
4330	61.33642
4331	61.15768
4332	60.92522
4333	60.66717
4334	60.35214
4335	59.76324
4336	58.60675
4337	56.47412
4338	53.04166
4339	48.61869
4340	43.93779
4341	40.22268
4342	65.53510
4343	65.39809
4344	65.23786
4345	65.02253
4346	64.73569
4347	64.36868
4348	63.96949
4349	63.49043
4350	62.61806
4351	60.98618
4352	58.19503
4353	54.09737
4354	49.20621
4355	44.26271
4356	40.42720
4357	68.62687
4358	68.42557
4359	68.19323

Line #	Value or Contents from NUFT Output File
4360	67.88433
4361	67.47844
4362	66.96765
4363	66.42305
4364	65.78035
4365	64.63849
4366	62.59020
4367	59.28581
4368	54.73085
4369	49.54775
4370	44.45011
4371	40.54591
4372	71.49818
4373	71.19914
4374	70.87034
4375	70.43655
4376	69.87359
4377	69.18138
4378	68.46436
4379	67.63634
4380	66.20793
4381	63.75983
4382	60.02549
4383	55.13702
4384	49.76121
4385	44.56732
4386	40.62124
4387	73.24761
4388	72.84965
4389	72.46469
4390	71.93851
4391	71.25467
4392	70.43119
4393	69.59789
4394	68.64946
4395	67.04224
4396	64.35884
4397	60.39013
4398	55.33206
4399	49.86284
4400	44.62342
4401	40.65773
4402	74.44924
4403	73.93363
4404	73.54626
4405	72.94227
4406	72.15575
4407	71.23432
4408	70.31835
4409	69.28642
4410	67.55723
4411	64.71990
4412	60.60482
4413	55.44522
4414	49.92160
4415	44.65604
4416	40.67913

Line #	Value or Contents from NUFT Output File
4417	75.18710
4418	74.79658
4419	74.48154
4420	73.78421
4421	72.89390
4422	71.88488
4423	70.89907
4424	69.79556
4425	67.96384
4426	65.00018
4427	60.76884
4428	55.53087
4429	49.96602
4430	44.68082
4431	40.69550
4432	75.43049
4433	75.38670
4434	75.23861
4435	74.66180
4436	73.64172
4437	72.54109
4438	71.48134
4439	70.30266
4440	68.36311
4441	65.27030
4442	60.92457
4443	55.61148
4444	50.00780
4445	44.70426
4446	40.71112
4447	75.68062
4448	75.60341
4449	75.47517
4450	75.32875
4451	74.38079
4452	73.19906
4453	72.06392
4454	70.80566
4455	68.75298
4456	65.52920
4457	61.07141
4458	55.68689
4459	50.04692
4460	44.72637
4461	40.72598
4462	75.94250
4463	75.84401
4464	75.71756
4465	75.56795
4466	75.05227
4467	73.85823
4468	72.64600
4469	71.30182
4470	69.13103
4471	65.77538
4472	61.20882
4473	55.75696

Line #	Value or Contents from NUFT Output File
4474	50.08334
4475	44.74714
4476	40.74007
4477	76.21939
4478	76.10257
4479	75.96743
4480	75.80489
4481	75.62750
4482	74.52760
4483	73.22717
4484	71.78843
4485	69.49444
4486	66.00736
4487	61.33631
4488	55.82154
4489	50.11702
4490	44.76655
4491	40.75341
4492	76.51407
4493	76.37744
4494	76.22621
4495	76.04290
4496	75.83470
4497	75.16055
4498	73.80712
4499	72.26179
4500	69.84048
4501	66.22360
4502	61.45332
4503	55.88050
4504	50.14794
4505	44.78460
4506	40.76599
4507	76.82955
4508	76.66909
4509	76.49544
4510	76.28451
4511	76.03467
4512	75.71710
4513	74.38733
4514	72.71601
4515	70.16584
4516	66.42254
4517	61.55936
4518	55.93371
4519	50.17607
4520	44.80129
4521	40.77780
4522	77.23233
4523	77.03649
4524	76.82887
4525	76.57940
4526	76.28647
4527	75.94878
4528	74.91659
4529	73.21941
4530	70.52263

Line #	Value or Contents from NUFT Output File
4531	66.63588
4532	61.67142
4533	55.98983
4534	50.20606
4535	44.81944
4536	40.79088
4537	77.68354
4538	77.43796
4539	77.18436
4540	76.88690
4541	76.54719
4542	76.18222
4543	75.45540
4544	73.69603
4545	70.83367
4546	66.81557
4547	61.76400
4548	56.03623
4549	50.23145
4550	44.83536
4551	40.80272
4552	78.10172
4553	77.80080
4554	77.49840
4555	77.15278
4556	76.76658
4557	76.34896
4558	75.92879
4559	74.07911
4560	71.06229
4561	66.94478
4562	61.82967
4563	56.06932
4564	50.25001
4565	44.84742
4566	40.81194
4567	78.62842
4568	78.24289
4569	77.87022
4570	77.46005
4571	77.01557
4572	76.54498
4573	76.10375
4574	74.38743
4575	71.27602
4576	67.06434
4577	61.88966
4578	56.09989
4579	50.26782
4580	44.85953
4581	40.82153
4582	79.17660
4583	78.76659
4584	78.28982
4585	77.79484
4586	77.28070
4587	76.75479

Line #	Value or Contents from NUFT Output File
4588	76.28929
4589	74.61268
4590	71.44079
4591	67.15448
4592	61.93406
4593	56.12325
4594	50.28258
4595	44.87047
4596	40.83070
4597	79.64908
4598	79.32474
4599	78.82594
4600	78.20808
4601	77.60036
4602	77.00374
4603	76.49923
4604	74.80129
4605	71.56858
4606	67.22025
4607	61.96547
4608	56.14123
4609	50.29587
4610	44.88171
4611	40.84085
4612	80.24737
4613	79.91446
4614	79.51792
4615	78.81506
4616	78.05314
4617	77.34128
4618	76.73231
4619	74.86903
4620	71.55967
4621	67.19694
4622	61.95091
4623	56.14019
4624	50.30372
4625	44.89358
4626	40.85392
4627	80.65426
4628	80.30480
4629	79.88890
4630	79.15640
4631	78.34142
4632	77.61740
4633	76.10967
4634	74.01711
4635	70.97736
4636	66.84751
4637	61.77344
4638	56.06613
4639	50.28115
4640	44.89403
4641	40.86316
4642	80.58582
4643	80.21446
4644	79.76740

Line #	Value or Contents from NUFT Output File
4645	78.96848
4646	78.07411
4647	76.24023
4648	74.36267
4649	72.55932
4650	69.93371
4651	66.21891
4652	61.45049
4653	55.92170
4654	50.22434
4655	44.87683
4656	40.86169
4657	78.79311
4658	78.35376
4659	77.77838
4660	77.02347
4661	75.76886
4662	74.26908
4663	72.88246
4664	71.40863
4665	69.12381
4666	65.72297
4667	61.18919
4668	55.80113
4669	50.17413
4670	44.85888
4671	40.85675
4672	75.61913
4673	75.09350
4674	73.83899
4675	73.60334
4676	73.68629
4677	72.81812
4678	71.74447
4679	70.50747
4680	68.47816
4681	65.31984
4682	60.97258
4683	55.69933
4684	50.13068
4685	44.84246
4686	40.85132
4687	71.42701
4688	71.38220
4689	71.39352
4690	71.26372
4691	70.99816
4692	70.45191
4693	69.73974
4694	68.85146
4695	67.25387
4696	64.53448
4697	60.54080
4698	55.49260
4699	50.04055
4700	44.80700
4701	40.83827

Line #	Value or Contents from NUFT Output File
4702	68.55340
4703	68.46102
4704	68.34422
4705	68.16245
4706	67.88304
4707	67.47916
4708	66.99469
4709	66.38669
4710	65.24366
4711	63.12222
4712	59.70641
4713	55.07126
4714	49.84789
4715	44.72552
4716	40.80339
4717	65.02250
4718	64.93016
4719	64.81858
4720	64.66247
4721	64.44617
4722	64.15716
4723	63.82689
4724	63.41698
4725	62.63756
4726	61.10856
4727	58.40363
4728	54.36576
4729	49.50763
4730	44.57283
4731	40.73171
4732	61.01451
4733	60.94993
4734	60.87304
4735	60.76741
4736	60.62451
4737	60.43562
4738	60.22217
4739	59.95755
4740	59.45071
4741	58.42251
4742	56.45968
4743	53.19951
4744	48.90009
4745	44.28140
4746	40.58406
4747	57.42131
4748	57.37850
4749	57.32744
4750	57.25842
4751	57.16401
4752	57.03933
4753	56.89804
4754	56.72215
4755	56.38243
4756	55.67810
4757	54.26780
4758	51.72383

Line #	Value or Contents from NUFT Output File
4759	48.05307
4760	43.84323
4761	40.34709
4762	54.11683
4763	54.08863
4764	54.05516
4765	54.00955
4766	53.94707
4767	53.86431
4768	53.77011
4769	53.65234
4770	53.42328
4771	52.94035
4772	51.93937
4773	50.01206
4774	46.98319
4775	43.25063
4776	40.00975
4777	50.82355
4778	50.80523
4779	50.78363
4780	50.75392
4781	50.71317
4782	50.65902
4783	50.59713
4784	50.51943
4785	50.36737
4786	50.04245
4787	49.35166
4788	47.95227
4789	45.57427
4790	42.40660
4791	39.50148
4792	47.38630
4793	47.37492
4794	47.36135
4795	47.34269
4796	47.31704
4797	47.28287
4798	47.24366
4799	47.19428
4800	47.09716
4801	46.88740
4802	46.43258
4803	45.47406
4804	43.72838
4805	41.20491
4806	38.73212
4807	43.41768
4808	43.41122
4809	43.40352
4810	43.39291
4811	43.37830
4812	43.35878
4813	43.33630
4814	43.30790
4815	43.25180

Line #	Value or Contents from NUFT Output File
4816	43.12950
4817	42.86013
4818	42.27434
4819	41.14115
4820	39.35745
4821	37.45967
4822	38.49233
4823	38.48937
4824	38.48584
4825	38.48098
4826	38.47426
4827	38.46524
4828	38.45481
4829	38.44158
4830	38.41530
4831	38.35741
4832	38.22825
4833	37.94077
4834	37.35751
4835	36.36353
4836	35.19908
4837	33.03093
4838	33.02994
4839	33.02876
4840	33.02711
4841	33.02483
4842	33.02174
4843	33.01812
4844	33.01351
4845	33.00424
4846	32.98349
4847	32.93653
4848	32.83051
4849	32.60926
4850	32.21214
4851	31.70957
4852	30.21664
4853	30.21620
4854	30.21566
4855	30.21490
4856	30.21383
4857	30.21235
4858	30.21058
4859	30.20828
4860	30.20354
4861	30.19260
4862	30.16725
4863	30.10961
4864	29.98844
4865	29.76773
4866	29.48159
4867	27.15834
4868	27.15818
4869	27.15799
4870	27.15772
4871	27.15734
4872	27.15682

Line #	Value or Contents from NUFT Output File
4873	27.15620
4874	27.15540
4875	27.15378
4876	27.15006
4877	27.14139
4878	27.12150
4879	27.07931
4880	27.00130
4881	26.89756
4882	25.61219
4883	25.61215
4884	25.61209
4885	25.61202
4886	25.61190
4887	25.61174
4888	25.61153
4889	25.61124
4890	25.61063
4891	25.60912
4892	25.60533
4893	25.59641
4894	25.57740
4895	25.54212
4896	25.49483
4897	24.74419
4898	24.74416
4899	24.74413
4900	24.74408
4901	24.74401
4902	24.74392
4903	24.74381
4904	24.74367
4905	24.74337
4906	24.74267
4907	24.74097
4908	24.73699
4909	24.72846
4910	24.71256
4911	24.69111
4912	24.03728
4913	24.03728
4914	24.03727
4915	24.03726
4916	24.03724
4917	24.03722
4918	24.03720
4919	24.03716
4920	24.03710
4921	24.03694
4922	24.03654
4923	24.03560
4924	24.03356
4925	24.02975
4926	24.02459
4927	23.99457
4928	23.99456
4929	23.99456

Line #	Value or Contents from NUFT Output File
4930	23.99455
4931	23.99454
4932	23.99453
4933	23.99451
4934	23.99449
4935	23.99445
4936	23.99436
4937	23.99414
4938	23.99362
4939	23.99251
4940	23.99043
4941	23.98762
4942	24.00243
4943	24.00242
4944	24.00242
4945	24.00241
4946	24.00240
4947	24.00239
4948	24.00238
4949	24.00236
4950	24.00233
4951	24.00226
4952	24.00212
4953	24.00181
4954	24.00116
4955	23.99994
4956	23.99828
4957	24.19081
4958	24.19081
4959	24.19080
4960	24.19079
4961	24.19078
4962	24.19077
4963	24.19075
4964	24.19073
4965	24.19070
4966	24.19065
4967	24.19057
4968	24.19044
4969	24.19020
4970	24.18975
4971	24.18915
4972	24.57363
4973	24.57363
4974	24.57362
4975	24.57360
4976	24.57359
4977	24.57357
4978	24.57355
4979	24.57352
4980	24.57348
4981	24.57342
4982	24.57334
4983	24.57328
4984	24.57320
4985	24.57305
4986	24.57286

Line #	Value or Contents from NUFT Output File
4987	25.02775
4988	25.02774
4989	25.02773
4990	25.02772
4991	25.02771
4992	25.02769
4993	25.02767
4994	25.02764
4995	25.02760
4996	25.02753
4997	25.02745
4998	25.02740
4999	25.02737
5000	25.02731
5001	25.02725
5002	25.51953
5003	25.51952
5004	25.51952
5005	25.51950
5006	25.51949
5007	25.51947
5008	25.51945
5009	25.51943
5010	25.51939
5011	25.51932
5012	25.51924
5013	25.51919
5014	25.51917
5015	25.51914
5016	25.51911
5017	26.07943
5018	26.07939
5019	26.07934
5020	26.07928
5021	26.07919
5022	26.07909
5023	26.07898
5024	26.07885
5025	26.07863
5026	26.07827
5027	26.07788
5028	26.07785
5029	26.07802
5030	26.07806
5031	26.07805
5032	26.56931
5033	26.56930
5034	26.56929
5035	26.56927
5036	26.56925
5037	26.56922
5038	26.56919
5039	26.56916
5040	26.56910
5041	26.56899
5042	26.56885
5043	26.56877

Line #	Value or Contents from NUFT Output File
5044	26.56876
5045	26.56874
5046	26.56873
5047	27.49450
5048	27.49450
5049	27.49449
5050	27.49448
5051	27.49447
5052	27.49446
5053	27.49445
5054	27.49444
5055	27.49441
5056	27.49436
5057	27.49428
5058	27.49421
5059	27.49415
5060	27.49411
5061	27.49409
5062	28.39263
5063	28.39261
5064	28.39258
5065	28.39254
5066	28.39249
5067	28.39243
5068	28.39236
5069	28.39227
5070	28.39213
5071	28.39187
5072	28.39152
5073	28.39132
5074	28.39135
5075	28.39138
5076	28.39138
5077	28.84515
5078	28.84514
5079	28.84514
5080	28.84513
5081	28.84512
5082	28.84511
5083	28.84510
5084	28.84508
5085	28.84506
5086	28.84501
5087	28.84493
5088	28.84484
5089	28.84477
5090	28.84473
5091	28.84470
5092	29.83768
5093	29.83768
5094	29.83767
5095	29.83766
5096	29.83766
5097	29.83764
5098	29.83763
5099	29.83761
5100	29.83758

Line #	Value or Contents from NUFT Output File
5101	29.83753
5102	29.83746
5103	29.83741
5104	29.83738
5105	29.83735
5106	29.83733
5107	31.16647
5108	31.16647
5109	31.16646
5110	31.16645
5111	31.16644
5112	31.16643
5113	31.16642
5114	31.16640
5115	31.16637
5116	31.16631
5117	31.16623
5118	31.16615
5119	31.16611
5120	31.16609
5121	31.16607
5122	31.87360
5123	31.87356
5124	31.87352
5125	31.87346
5126	31.87339
5127	31.87329
5128	31.87318
5129	31.87305
5130	31.87281
5131	31.87239
5132	31.87177
5133	31.87138
5134	31.87158
5135	31.87175
5136	31.87180
5137	32.23134
5138	32.23134
5139	32.23134
5140	32.23134
5141	32.23134
5142	32.23133
5143	32.23133
5144	32.23132
5145	32.23132
5146	32.23130
5147	32.23127
5148	32.23123
5149	32.23121
5150	32.23120
5151	32.23120
5152	32.54400
5153	32.54400
5154	32.54400
5155	32.54400
5156	32.54400
5157	32.54400

Line #	Value or Contents from NUFT Output File
5158	32.54400
5159	32.54400
5160	32.54400
5161	32.54400
5162	32.54400
5163	32.54400
5164	32.54400
5165	32.54400
5166	32.54400

Table VII-3 Output File from ZONEAVG V1.2 ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext.zavg") Used for Validation

Line #	Value or Contents
1	zoneavg.sh 1.2 10/15/99 12:06:51 LLNL
2	Parsing file l4c4-LDTH60-1Dds_mc-ui-01.f.ext...
3	num variables 6
4	tsw35_A0.f#1:1:28 Volume: 1.71
5	tsw35_A0.f#2:1:28 Volume: 1.05
6	tsw35_A0.f#3:1:28 Volume: 0.993
7	tsw35_A0.f#4:1:28 Volume: 1.0791
8	tsw35_A0.f#5:1:28 Volume: 1.1391
9	tsw35_A0.f#6:1:28 Volume: 1.26
10	tsw35_A0.f#7:1:28 Volume: 1.0182
11	tsw35_A0.f#8:1:28 Volume: 1.5
12	tsw35_A0.f#9:1:28 Volume: 2.7
13	tsw35_A0.f#10:1:28 Volume: 4.5
14	tsw35_A0.f#11:1:28 Volume: 7.5
15	tsw35_A0.f#12:1:28 Volume: 12
16	tsw35_A0.f#13:1:28 Volume: 18
17	tsw35_A0.f#14:1:28 Volume: 27
18	tsw35_A0.f#15:1:28 Volume: 40.05
19	hstrk_A1.f#1:1:29 Volume: 1.368
20	hstrk_A1.f#2:1:29 Volume: 0.84
21	hstrk_A1.f#3:1:29 Volume: 0.7944
22	hstrk_A1.f#4:1:29 Volume: 0.86328
23	hstrk_A1.f#5:1:29 Volume: 0.91128
24	hstrk_A1.f#6:1:29 Volume: 1.008
25	hstrk_A1.f#7:1:29 Volume: 0.81456
26	hstrk_A1.f#8:1:29 Volume: 1.2
27	hstrk_A1.f#9:1:29 Volume: 2.16
28	hstrk_A1.f#10:1:29 Volume: 3.6
29	hstrk_A1.f#11:1:29 Volume: 6
30	hstrk_A1.f#12:1:29 Volume: 9.6
31	hstrk_A1.f#13:1:29 Volume: 14.4
32	hstrk_A1.f#14:1:29 Volume: 21.6
33	hstrk_A1.f#15:1:29 Volume: 32.04
34	hstrk_A1.f#1:1:30 Volume: 1.14
35	hstrk_A1.f#2:1:30 Volume: 0.7
36	hstrk_A1.f#3:1:30 Volume: 0.662
37	hstrk_A1.f#4:1:30 Volume: 0.7194
38	hstrk_A1.f#5:1:30 Volume: 0.7594
39	hstrk_A1.f#6:1:30 Volume: 0.84
40	hstrk_A1.f#7:1:30 Volume: 0.6788
41	hstrk_A1.f#8:1:30 Volume: 1
42	hstrk_A1.f#9:1:30 Volume: 1.8
43	hstrk_A1.f#10:1:30 Volume: 3
44	hstrk_A1.f#11:1:30 Volume: 5
45	hstrk_A1.f#12:1:30 Volume: 8
46	hstrk_A1.f#13:1:30 Volume: 12
47	hstrk_A1.f#14:1:30 Volume: 18
48	hstrk_A1.f#15:1:30 Volume: 26.7
49	hstrk_A1.f#1:1:31 Volume: 0.57
50	hstrk_A1.f#2:1:31 Volume: 0.35
51	hstrk_A1.f#3:1:31 Volume: 0.331
52	hstrk_A1.f#4:1:31 Volume: 0.3597
53	hstrk_A1.f#5:1:31 Volume: 0.3797
54	hstrk_A1.f#6:1:31 Volume: 0.42

Line #	Value or Contents
55	hstrk_A1.f#7:1:31 Volume: 0.3394
56	hstrk_A1.f#8:1:31 Volume: 0.5
57	hstrk_A1.f#9:1:31 Volume: 0.9
58	hstrk_A1.f#10:1:31 Volume: 1.5
59	hstrk_A1.f#11:1:31 Volume: 2.5
60	hstrk_A1.f#12:1:31 Volume: 4
61	hstrk_A1.f#13:1:31 Volume: 6
62	hstrk_A1.f#14:1:31 Volume: 9
63	hstrk_A1.f#15:1:31 Volume: 13.35
64	hstrk_A1.f#1:1:32 Volume: 0.57
65	hstrk_A1.f#2:1:32 Volume: 0.35
66	hstrk_A1.f#3:1:32 Volume: 0.331
67	hstrk_A1.f#4:1:32 Volume: 0.3597
68	hstrk_A1.f#5:1:32 Volume: 0.3797
69	hstrk_A1.f#6:1:32 Volume: 0.42
70	hstrk_A1.f#7:1:32 Volume: 0.3394
71	hstrk_A1.f#8:1:32 Volume: 0.5
72	hstrk_A1.f#9:1:32 Volume: 0.9
73	hstrk_A1.f#10:1:32 Volume: 1.5
74	hstrk_A1.f#11:1:32 Volume: 2.5
75	hstrk_A1.f#12:1:32 Volume: 4
76	hstrk_A1.f#13:1:32 Volume: 6
77	hstrk_A1.f#14:1:32 Volume: 9
78	hstrk_A1.f#15:1:32 Volume: 13.35
79	hstrk_A1.f#1:1:33 Volume: 0.285
80	hstrk_A1.f#2:1:33 Volume: 0.175
81	hstrk_A1.f#3:1:33 Volume: 0.1655
82	hstrk_A1.f#4:1:33 Volume: 0.17985
83	hstrk_A1.f#5:1:33 Volume: 0.18985
84	hstrk_A1.f#6:1:33 Volume: 0.21
85	hstrk_A1.f#7:1:33 Volume: 0.1697
86	hstrk_A1.f#8:1:33 Volume: 0.25
87	hstrk_A1.f#9:1:33 Volume: 0.45
88	hstrk_A1.f#10:1:33 Volume: 0.75
89	hstrk_A1.f#11:1:33 Volume: 1.25
90	hstrk_A1.f#12:1:33 Volume: 2
91	hstrk_A1.f#13:1:33 Volume: 3
92	hstrk_A1.f#14:1:33 Volume: 4.5
93	hstrk_A1.f#15:1:33 Volume: 6.675
94	hstrk_A1.f#1:1:34 Volume: 0.171
95	hstrk_A1.f#2:1:34 Volume: 0.105
96	hstrk_A1.f#3:1:34 Volume: 0.0993
97	hstrk_A1.f#4:1:34 Volume: 0.10791
98	hstrk_A1.f#5:1:34 Volume: 0.11391
99	hstrk_A1.f#6:1:34 Volume: 0.126
100	hstrk_A1.f#7:1:34 Volume: 0.10182
101	hstrk_A1.f#8:1:34 Volume: 0.15
102	hstrk_A1.f#9:1:34 Volume: 0.27
103	hstrk_A1.f#10:1:34 Volume: 0.45
104	hstrk_A1.f#11:1:34 Volume: 0.75
105	hstrk_A1.f#12:1:34 Volume: 1.2
106	hstrk_A1.f#13:1:34 Volume: 1.8
107	hstrk_A1.f#14:1:34 Volume: 2.7
108	hstrk_A1.f#15:1:34 Volume: 4.005
109	hstrk_A1.f#2:1:35 Volume: 0.07
110	hstrk_A1.f#3:1:35 Volume: 0.0662
111	hstrk_A1.f#4:1:35 Volume: 0.07194

Line #	Value or Contents
112	hstrk_A1.f#5:1:35 Volume: 0.07594
113	hstrk_A1.f#6:1:35 Volume: 0.084
114	hstrk_A1.f#7:1:35 Volume: 0.06788
115	hstrk_A1.f#8:1:35 Volume: 0.1
116	hstrk_A1.f#9:1:35 Volume: 0.18
117	hstrk_A1.f#10:1:35 Volume: 0.3
118	hstrk_A1.f#11:1:35 Volume: 0.5
119	hstrk_A1.f#12:1:35 Volume: 0.8
120	hstrk_A1.f#13:1:35 Volume: 1.2
121	hstrk_A1.f#14:1:35 Volume: 1.8
122	hstrk_A1.f#15:1:35 Volume: 2.67
123	hstrk_A1.f#4:1:36 Volume: 0.07194
124	hstrk_A1.f#5:1:36 Volume: 0.07594
125	hstrk_A1.f#6:1:36 Volume: 0.084
126	hstrk_A1.f#7:1:36 Volume: 0.06788
127	hstrk_A1.f#8:1:36 Volume: 0.1
128	hstrk_A1.f#9:1:36 Volume: 0.18
129	hstrk_A1.f#10:1:36 Volume: 0.3
130	hstrk_A1.f#11:1:36 Volume: 0.5
131	hstrk_A1.f#12:1:36 Volume: 0.8
132	hstrk_A1.f#13:1:36 Volume: 1.2
133	hstrk_A1.f#14:1:36 Volume: 1.8
134	hstrk_A1.f#15:1:36 Volume: 2.67
135	hstrk_A1.f#5:1:37 Volume: 0.07594
136	hstrk_A1.f#6:1:37 Volume: 0.084
137	hstrk_A1.f#7:1:37 Volume: 0.06788
138	hstrk_A1.f#8:1:37 Volume: 0.1
139	hstrk_A1.f#9:1:37 Volume: 0.18
140	hstrk_A1.f#10:1:37 Volume: 0.3
141	hstrk_A1.f#11:1:37 Volume: 0.5
142	hstrk_A1.f#12:1:37 Volume: 0.8
143	hstrk_A1.f#13:1:37 Volume: 1.2
144	hstrk_A1.f#14:1:37 Volume: 1.8
145	hstrk_A1.f#15:1:37 Volume: 2.67
146	hstrk_A1.f#6:1:38 Volume: 0.084
147	hstrk_A1.f#7:1:38 Volume: 0.06788
148	hstrk_A1.f#8:1:38 Volume: 0.1
149	hstrk_A1.f#9:1:38 Volume: 0.18
150	hstrk_A1.f#10:1:38 Volume: 0.3
151	hstrk_A1.f#11:1:38 Volume: 0.5
152	hstrk_A1.f#12:1:38 Volume: 0.8
153	hstrk_A1.f#13:1:38 Volume: 1.2
154	hstrk_A1.f#14:1:38 Volume: 1.8
155	hstrk_A1.f#15:1:38 Volume: 2.67
156	hstrk_A1.f#6:1:39 Volume: 0.084
157	hstrk_A1.f#7:1:39 Volume: 0.06788
158	hstrk_A1.f#8:1:39 Volume: 0.1
159	hstrk_A1.f#9:1:39 Volume: 0.18
160	hstrk_A1.f#10:1:39 Volume: 0.3
161	hstrk_A1.f#11:1:39 Volume: 0.5
162	hstrk_A1.f#12:1:39 Volume: 0.8
163	hstrk_A1.f#13:1:39 Volume: 1.2
164	hstrk_A1.f#14:1:39 Volume: 1.8
165	hstrk_A1.f#15:1:39 Volume: 2.67
166	hstrk_A1.f#7:1:40 Volume: 0.06788
167	hstrk_A1.f#8:1:40 Volume: 0.1
168	hstrk_A1.f#9:1:40 Volume: 0.18

Line #	Value or Contents
169	hstrk_A1.f#10:1:40 Volume: 0.3
170	hstrk_A1.f#11:1:40 Volume: 0.5
171	hstrk_A1.f#12:1:40 Volume: 0.8
172	hstrk_A1.f#13:1:40 Volume: 1.2
173	hstrk_A1.f#14:1:40 Volume: 1.8
174	hstrk_A1.f#15:1:40 Volume: 2.67
175	hstrk_A1.f#7:1:41 Volume: 0.06788
176	hstrk_A1.f#8:1:41 Volume: 0.1
177	hstrk_A1.f#9:1:41 Volume: 0.18
178	hstrk_A1.f#10:1:41 Volume: 0.3
179	hstrk_A1.f#11:1:41 Volume: 0.5
180	hstrk_A1.f#12:1:41 Volume: 0.8
181	hstrk_A1.f#13:1:41 Volume: 1.2
182	hstrk_A1.f#14:1:41 Volume: 1.8
183	hstrk_A1.f#15:1:41 Volume: 2.67
184	hstrk_A1.f#8:1:42 Volume: 0.1
185	hstrk_A1.f#9:1:42 Volume: 0.18
186	hstrk_A1.f#10:1:42 Volume: 0.3
187	hstrk_A1.f#11:1:42 Volume: 0.5
188	hstrk_A1.f#12:1:42 Volume: 0.8
189	hstrk_A1.f#13:1:42 Volume: 1.2
190	hstrk_A1.f#14:1:42 Volume: 1.8
191	hstrk_A1.f#15:1:42 Volume: 2.67
192	hstrk_A1.f#8:1:43 Volume: 0.137
193	hstrk_A1.f#9:1:43 Volume: 0.2466
194	hstrk_A1.f#10:1:43 Volume: 0.411
195	hstrk_A1.f#11:1:43 Volume: 0.685
196	hstrk_A1.f#12:1:43 Volume: 1.096
197	hstrk_A1.f#13:1:43 Volume: 1.644
198	hstrk_A1.f#14:1:43 Volume: 2.466
199	hstrk_A1.f#15:1:43 Volume: 3.6579
200	hstrk_A1.f#8:1:44 Volume: 0.1
201	hstrk_A1.f#9:1:44 Volume: 0.18
202	hstrk_A1.f#10:1:44 Volume: 0.3
203	hstrk_A1.f#11:1:44 Volume: 0.5
204	hstrk_A1.f#12:1:44 Volume: 0.8
205	hstrk_A1.f#13:1:44 Volume: 1.2
206	hstrk_A1.f#14:1:44 Volume: 1.8
207	hstrk_A1.f#15:1:44 Volume: 2.67
208	hstrk_A1.f#9:1:45 Volume: 0.18
209	hstrk_A1.f#10:1:45 Volume: 0.3
210	hstrk_A1.f#11:1:45 Volume: 0.5
211	hstrk_A1.f#12:1:45 Volume: 0.8
212	hstrk_A1.f#13:1:45 Volume: 1.2
213	hstrk_A1.f#14:1:45 Volume: 1.8
214	hstrk_A1.f#15:1:45 Volume: 2.67
215	hstrk_A1.f#9:1:46 Volume: 0.2286
216	hstrk_A1.f#10:1:46 Volume: 0.381
217	hstrk_A1.f#11:1:46 Volume: 0.635
218	hstrk_A1.f#12:1:46 Volume: 1.016
219	hstrk_A1.f#13:1:46 Volume: 1.524
220	hstrk_A1.f#14:1:46 Volume: 2.286
221	hstrk_A1.f#15:1:46 Volume: 3.3909
222	hstrk_A1.f#9:1:47 Volume: 0.2133
223	hstrk_A1.f#10:1:47 Volume: 0.3555
224	hstrk_A1.f#11:1:47 Volume: 0.5925
225	hstrk_A1.f#12:1:47 Volume: 0.948

Line #	Value or Contents
226	hstrk_A1.f#13:1:47 Volume: 1.422
227	hstrk_A1.f#14:1:47 Volume: 2.133
228	hstrk_A1.f#15:1:47 Volume: 3.16395
229	hstrk_A1.f#9:1:48 Volume: 0.3438
230	hstrk_A1.f#10:1:48 Volume: 0.573
231	hstrk_A1.f#11:1:48 Volume: 0.955
232	hstrk_A1.f#12:1:48 Volume: 1.528
233	hstrk_A1.f#13:1:48 Volume: 2.292
234	hstrk_A1.f#14:1:48 Volume: 3.438
235	hstrk_A1.f#15:1:48 Volume: 5.0997
236	hstrk_A1.f#9:1:49 Volume: 0.5823
237	hstrk_A1.f#10:1:49 Volume: 0.9705
238	hstrk_A1.f#11:1:49 Volume: 1.6175
239	hstrk_A1.f#12:1:49 Volume: 2.588
240	hstrk_A1.f#13:1:49 Volume: 3.882
241	hstrk_A1.f#14:1:49 Volume: 5.823
242	hstrk_A1.f#15:1:49 Volume: 8.63745
243	hstrk_A1.f#7:1:50 Volume: 0.2667684
244	hstrk_A1.f#8:1:50 Volume: 0.393
245	hstrk_A1.f#9:1:50 Volume: 0.7074
246	hstrk_A1.f#10:1:50 Volume: 1.179
247	hstrk_A1.f#11:1:50 Volume: 1.965
248	hstrk_A1.f#12:1:50 Volume: 3.144
249	hstrk_A1.f#13:1:50 Volume: 4.716
250	hstrk_A1.f#14:1:50 Volume: 7.074
251	hstrk_A1.f#15:1:50 Volume: 10.4931
252	hstrk_A1.f#6:1:51 Volume: 0.21588
253	hstrk_A1.f#7:1:51 Volume: 0.1744516
254	hstrk_A1.f#8:1:51 Volume: 0.257
255	hstrk_A1.f#9:1:51 Volume: 0.4626
256	hstrk_A1.f#10:1:51 Volume: 0.771
257	hstrk_A1.f#11:1:51 Volume: 1.285
258	hstrk_A1.f#12:1:51 Volume: 2.056
259	hstrk_A1.f#13:1:51 Volume: 3.084
260	hstrk_A1.f#14:1:51 Volume: 4.626
261	hstrk_A1.f#15:1:51 Volume: 6.8619
262	hstrk_A1.f#5:1:52 Volume: 0.1150491
263	hstrk_A1.f#6:1:52 Volume: 0.12726
264	hstrk_A1.f#7:1:52 Volume: 0.1028382
265	hstrk_A1.f#8:1:52 Volume: 0.1515
266	hstrk_A1.f#9:1:52 Volume: 0.2727
267	hstrk_A1.f#10:1:52 Volume: 0.4545
268	hstrk_A1.f#11:1:52 Volume: 0.7575
269	hstrk_A1.f#12:1:52 Volume: 1.212
270	hstrk_A1.f#13:1:52 Volume: 1.818
271	hstrk_A1.f#14:1:52 Volume: 2.727
272	hstrk_A1.f#15:1:52 Volume: 4.04505
273	hstrk_A1.f#3:1:53 Volume: 0.100293
274	hstrk_A1.f#4:1:53 Volume: 0.1089891
275	hstrk_A1.f#5:1:53 Volume: 0.1150491
276	hstrk_A1.f#6:1:53 Volume: 0.12726
277	hstrk_A1.f#7:1:53 Volume: 0.1028382
278	hstrk_A1.f#8:1:53 Volume: 0.1515
279	hstrk_A1.f#9:1:53 Volume: 0.2727
280	hstrk_A1.f#10:1:53 Volume: 0.4545
281	hstrk_A1.f#11:1:53 Volume: 0.7575
282	hstrk_A1.f#12:1:53 Volume: 1.212

Line #	Value or Contents
283	hstrk_A1.f#13:1:53 Volume: 1.818
284	hstrk_A1.f#14:1:53 Volume: 2.727
285	hstrk_A1.f#15:1:53 Volume: 4.04505
286	hstrk_A1.f#1:1:54 Volume: 0.456
287	hstrk_A1.f#2:1:54 Volume: 0.28
288	hstrk_A1.f#3:1:54 Volume: 0.2648
289	hstrk_A1.f#4:1:54 Volume: 0.28776
290	hstrk_A1.f#5:1:54 Volume: 0.30376
291	hstrk_A1.f#6:1:54 Volume: 0.336
292	hstrk_A1.f#7:1:54 Volume: 0.27152
293	hstrk_A1.f#8:1:54 Volume: 0.4
294	hstrk_A1.f#9:1:54 Volume: 0.72
295	hstrk_A1.f#10:1:54 Volume: 1.2
296	hstrk_A1.f#11:1:54 Volume: 2
297	hstrk_A1.f#12:1:54 Volume: 3.2
298	hstrk_A1.f#13:1:54 Volume: 4.8
299	hstrk_A1.f#14:1:54 Volume: 7.2
300	hstrk_A1.f#15:1:54 Volume: 10.68
301	hstrk_A1.f#1:1:55 Volume: 0.57
302	hstrk_A1.f#2:1:55 Volume: 0.35
303	hstrk_A1.f#3:1:55 Volume: 0.331
304	hstrk_A1.f#4:1:55 Volume: 0.3597
305	hstrk_A1.f#5:1:55 Volume: 0.3797
306	hstrk_A1.f#6:1:55 Volume: 0.42
307	hstrk_A1.f#7:1:55 Volume: 0.3394
308	hstrk_A1.f#8:1:55 Volume: 0.5
309	hstrk_A1.f#9:1:55 Volume: 0.9
310	hstrk_A1.f#10:1:55 Volume: 1.5
311	hstrk_A1.f#11:1:55 Volume: 2.5
312	hstrk_A1.f#12:1:55 Volume: 4
313	hstrk_A1.f#13:1:55 Volume: 6
314	hstrk_A1.f#14:1:55 Volume: 9
315	hstrk_A1.f#15:1:55 Volume: 13.35
316	hstrk_A1.f#1:1:56 Volume: 0.855
317	hstrk_A1.f#2:1:56 Volume: 0.525
318	hstrk_A1.f#3:1:56 Volume: 0.4965
319	hstrk_A1.f#4:1:56 Volume: 0.53955
320	hstrk_A1.f#5:1:56 Volume: 0.56955
321	hstrk_A1.f#6:1:56 Volume: 0.63
322	hstrk_A1.f#7:1:56 Volume: 0.5091
323	hstrk_A1.f#8:1:56 Volume: 0.75
324	hstrk_A1.f#9:1:56 Volume: 1.35
325	hstrk_A1.f#10:1:56 Volume: 2.25
326	hstrk_A1.f#11:1:56 Volume: 3.75
327	hstrk_A1.f#12:1:56 Volume: 6
328	hstrk_A1.f#13:1:56 Volume: 9
329	hstrk_A1.f#14:1:56 Volume: 13.5
330	hstrk_A1.f#15:1:56 Volume: 20.025
331	hstrk_A2.f#1:1:35 Volume: 0.114
332	hstrk_A2.f#2:1:36 Volume: 0.07
333	hstrk_A2.f#3:1:36 Volume: 0.0662
334	hstrk_A2.f#4:1:37 Volume: 0.07194
335	hstrk_A2.f#5:1:38 Volume: 0.07594
336	hstrk_A2.f#5:1:39 Volume: 0.07594
337	hstrk_A2.f#6:1:40 Volume: 0.084
338	hstrk_A2.f#6:1:41 Volume: 0.084
339	hstrk_A2.f#7:1:42 Volume: 0.06788

Line #	Value or Contents
340	hstrk_A2.f#7:1:43 Volume: 0.0929956
341	hstrk_A2.f#7:1:44 Volume: 0.06788
342	hstrk_A2.f#8:1:45 Volume: 0.1
343	hstrk_A2.f#8:1:46 Volume: 0.127
344	hstrk_A2.f#8:1:47 Volume: 0.1185
345	hstrk_A2.f#8:1:48 Volume: 0.191
346	hstrk_A2.f#8:1:49 Volume: 0.3235
347	dr_A3.f#1:1:36 Volume: 0.114
348	dr_A3.f#1:1:37 Volume: 0.114
349	dr_A3.f#2:1:37 Volume: 0.07
350	dr_A3.f#3:1:37 Volume: 0.0662
351	dr_A3.f#1:1:38 Volume: 0.114
352	dr_A3.f#2:1:38 Volume: 0.07
353	dr_A3.f#3:1:38 Volume: 0.0662
354	dr_A3.f#4:1:38 Volume: 0.07194
355	bf_A3.f#1:1:39 Volume: 0.114
356	dr_A3.f#2:1:39 Volume: 0.07
357	dr_A3.f#3:1:39 Volume: 0.0662
358	dr_A3.f#4:1:39 Volume: 0.07194
359	bf_A3.f#1:1:40 Volume: 0.114
360	bf_A3.f#2:1:40 Volume: 0.07
361	dr_A3.f#3:1:40 Volume: 0.0662
362	dr_A3.f#4:1:40 Volume: 0.07194
363	dr_A3.f#5:1:40 Volume: 0.07594
364	bf_A3.f#1:1:41 Volume: 0.114
365	bf_A3.f#2:1:41 Volume: 0.07
366	bf_A3.f#3:1:41 Volume: 0.0662
367	dr_A3.f#4:1:41 Volume: 0.07194
368	dr_A3.f#5:1:41 Volume: 0.07594
369	bf_A3.f#1:1:42 Volume: 0.114
370	bf_A3.f#2:1:42 Volume: 0.07
371	bf_A3.f#3:1:42 Volume: 0.0662
372	bf_A3.f#4:1:42 Volume: 0.07194
373	dr_A3.f#5:1:42 Volume: 0.07594
374	dr_A3.f#6:1:42 Volume: 0.084
375	bf_A3.f#1:1:43 Volume: 0.15618
376	bf_A3.f#2:1:43 Volume: 0.0959
377	bf_A3.f#3:1:43 Volume: 0.090694
378	bf_A3.f#4:1:43 Volume: 0.0985578
379	bf_A3.f#5:1:43 Volume: 0.1040378
380	dr_A3.f#6:1:43 Volume: 0.11508
381	bf_A3.f#1:1:44 Volume: 0.114
382	bf_A3.f#2:1:44 Volume: 0.07
383	bf_A3.f#3:1:44 Volume: 0.0662
384	bf_A3.f#4:1:44 Volume: 0.07194
385	bf_A3.f#5:1:44 Volume: 0.07594
386	bf_A3.f#6:1:44 Volume: 0.084
387	bf_A3.f#1:1:45 Volume: 0.114
388	bf_A3.f#2:1:45 Volume: 0.07
389	bf_A3.f#3:1:45 Volume: 0.0662
390	bf_A3.f#4:1:45 Volume: 0.07194
391	bf_A3.f#5:1:45 Volume: 0.07594
392	bf_A3.f#6:1:45 Volume: 0.084
393	bf_A3.f#7:1:45 Volume: 0.06788
394	bf_A3.f#2:1:46 Volume: 0.0889
395	bf_A3.f#3:1:46 Volume: 0.084074
396	bf_A3.f#4:1:46 Volume: 0.0913638

Line #	Value or Contents
397	bf_A3.f#5:1:46 Volume: 0.0964438
398	bf_A3.f#6:1:46 Volume: 0.10668
399	bf_A3.f#7:1:46 Volume: 0.0862076
400	bf_A3.f#3:1:47 Volume: 0.078447
401	bf_A3.f#4:1:47 Volume: 0.0852489
402	bf_A3.f#5:1:47 Volume: 0.0899889
403	bf_A3.f#6:1:47 Volume: 0.09954
404	bf_A3.f#7:1:47 Volume: 0.0804378
405	bf_A3.f#4:1:48 Volume: 0.1374054
406	bf_A3.f#5:1:48 Volume: 0.1450454
407	bf_A3.f#6:1:48 Volume: 0.16044
408	bf_A3.f#7:1:48 Volume: 0.1296508
409	bf_A3.f#5:1:49 Volume: 0.2456659
410	bf_A3.f#6:1:49 Volume: 0.27174
411	bf_A3.f#7:1:49 Volume: 0.2195918
412	dr_A4.f#1:1:46 Volume: 0.14478
413	dr_A4.f#2:1:47 Volume: 0.08295
414	dr_A4.f#3:1:48 Volume: 0.126442
415	dr_A4.f#4:1:49 Volume: 0.2327259
416	dr_A5.f#4:1:50 Volume: 0.2827242
417	dr_A5.f#5:1:50 Volume: 0.2984442
418	dr_A5.f#6:1:50 Volume: 0.33012
419	dr_A5.f#4:1:51 Volume: 0.1848858
420	dr_A5.f#5:1:51 Volume: 0.1951658
421	in_A6.f#1:1:52 Volume: 0.17271
422	in_A6.f#2:1:52 Volume: 0.10605
423	in_A6.f#3:1:52 Volume: 0.100293
424	in_A6.f#4:1:52 Volume: 0.1089891
425	in_A6.f#1:1:53 Volume: 0.17271
426	in_A6.f#2:1:53 Volume: 0.10605
Break	**Zone-Averaged Values**
1108	Variable: S.liquid

1109		Zone	A0	A1	A2	A3	A4	A5	A6
1110	Time								
1111	0	1.58E+09	2.82E-02	2.77E-02	5.22E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1112	1	3.16E+09	2.60E-02	2.41E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1113	2	6.31E+09	2.53E-02	2.37E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1114	3	9.47E+09	2.50E-02	2.37E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1115	4	1.26E+10	2.49E-02	2.38E-02	8.10E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1116	5	1.58E+10	2.48E-02	2.39E-02	2.50E-03	9.72E-04	0.00E+00	0.00E+00	0.00E+00
1117	6	2.21E+10	2.88E-02	2.81E-02	9.72E-03	4.61E-02	0.00E+00	0.00E+00	0.00E+00
1118	7	3.16E+10	2.89E-02	2.85E-02	1.72E-02	9.92E-02	0.00E+00	1.37E-02	0.00E+00
1119	8	4.73E+10	2.91E-02	2.89E-02	1.69E-02	1.38E-01	1.57E-01	2.76E-01	1.32E-01
1120	9	6.31E+10	2.95E-02	2.92E-02	1.62E-02	1.38E-01	1.60E-01	2.79E-01	1.35E-01
1121	10	7.89E+10	3.47E-02	3.43E-02	1.76E-02	1.48E-01	1.73E-01	2.93E-01	1.43E-01
1122	11	9.47E+10	3.55E-02	3.51E-02	1.78E-02	1.49E-01	1.76E-01	2.97E-01	1.44E-01
1123	12	1.26E+11	3.67E-02	3.63E-02	1.82E-02	1.52E-01	1.80E-01	3.02E-01	1.46E-01
1124	13	1.58E+11	3.77E-02	3.73E-02	1.85E-02	1.54E-01	1.83E-01	3.05E-01	1.47E-01
1125	14	2.21E+11	3.91E-02	3.87E-02	1.90E-02	1.57E-01	1.87E-01	3.10E-01	1.49E-01
1126	15	3.16E+11	4.03E-02	4.00E-02	1.95E-02	1.61E-01	1.91E-01	3.15E-01	1.51E-01
1127	16	3.16E+13	4.54E-02	4.52E-02	2.18E-02	1.74E-01	2.09E-01	3.34E-01	1.59E-01
1128									
1129	Variable: X.air.gas								

1130		Zone	A0	A1	A2	A3	A4	A5	A6
1131	Time								
1132	0	1.58E+09	9.29E-01	9.08E-01	6.80E-01	6.78E-01	6.78E-01	6.78E-01	6.83E-01
1133	1	3.16E+09	6.65E-01	5.32E-01	4.92E-02	4.99E-02	5.48E-02	6.96E-02	8.77E-02

Line #	Value or Contents								
1134	2	6.31E+09	5.19E-01	4.06E-01	2.95E-02	3.00E-02	3.37E-02	4.57E-02	6.11E-02
1135	3	9.47E+09	4.55E-01	3.52E-01	1.83E-02	1.88E-02	2.13E-02	2.94E-02	4.05E-02
1136	4	1.26E+10	4.09E-01	3.12E-01	1.11E-02	1.15E-02	1.33E-02	1.93E-02	2.75E-02
1137	5	1.58E+10	3.79E-01	2.87E-01	7.16E-03	7.23E-03	8.65E-03	1.33E-02	1.96E-02
1138	6	2.21E+10	3.65E-01	2.79E-01	1.68E-03	1.54E-03	2.03E-03	4.43E-03	8.41E-03
1139	7	3.16E+10	4.14E-01	3.40E-01	4.62E-03	2.30E-03	2.27E-03	6.34E-03	1.55E-02
1140	8	4.73E+10	5.20E-01	4.68E-01	2.60E-01	1.88E-01	1.37E-01	1.43E-01	1.05E-01
1141	9	6.31E+10	6.16E-01	5.79E-01	4.62E-01	4.04E-01	3.35E-01	3.55E-01	3.27E-01
1142	10	7.89E+10	7.30E-01	7.03E-01	6.37E-01	5.95E-01	5.32E-01	5.55E-01	5.35E-01
1143	11	9.47E+10	8.00E-01	7.80E-01	7.38E-01	7.07E-01	6.56E-01	6.76E-01	6.62E-01
1144	12	1.26E+11	8.72E-01	8.61E-01	8.37E-01	8.19E-01	7.84E-01	7.98E-01	7.90E-01
1145	13	1.58E+11	9.07E-01	9.00E-01	8.84E-01	8.71E-01	8.45E-01	8.56E-01	8.51E-01
1146	14	2.21E+11	9.38E-01	9.33E-01	9.24E-01	9.16E-01	9.00E-01	9.08E-01	9.04E-01
1147	15	3.16E+11	9.56E-01	9.53E-01	9.48E-01	9.43E-01	9.33E-01	9.38E-01	9.36E-01
1148	16	3.16E+13	9.86E-01	9.86E-01	9.86E-01	9.86E-01	9.85E-01	9.86E-01	9.85E-01
1149									
1150	Variable: T								
1151		Zone	A0	A1	A2	A3	A4	A5	A6
1152	Time								
1153	0	1.58E+09	4.46E+01	4.82E+01	7.47E+01	7.67E+01	7.88E+01	7.84E+01	7.71E+01
1154	1	3.16E+09	7.36E+01	8.08E+01	1.22E+02	1.57E+02	2.23E+02	1.93E+02	2.08E+02
1155	2	6.31E+09	8.20E+01	8.65E+01	1.08E+02	1.29E+02	1.69E+02	1.51E+02	1.60E+02
1156	3	9.47E+09	8.46E+01	8.83E+01	1.04E+02	1.20E+02	1.51E+02	1.38E+02	1.45E+02
1157	4	1.26E+10	8.63E+01	8.94E+01	1.01E+02	1.15E+02	1.42E+02	1.30E+02	1.36E+02
1158	5	1.58E+10	8.73E+01	9.00E+01	9.96E+01	1.11E+02	1.35E+02	1.25E+02	1.30E+02
1159	6	2.21E+10	8.78E+01	9.01E+01	9.64E+01	9.98E+01	1.18E+02	1.12E+02	1.16E+02
1160	7	3.16E+10	8.63E+01	8.84E+01	9.60E+01	9.60E+01	9.97E+01	9.91E+01	1.02E+02
1161	8	4.73E+10	8.25E+01	8.44E+01	9.08E+01	9.24E+01	9.35E+01	9.34E+01	9.42E+01
1162	9	6.31E+10	7.82E+01	7.99E+01	8.48E+01	8.68E+01	8.88E+01	8.82E+01	8.91E+01
1163	10	7.89E+10	7.12E+01	7.31E+01	7.71E+01	7.93E+01	8.21E+01	8.12E+01	8.20E+01
1164	11	9.47E+10	6.53E+01	6.71E+01	7.07E+01	7.28E+01	7.61E+01	7.49E+01	7.57E+01
1165	12	1.26E+11	5.63E+01	5.80E+01	6.12E+01	6.33E+01	6.69E+01	6.54E+01	6.62E+01
1166	13	1.58E+11	5.02E+01	5.17E+01	5.46E+01	5.66E+01	6.02E+01	5.87E+01	5.95E+01
1167	14	2.21E+11	4.27E+01	4.40E+01	4.64E+01	4.83E+01	5.16E+01	5.02E+01	5.09E+01
1168	15	3.16E+11	3.66E+01	3.76E+01	3.96E+01	4.12E+01	4.41E+01	4.28E+01	4.34E+01
1169	16	3.16E+13	1.76E+01	1.77E+01	1.77E+01	1.78E+01	1.79E+01	1.79E+01	1.79E+01
1170									
1171	Variable: QPhChg.water.gas								
1172		Zone	A0	A1	A2	A3	A4	A5	A6
1173	Time								
1174	0	1.58E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1175	1	3.16E+09	-4.95E-08	-8.24E-08	3.83E-13	5.13E-14	-1.39E-14	6.99E-14	1.08E-13
1176	2	6.31E+09	-2.55E-08	-4.70E-08	5.68E-12	1.32E-11	-4.12E-14	1.73E-11	-5.54E-12
1177	3	9.47E+09	-1.65E-08	-3.29E-08	5.49E-11	1.28E-13	-2.35E-14	1.78E-13	-2.22E-13
1178	4	1.26E+10	-1.33E-08	-3.27E-08	4.95E-08	5.96E-09	7.74E-13	3.24E-11	1.69E-11
1179	5	1.58E+10	-7.37E-09	-2.49E-08	2.67E-08	2.37E-08	7.68E-16	1.68E-14	1.22E-14
1180	6	2.21E+10	4.45E-10	-1.73E-08	3.19E-08	6.58E-08	-1.62E-14	3.36E-14	9.99E-14
1181	7	3.16E+10	9.54E-09	-3.35E-09	-7.46E-08	5.73E-08	6.10E-07	1.37E-07	2.18E-13
1182	8	4.73E+10	1.27E-08	4.03E-09	-1.09E-07	-3.31E-09	5.97E-07	1.88E-07	3.14E-07
1183	9	6.31E+10	1.22E-08	4.21E-09	-3.64E-08	-3.35E-09	3.99E-07	1.27E-07	1.81E-07
1184	10	7.89E+10	1.03E-08	3.67E-09	-1.47E-08	-3.06E-09	2.68E-07	8.47E-08	1.22E-07
1185	11	9.47E+10	8.86E-09	3.19E-09	-8.02E-09	-2.54E-09	1.91E-07	6.07E-08	8.90E-08
1186	12	1.26E+11	7.44E-09	2.56E-09	-3.63E-09	-1.53E-09	1.15E-07	3.75E-08	5.81E-08
1187	13	1.58E+11	5.69E-09	2.09E-09	-2.31E-09	-1.26E-09	8.13E-08	2.62E-08	4.06E-08
1188	14	2.21E+11	4.50E-09	1.59E-09	-1.20E-09	-8.63E-10	4.94E-08	1.51E-08	2.78E-08
1189	15	3.16E+11	3.31E-09	1.24E-09	-6.69E-10	-4.47E-10	2.87E-08	9.21E-09	1.59E-08
1190	16	3.16E+13	1.22E-09	4.24E-10	1.94E-13	-7.54E-13	2.41E-10	7.34E-11	1.02E-10

Line #	Value or Contents								
1191									
1192	Variable: qPhChg.water.gas								
1193		Zone	A0	A1	A2	A3	A4	A5	A6
1194	Time								
1195	0	1.58E+09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1196	1	3.16E+09	-1.40E-08	9.14E-10	2.26E-12	2.80E-13	-5.73E-14	2.38E-13	7.80E-13
1197	2	6.31E+09	-7.99E-09	3.50E-09	5.19E-11	6.96E-11	-2.42E-13	6.07E-11	-4.44E-11
1198	3	9.47E+09	-5.78E-09	3.03E-09	7.66E-10	7.21E-13	-1.36E-13	6.27E-13	-1.17E-12
1199	4	1.26E+10	-4.96E-09	1.27E-09	5.12E-07	5.22E-08	3.36E-12	1.16E-10	1.42E-10
1200	5	1.58E+10	-3.98E-09	-1.34E-09	3.66E-07	2.86E-07	8.01E-15	5.81E-14	-2.23E-13
1201	6	2.21E+10	-2.28E-09	-9.55E-09	2.45E-07	6.64E-07	-6.81E-14	1.19E-13	4.87E-13
1202	7	3.16E+10	-5.58E-10	-1.45E-08	-4.47E-07	4.25E-07	4.07E-06	4.32E-07	2.22E-12
1203	8	4.73E+10	3.22E-10	-2.69E-09	-9.31E-07	-3.12E-08	4.11E-06	7.65E-07	2.34E-06
1204	9	6.31E+10	4.39E-10	-4.85E-10	-3.17E-07	-2.99E-08	2.70E-06	5.21E-07	1.37E-06
1205	10	7.89E+10	4.07E-10	6.81E-12	-1.27E-07	-2.72E-08	1.79E-06	3.50E-07	9.36E-07
1206	11	9.47E+10	3.62E-10	1.28E-10	-6.86E-08	-2.22E-08	1.27E-06	2.52E-07	6.83E-07
1207	12	1.26E+11	3.00E-10	1.68E-10	-3.09E-08	-1.35E-08	7.57E-07	1.56E-07	4.58E-07
1208	13	1.58E+11	2.39E-10	1.60E-10	-1.93E-08	-1.08E-08	5.31E-07	1.10E-07	3.14E-07
1209	14	2.21E+11	1.87E-10	1.37E-10	-1.02E-08	-7.47E-09	3.24E-07	6.41E-08	2.16E-07
1210	15	3.16E+11	1.42E-10	1.16E-10	-5.71E-09	-3.68E-09	1.86E-07	3.87E-08	1.23E-07
1211	16	3.16E+13	5.12E-11	4.54E-11	-9.53E-12	-6.58E-12	1.58E-09	3.05E-10	8.00E-10

Table VII-4 Example Zone Volume Calculation (grid block name: "tsw35_A0.f#1:1:28")

Input File (from Table VII-2)	**Volume Calculation ZONEAVG V1.2**	**Output File (to Table VII-3)**
Grid Block Width (x) Row 15	Δx=5.7000e-01	
Grid Block Height (z) Row 60	Δz=3.0000e+00	
Grid Block Thickness (y) Row 31	Δy=1.0000e+00	
	Volume = $\Delta x \Delta y \Delta z$ = 0.57*1.0*3.0 = 1.71	Table VII-3 Row 7

Table VII-5 Example Zone-Average Temperature Calculation (for Zone 0 at time step 1.577889E+09 sec = 50 yr)

Grid Blocks in Zone 0	Temperature at 50 yr	Grid Block Volume (m^3)	Temp. - Volume Product
(Table VII-2, Rows 538 through 552)	(Table VII-2, Rows 4297 through 4311)	(Table VII-3, Row 4 through 18)	
tsw35_A0.f#1:1:28	53.11517	1.710	90.82694
tsw35_A0.f#2:1:28	53.08694	1.050	55.74129
tsw35_A0.f#3:1:28	53.50336	0.993	52.68199
tsw35_A0.f#4:1:28	53.00732	1.0791	57.20020
tsw35_A0.f#5:1:28	52.94435	1.1391	60.30891
tsw35_A0.f#6:1:28	52.86107	1.260	66.60495
tsw35_A0.f#7:1:28	52.76662	1.0182	53.72697
tsw35_A0.f#8:1:28	52.64904	1.500	78.97356
tsw35_A0.f#9:1:28	52.42227	2.700	141.5401
tsw35_A0.f#10:1:28	51.94830	4.500	233.7674
tsw35_A0.f#11:1:28	50.97080	7.500	382.2810
tsw35_A0.f#12:1:28	49.09311	12.000	589.1173
tsw35_A0.f#13:1:28	46.13511	18.000	830.4320
tsw35_A0.f#14:1:28	42.47522	27.000	1146.831
tsw35_A0.f#15:1:28	39.29050	40.050	1573.585
Totals		121.4994	5413.618
Zone-Average Temperature 5413.618 / 121.4994 = 44.55675 (Table VII-3, Row 1133, 4th column)			

Table VII-6 Example Zone-Average Temperature Calculation (for Zone 6 at time step 1.577889E+09 sec = 50 yr)

Grid Blocks in Zone 0	**Temperature at 50 yr**	**Grid Block Volume (m^3)**	**Temp. - Volume Product**
(Table VII-2, Rows 898 to 901, & Rows 913 to 914)	**(Table VII-2, Rows 4657 to 4660, & Rows 4672 to 4673)**	**(Table VII-3, Row 421 through 426)**	
in_A6.f#1:1:52	78.79311	0.172710	13.60836
in_A6.f#2:1:52	78.35376	0.106050	8.309416
in_A6.f#3:1:52	77.77838	0.100293	7.800627
in_A6.f#4:1:52	77.02347	0.108989	8.394719
in_A6.f#1:1:53	75.61913	0.172710	13.06018
in_A6.f#2:1:53	75.09350	0.106050	7.963666
Total		0.766802	59.13697
Zone-Average Temperature 59.13697 / 0.766802 = 77.12155 (Table VII-3, Row 1153, last column)			

ATTACHMENT VIII SOFTWARE ROUTINE DOCUMENTATION FOR NUFT POST PROCESSOR: VFLUXPROF V1.1

ROUTINE PURPOSE AND DESCRIPTION

This attachment describes the initial issue of software routine: VFLUXPROF V1.1. This routine sorts one NUFT output file (*.ext) to obtain one output file containing the vertical component of the gas-phase total mass flux, along a vertical profile passing through the drift centerline. The structure of the output file is a table with columns corresponding to vertical position (z-index) and the rows corresponding to the time steps at which NUFT output was generated. The program listing of the VFLUXPROF routine is provided in Table VIII-1.

The routine is written in the "perl" scripting language for Unix, and is compatible with any 5.x version of the perl compiler. The program listing of the VFLUXPROF V1.1 is provided in Table VIII-1. The routine was run on a Sun Ultra 2 workstation with SunOS 5.5.1 operating system.

VALIDATION TEST CASE

Validation of the VFLUXPROF routine was performed by manually checking the input and output files. An example NUFT output file (file: "l4c4-LDTH60-1Dds_mc-ui-01.f.ext") is used as input to the VFLUXPROF routine. The resulting output file from the VFLUXPROF routine is called "l4c4-LDTH60-1Dds_mc-ui-01.f.ext.q.gas.vflux" and is listed in Table VIII-2.

The NUFT file ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext") and the VFLUXPROF output file ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext.q.gas.vflux") are available in electronic form (Attachment I).

In order to validate the VFLUXPROF routine it is necessary to understand the structure of a NUFT output (*.ext) file. The *.ext file is a single column of numbers or text entries, i.e. the numerical part of the file is a long vector. For inspecting this large file ("l4c4-LDTH60-1Dds_mc-ui-01.f.ext") it has been converted to an Excel spreadsheet with line numbers, which is available in electronic form (file: "AttachmentVIIRev00BCompleteTable2.xls" see Attachment I to this report). The following is a description of major blocks of information within the file.

For the example problem the 2-D model plane (with thickness y = 1 m) is defined by a 15 x 85 mesh. There are 15 grid blocks in the horizontal (x) direction and 85 grid blocks in the vertical (z) direction. The widths of 15 elements in the x-direction are given in Rows 15 through 29, while the heights of 85 elements in the z-direction are given in Rows 33 through 117. The total number of grid blocks is 15 x 85 = 1275.

In the NUFT output file, the names of the 1,275 grid blocks are then listed in Rows 133 through 1407. They are entered as eighty-five 15-block horizontal sequences, each one starting with the drift axis, and extending to the pillar axis (x-index from 1 to 15). Next, the NUFT output file (for 2-D "chimney" models without nested meshing) lists all pairs of grid blocks which adjoin in the vertical direction, along the vertical strip coincident with the drift axis. This list appears in Rows 1409 through 1492, and is exactly the vertical profile for which data are sorted using VFLUXPROF. The listing of grid block pairs continues, for a total of 2450 records, from Rows 1409 through 3858.

NUFT output data are written to the *.ext file in the same order that they appear in the list of grid block names, but the organization also depends on the number of scalar variables for which NUFT generates

output at each time step. For this input file that number is 5 (liquid saturation, air mass-fraction, temperature, evaporation rate per block, evaporation rate per volume). At each time step, 1275 values of each of these variables are written in turn, separate by timing and blocking parameters. Then 2450 values are written containing flux information. The vertical flux information used by VFLUXPROF is the first 85 of these values.

Each data value in the output file was manually checked and compared against the input data. That is, the sequence of data blocks was counted out and parsed, and the 85 values at the beginning of each 2450-value block of data, were compared to the VFLUXPROF output (Table VIII-2). A map of the structure of the intput and output files is shown in Table VIII-3. It was found that all the output data were in agreement with the input data. The routine provides correct results for the range of parameters obtained from NUFT outputs. Therefore, the software routine VFLUXPROF V1.1 is validated for its intended use within the validation range of 50 to 1,000,000 years.

This routine is valid for parsing the "q.gas" variable from the output of NUFT V3.0s, for any 2-D simulation problem. The vertical profile is always located along the boundary of the model corresponding to the x=1 grid block indices.

Table VIII-1 Program Listing for Software Routine VFLUXPROF V1.1

```
#!/usr/local/bin/perl -s

$_version = "vfluxprof.sh 1.2 10/20/99 13:48:27 LLNL";

print "$_version\n";
$x=1 unless defined($x);
$y=1 unless defined($y);

foreach $file (@ARGV) {
    print "Parsing file $file...\n";
    $pardata=&getPVals($file,$x,$y);
    foreach $param (keys(%{$pardata})) {
      next if $param eq 'zloc';
      print "Output parameter $param...\n";
      open(PAR,">$file.$param.vflux") || die "Cannot open output file $file.$par.vprof:
$!\n";
      &writeHeader(PAR,@{$pardata->{'zloc'}});
      $vdat=$pardata->{$param};
      foreach $i (0..$#{$vdat}) {
          &writeData(PAR,$i,$vdat->[$i]->{'time'},@{$vdat->[$i]->{'vprof'}});
      }
      close(PAR);
    }
}
sub writeData
{
    my($fl,$tidx,$time,@data)=@_;
    my($i);

    printf $fl "%d\t%e",$tidx,$time;
    foreach $i (0..$#data) {
      printf $fl "\t% 12e",$data[$i];
    }
    printf $fl "\n";
}
sub writeHeader
{
    my($fl,@z)=@_;
    my($num);

    printf $fl "\tZ Indices";
    foreach $i (1..$#z+1) {
      printf $fl "\t%12d",$i;
    }
    printf $fl "\n";
    printf $fl "Time\t  Distances";
    foreach $i (0..$#z) {
      printf $fl "\t% 12e",$z[$i];
    }
    printf $fl "\n";
}
sub getPVals
{
    my($fl,$xloc,$yloc)=@_;
    my($grd,@dz,$idxlst,$par,$info,$zloc,$i);

    open(RES,"<$fl")||die "Unable to open $fl: $!\n";
    $info=&getFileInfo(RES);
    $idxlst=&getIndices("#$x:$y:.*#$x:$y:", @{$info->{'vblk'}});
    die "No blocks available at x=$x and y=$y\n" unless $idxlst;
    print "Extracting data...\n";
```

```
    $par=&getLines(RES,$info->{'vvar'},scalar(@{$info->{'svar'}}),@{$idxlst});
    close(RES);
    $zloc=[];
    $zloc->[0]=$dz[0];
    foreach $i (1..$#dz-1) {
       $zloc->[$i]=$zloc[$i-1]+$dz[$i];
    }
    $par->{'zloc'}=$zloc;
    foreach $i (0..$#{$idxlst}) {
       @blk=split(/ /,$idxlst->[$i]);
       $k0=(split(/:/,$blk[0]))[2];
       $k1=(split(/:/,$blk[1]))[2];
       push(@flip,$i) if $k1<$k0;
    }
    while (($key,$dat)=each(%{$par})) {
       foreach $i (@flip) {
           $dat->{'vprof'}->[$i] *= -1 if $dat->{'vprof'}->[$i];
       }
    }
    return $par;
}
sub getLines
{
    my($in,$nlst,$noff,@idx)=@_;
    my($name,$out,$i,$vidx,$data,$dout,$td);

    $out={};
    foreach $name (@{$nlst}) {
       $out->{$name}=[];
    }
    while ($data=&getData($in)) {
       $vidx=$data->{'var'}-$noff;
       next if $vidx>$#{$nlst} || $vidx<0;
       $name=$nlst->[$vidx];
       $dout=[];
       for $i (0..$#idx) {
           next unless defined($idx[$i]);
           $dout->[$i]=$data->{'data'}->[$idx[$i]];
       }
       $td={};
       $td->{'time'}=$data->{'time'};
       $td->{'vprof'}=$dout;
       push(@{$out->{$name}}, $td);
    }
    return $out;
}
#
# Pack all ext header info into one structure
sub getFileInfo
{
    my($in)=@_[0];
    my($info,$grd);

    $grd=&readGrid($in);
    die "Could not find grid\n" unless $grd;
    $info=&readDesc($in);
    die "Unable to parse block descriptions\n" unless $info;
    $info->{'grid'}=$grd;
    return $info;
}
#
# Read a single timestep, single variable data block
sub getData
```

```
{
    my($in)=@_[0];
    my($out,$vidx,$data,$time);

    return if eof $in;
    $out={};
    $time=<$in>+0.0;
    $vidx=<$in>-1;
    $name=$nlst->[$vidx];
    $data=&readDataBlk($in,<$in>+0);
    $out->{'data'}=$data;
    $out->{'var'}=$vidx;
    $out->{'time'}=$time;
    return $out;
}
#
# Extract a list of indices into the date blocks for
# block names matching a given (RE) pattern
sub getIndices
{
    my($pat,@sb)=@_;
    my($i,$idx);

    $idx=[];
    foreach $i (0..$#sb) {
       if ($sb[$i] =~ /$pat/) {
           push(@{$idx},$i);
       }
    }
    return $idx;
}
#
# Read the variable and block descriptions from the file
# Information stored in hash table:
# $out->{'svar'}==ordered array of scalar variable names
# $out->{'vvar'}==ordered array of connection variable names
# $out->{'sblk'}==ordered array of block names for scalar (element) variables
# $out->{'vblk'}==ordered array of block connections for vector (connection) varibles
# $out->{'vnames'}==ordered array of all varible names
sub readDesc
{
    my($in)=@_[0];
    my($out,$line,$num,$i);

    $out={};
    do {
       $line=<$in>;
    } while $line=~/^\$/;
    $out->{'svar'}=&readDataBlk($in,$line+0);
    $out->{'vvar'}=&readDataBlk($in,<$in>+0);
    $out->{'sblk'}=&readDataBlk($in,<$in>+0);
    $out->{'vblk'}=&readDataBlk($in,<$in>+0);
    $out->{'vnames'}=[];
    @{$out->{'vnames'}}=@{$out->{'svar'}};
    push(@{$out->{'vnames'}},@{$out->{'vvar'}});
    $num=0;
    $num+=scalar(@{$out->{'svar'}}) if defined(@{$out->{'svar'}});
    $num+=scalar(@{$out->{'vvar'}}) if defined(@{$out->{'vvar'}});
    print "num variables $num\n";
    die "No variables found in file\n" unless $num;
    foreach $i (1..5*$num) {
       $line=<$in>;
    }
```

```
    return $out;
}
#
# Read one block from extfile of $num lines
# return reference to array of lines
sub readDataBlk
{
    my($in,$num)=@_;
    my($out,$i,$line);

    $out=[] if $num;
    foreach $i (1..$num) {
       $line=<$in>;
       chomp $line;
       push(@{$out}, $line);
    }
    return $out;
}
#
# Read the grid definition from the file into data area
# for rectangular ext file grid will result in
# $grd->{'type'}=='rect'
# $grd->{'nx'}=value from $nx line
#    similar from 'ny','nz'
# $grd->{'x'}=array of values from $dx block
# similar for 'y','z'
# return reference to structure
#
sub readGrid
{
    my($in)=@_[0];
    my($line,$grd,$gptr,@tok);

    $line=<$in> until $line=~s/^\$//;
    chomp($line);
    $grd={};
    $grd->{'type'}=$line;
    $gptr=$grd;
    while ($line=<$in>) {
       chomp($line);
       $line=~/^\$continuum/ && do {
           @tok=split(/ /,$line);
           $grd->{$tok[1]}={};
           $gptr=$grd->{$tok[1]};
           next;
       };
       $line=~s/^\$n// && do {
           @tok=split(/ /,$line);
           $gptr->{"n$tok[0]"}=0+$tok[1];
           next;
       };
       $line=~s/^\$d// && do {
           $gptr->{$line}=&readDataBlk($in,$gptr->{"n$line"});
           next;
       };
       $line=~/^\$end/ && last;
    }
    return $grd;
}
```

Table VIII-2 Listing of VFLUXPROF Output File "l4c4-LDTH60-1Dds_ui-01.f.ext.q.ga.vflux". (Each block of data is one output record.)

Line #				
1	Z Indices	=	1	
2	Time	Distances	0.000000e+00	
3	0	1.577880e+09		
4	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
5	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
6	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
7	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
8	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
9	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
10	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
11	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
12	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
13	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
14	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
15	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
16	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
17	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
18	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
19	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
20	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
21	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
22	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
23	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
24	-0.000000e+00	-0.000000e+00	-0.000000e+00	-0.000000e+00
25				
26	1	3.155760e+09		
27	2.471739e-10	2.489617e-10	2.485916e-10	2.486410e-10
28	2.488574e-10	2.494158e-10	2.545599e-10	3.116295e-10
29	2.776163e-10	2.191378e-10	3.197228e-10	3.096037e-10
30	3.360253e-10	2.669949e-10	2.641474e-10	2.631553e-10
31	2.806556e-10	3.499717e-10	7.033902e-10	9.633458e-10
32	2.412567e-09	1.822180e-08	3.771130e-08	6.671471e-08
33	9.123673e-08	1.127203e-07	1.516054e-07	4.352049e-07
34	2.283642e-06	3.331940e-06	3.934694e-07	5.299229e-08
35	5.050921e-08	5.493046e-08	6.039543e-08	3.375497e-08
36	3.704311e-08	3.999939e-08	4.238661e-08	4.395478e-08
37	4.442361e-08	4.343983e-08	3.896953e-08	3.229877e-08
38	2.165604e-08	-0.000000e+00	-0.000000e+00	-0.000000e+00
39	-0.000000e+00	-0.000000e+00	-0.000000e+00	8.344060e-08
40	1.522141e-07	1.386789e-07	1.351019e-07	1.414574e-07
41	1.565522e-07	1.746876e-07	-1.267444e-08	6.482068e-08
42	8.044011e-08	6.563864e-08	4.026657e-08	1.446392e-08
43	5.492097e-09	1.604002e-09	8.901475e-10	1.288063e-10
44	3.805158e-11	1.590347e-11	2.127490e-11	2.040924e-11
45	1.919838e-11	1.771468e-11	1.603314e-11	1.519159e-11
46	1.847729e-11	3.637439e-10	1.226724e-10	5.185678e-11
47	2.836035e-11	3.261628e-11	2.838796e-11	-0.000000e+00
48				
49	2	6.311520e+09		
50	2.172540e-10	2.187685e-10	2.183204e-10	2.183392e-10
51	2.185572e-10	2.193067e-10	2.259323e-10	3.057499e-10
52	2.555284e-10	2.022451e-10	3.316746e-10	3.677288e-10

53	4.277041e-10	2.620385e-10	2.625073e-10	2.533466e-10
54	2.934154e-10	3.365565e-10	6.291922e-10	9.086817e-10
55	2.075939e-09	1.298157e-08	2.658775e-08	4.784860e-08
56	6.768406e-08	8.722056e-08	1.209437e-07	2.633352e-07
57	1.115432e-06	1.967091e-06	2.211683e-06	3.721159e-07
58	-6.041912e-08	-7.601014e-08	-7.882452e-08	-3.960959e-08
59	-3.312526e-08	-2.731405e-08	-2.177710e-08	-1.650337e-08
60	-1.151051e-08	-6.956262e-09	-1.771561e-09	7.969187e-10
61	1.865388e-09	-0.000000e+00	-0.000000e+00	-0.000000e+00
62	-0.000000e+00	-0.000000e+00	-0.000000e+00	2.981308e-08
63	3.417689e-09	-9.299011e-11	-5.144918e-10	4.557815e-09
64	1.562172e-08	2.723461e-08	9.789213e-09	1.939342e-08
65	4.587895e-08	3.901195e-08	2.272124e-08	7.514976e-09
66	2.179850e-09	1.771288e-10	-5.158053e-11	-2.085465e-10
67	-1.022302e-10	-1.960355e-10	2.557355e-11	2.871348e-11
68	2.938948e-11	2.931321e-11	2.897248e-11	2.660480e-11
69	2.794468e-11	3.137153e-10	1.122503e-10	5.605323e-11
70	3.247253e-11	3.602292e-11	3.122685e-11	-0.000000e+00
71				
72	3	9.467280e+09		
73	1.578184e-10	1.574449e-10	1.571025e-10	1.573621e-10
74	1.580918e-10	1.604314e-10	1.726328e-10	3.208386e-10
75	2.297873e-10	1.826316e-10	4.009238e-10	5.564880e-10
76	6.286948e-10	2.621826e-10	2.661869e-10	2.408704e-10
77	3.069537e-10	3.325627e-10	6.208150e-10	9.251747e-10
78	2.013258e-09	1.128598e-08	2.274217e-08	4.066121e-08
79	5.767985e-08	7.474872e-08	1.018315e-07	1.969836e-07
80	7.636048e-07	1.515684e-06	1.772686e-06	1.860516e-06
81	5.519052e-07	-1.371246e-07	-1.423980e-07	-7.348664e-08
82	-6.575217e-08	-5.897429e-08	-5.237201e-08	-4.565362e-08
83	-3.876118e-08	-3.172894e-08	-2.201305e-08	-1.497123e-08
84	-8.120252e-09	-0.000000e+00	-0.000000e+00	-0.000000e+00
85	-0.000000e+00	-0.000000e+00	-0.000000e+00	6.722559e-09
86	-5.714626e-08	-5.590218e-08	-5.359572e-08	-4.539316e-08
87	-2.863427e-08	-1.073556e-08	-3.489444e-08	7.744442e-09
88	3.276498e-08	2.933677e-08	1.712883e-08	5.383059e-09
89	1.102503e-09	-4.063112e-10	-4.688847e-10	-4.151903e-10
90	-2.060115e-10	-4.940638e-10	2.997079e-11	3.663314e-11
91	3.831007e-11	3.871405e-11	3.904067e-11	3.496692e-11
92	3.135680e-11	1.024755e-10	4.606293e-11	3.161773e-11
93	2.484934e-11	2.961194e-11	2.537392e-11	-0.000000e+00
94				
95	4	1.262304e+10		
96	2.740446e-10	2.686965e-10	2.695445e-10	2.712066e-10
97	2.748963e-10	2.819538e-10	3.019184e-10	5.510105e-10
98	4.139068e-10	3.305706e-10	7.402675e-10	9.829981e-10
99	1.113045e-09	5.079206e-10	5.005167e-10	4.613332e-10
100	5.570793e-10	5.786358e-10	8.736644e-10	1.199538e-09
101	2.278147e-09	1.062097e-08	2.079910e-08	3.669127e-08
102	5.212168e-08	6.746400e-08	9.285906e-08	1.739985e-07
103	6.193699e-07	1.256223e-06	1.483741e-06	1.627610e-06
104	1.613411e-06	1.315300e-06	3.696233e-07	-1.511157e-07
105	-1.293656e-07	-1.123174e-07	-9.769127e-08	-8.445115e-08
106	-7.197564e-08	-5.989565e-08	-4.350892e-08	-3.114849e-08
107	-1.811970e-08	-0.000000e+00	-0.000000e+00	-0.000000e+00
108	-0.000000e+00	-0.000000e+00	-0.000000e+00	-8.030550e-09
109	-9.393979e-08	-8.978407e-08	-8.620092e-08	-7.674115e-08

110	-5.679566e-08	-3.434261e-08	-7.052892e-08	2.157109e-09
111	2.506099e-08	2.338489e-08	1.380163e-08	4.182314e-09
112	4.987390e-10	-7.498401e-10	-7.265095e-10	-5.503808e-10
113	-2.737704e-10	-8.237415e-10	5.190041e-11	6.168707e-11
114	6.378921e-11	6.402631e-11	6.430304e-11	5.843209e-11
115	4.854307e-11	-2.072562e-10	-4.851410e-11	9.160595e-12
116	1.521891e-11	2.071340e-11	1.772011e-11	-0.000000e+00
117				
118	5	1.577880e+10		
119	1.772795e-10	1.582031e-10	1.575281e-10	1.585508e-10
120	1.613010e-10	1.663274e-10	1.958979e-10	6.052183e-10
121	3.517435e-10	2.779586e-10	8.472085e-10	1.248536e-09
122	1.358167e-09	4.490811e-10	4.231578e-10	3.527427e-10
123	4.524686e-10	4.491087e-10	7.260274e-10	1.054308e-09
124	2.089882e-09	9.781232e-09	1.899015e-08	3.349955e-08
125	4.756704e-08	6.205547e-08	8.472411e-08	1.508560e-07
126	4.858621e-07	1.065380e-06	1.310059e-06	1.489539e-06
127	1.597373e-06	1.679938e-06	1.745997e-06	2.715078e-07
128	-6.411347e-08	-7.143417e-08	-7.278994e-08	-6.995633e-08
129	-6.420612e-08	-5.637378e-08	-4.309264e-08	-3.174251e-08
130	-1.890534e-08	-0.000000e+00	-0.000000e+00	-0.000000e+00
131	-0.000000e+00	-0.000000e+00	-0.000000e+00	-1.217258e-08
132	-1.016828e-07	-9.801571e-08	-9.736588e-08	-9.360175e-08
133	-7.832241e-08	-6.105826e-08	-8.052196e-08	3.192071e-09
134	2.115361e-08	1.965271e-08	1.152662e-08	3.259416e-09
135	8.866218e-12	-1.062083e-09	-9.709903e-10	-6.981144e-10
136	-3.595140e-10	-1.223966e-09	3.620276e-11	5.056158e-11
137	5.440338e-11	5.559708e-11	5.725867e-11	5.259124e-11
138	3.676692e-11	-5.890499e-10	-1.875373e-10	-3.969229e-11
139	-4.608106e-12	3.481639e-12	2.460798e-12	-0.000000e+00
140				
141	6	2.209032e+10		
142	2.139358e-10	1.648878e-10	1.639618e-10	1.660871e-10
143	1.696681e-10	1.783015e-10	2.167539e-10	8.591735e-10
144	4.370547e-10	3.550285e-10	1.243258e-09	1.852856e-09
145	2.003347e-09	6.754665e-10	5.993086e-10	4.695544e-10
146	5.764196e-10	5.476328e-10	7.779994e-10	1.102279e-09
147	2.039353e-09	8.719178e-09	1.657653e-08	2.904753e-08
148	4.143151e-08	5.357181e-08	7.042032e-08	1.078342e-07
149	2.799606e-07	8.667388e-07	1.266369e-06	1.572372e-06
150	1.776688e-06	1.938153e-06	2.071668e-06	1.116896e-06
151	1.147321e-06	1.198258e-06	1.263927e-06	1.343936e-06
152	1.440483e-06	1.020521e-06	-1.668588e-07	-1.233274e-07
153	-7.553361e-08	-0.000000e+00	-0.000000e+00	-0.000000e+00
154	-0.000000e+00	-0.000000e+00	-0.000000e+00	-8.420979e-08
155	-2.934233e-07	-2.685168e-07	-2.490232e-07	-2.203450e-07
156	-1.846955e-07	-1.472381e-07	-2.312907e-08	1.365557e-08
157	1.963540e-08	1.676194e-08	9.437686e-09	2.409845e-09
158	-4.264356e-10	-1.356108e-09	-1.231317e-09	-8.368017e-10
159	-4.345159e-10	-9.993719e-10	5.798826e-11	7.205296e-11
160	7.563846e-11	7.776301e-11	8.069361e-11	7.479489e-11
161	4.235143e-11	-1.564820e-09	-5.017977e-10	-1.433951e-10
162	-5.138677e-11	-4.379782e-11	-3.256527e-11	-0.000000e+00
163				
164	7	3.155760e+10		
165	1.764486e-10	1.062108e-10	1.055961e-10	1.071074e-10
166	1.126331e-10	1.237719e-10	1.784784e-10	1.056132e-09

167	4.849897e-10	3.999081e-10	1.619015e-09	2.416554e-09
168	2.579774e-09	7.884167e-10	6.607552e-10	4.862102e-10
169	5.857002e-10	5.255109e-10	6.921764e-10	9.641254e-10
170	1.747555e-09	7.431877e-09	1.405940e-08	2.514586e-08
171	3.632945e-08	4.730925e-08	6.006620e-08	7.913986e-08
172	1.121107e-07	1.869922e-07	4.203845e-07	1.039415e-06
173	1.509130e-06	1.783300e-06	1.981957e-06	1.079806e-06
174	1.119950e-06	1.180781e-06	1.257355e-06	1.349938e-06
175	1.461613e-06	1.597688e-06	1.836336e-06	2.067575e-06
176	1.554887e-06	-0.000000e+00	-0.000000e+00	-0.000000e+00
177	-0.000000e+00	-0.000000e+00	-0.000000e+00	-8.480854e-08
178	-2.628157e-07	-2.327406e-07	-2.001294e-07	-9.532061e-08
179	9.332793e-09	2.796888e-08	3.228277e-08	3.035037e-08
180	2.542463e-08	1.789311e-08	9.224242e-09	2.391264e-0
181	-2.122529e-10	-1.178201e-09	-1.161672e-09	-8.589725e-10
182	-5.023304e-10	-1.213740e-09	2.673359e-11	4.247663e-11
183	4.772533e-11	5.171875e-11	5.826647e-11	5.414541e-11
184	7.180132e-12	-3.230936e-09	-1.099084e-09	-3.402536e-10
185	-1.294973e-10	-9.318167e-11	-5.476579e-11	-0.000000e+00
186				
187	8	4.733640e+10		
188	1.396677e-10	4.188492e-11	4.116605e-11	4.179524e-11
189	4.677340e-11	5.793016e-11	1.323090e-10	1.190583e-09
190	5.224088e-10	4.215204e-10	1.922209e-09	2.852360e-09
191	2.977136e-09	8.435888e-10	6.511748e-10	4.451653e-10
192	5.189448e-10	4.263309e-10	5.096288e-10	6.957682e-10
193	1.207715e-09	5.071921e-09	9.473566e-09	1.679646e-08
194	2.427135e-08	3.139827e-08	3.891027e-08	4.861242e-08
195	5.922238e-08	7.050965e-08	7.818955e-08	8.654961e-08
196	9.038981e-08	1.042106e-07	4.135498e-07	5.503051e-07
197	5.812189e-07	6.153319e-07	6.533578e-07	6.960720e-07
198	7.444113e-07	8.001363e-07	8.885863e-07	9.685231e-07
199	1.055576e-06	-0.000000e+00	-0.000000e+00	-0.000000e+00
200	-0.000000e+00	-0.000000e+00	-0.000000e+00	-9.166111e-07
201	-3.154374e-07	1.239298e-08	3.074555e-08	4.073803e-08
202	4.275853e-08	3.958792e-08	3.484944e-08	2.929031e-08
203	2.288739e-08	1.574951e-08	8.208934e-09	2.402920e-09
204	2.914255e-10	-5.943509e-10	-7.296001e-10	-6.199969e-10
205	-4.282412e-10	-1.113488e-09	-2.437629e-11	-9.423876e-12
206	-3.864809e-12	3.122924e-12	1.369573e-11	6.574491e-12
207	-5.744868e-11	-5.462199e-09	-1.835057e-09	-5.957490e-10
208	-2.280574e-10	-1.320094e-10	-5.561084e-11	-0.000000e+00
209				
210	9	6.311520e+10		
211	1.190092e-10	5.827782e-12	-9.571220e-13	-2.990188e-12
212	-2.073099e-12	6.813267e-12	7.879794e-11	1.203125e-09
213	4.071357e-10	3.449117e-10	1.829751e-09	2.756315e-09
214	2.773521e-09	6.684738e-10	4.551742e-10	2.426469e-10
215	2.767596e-10	1.687670e-10	2.009734e-10	3.210427e-10
216	6.621387e-10	3.425737e-09	6.563402e-09	1.181146e-08
217	1.710061e-08	2.216916e-08	2.739518e-08	3.364959e-08
218	4.081354e-08	4.746526e-08	5.282547e-08	5.731905e-08
219	5.996265e-08	6.411380e-08	1.709641e-07	3.291896e-07
220	3.523815e-07	3.767974e-07	3.919715e-07	4.402852e-07
221	4.738012e-07	5.131098e-07	5.751391e-07	6.298425e-07
222	6.906510e-07	-0.000000e+00	-0.000000e+00	-0.000000e+00
223	-0.000000e+00	-0.000000e+00	-0.000000e+00	-6.053584e-07

224	-2.566518e-08	4.700622e-08	4.562777e-08	4.359683e-08
225	3.887298e-08	3.425555e-08	2.940799e-08	2.406944e-08
226	1.871951e-08	1.289356e-08	6.816075e-09	2.096691e-09
227	5.104739e-10	-1.911822e-10	-3.760371e-10	-3.792439e-10
228	-2.990214e-10	-7.680146e-10	-3.650167e-11	-2.629346e-11
229	-2.266772e-11	-1.601891e-11	-6.408757e-12	-1.852309e-11
230	-8.133513e-11	-6.132810e-09	-2.053970e-09	-6.831427e-10
231	-2.630846e-10	-1.482932e-10	-5.913702e-11	-0.000000e+00
232				
233	10	7.889400e+10		
234	5.079942e-11	6.012008e-12	5.827104e-12	6.867666e-12
235	1.121505e-11	1.954242e-11	6.259700e-11	7.891190e-10
236	3.022748e-10	2.530592e-10	1.238954e-09	1.823766e-09
237	1.831353e-09	5.559744e-10	3.983315e-10	2.515161e-10
238	2.777228e-10	2.123403e-10	2.360464e-10	3.175656e-10
239	5.544374e-10	2.590605e-09	4.932153e-09	8.837097e-09
240	1.278459e-08	1.651437e-08	2.024002e-08	2.500081e-08
241	3.013529e-08	3.556119e-08	3.953432e-08	4.414193e-08
242	4.722997e-08	5.015103e-08	9.604933e-08	2.081229e-07
243	2.245872e-07	2.414621e-07	2.597009e-07	2.819439e-07
244	3.097962e-07	3.363608e-07	3.775894e-07	4.210217e-07
245	4.660766e-07	-0.000000e+00	-0.000000e+00	-0.000000e+00
246	-0.000000e+00	-0.000000e+00	-0.000000e+00	-3.936189e-07
247	2.431779e-08	5.055398e-08	4.528267e-08	3.964725e-08
248	3.405560e-08	2.938202e-08	2.473159e-08	2.032031e-08
249	1.579487e-08	1.095680e-08	5.976416e-09	2.010836e-09
250	7.123303e-10	1.050014e-10	-2.229963e-11	-1.255166e-10
251	-1.294045e-10	-3.383628e-11	-1.688041e-11	-1.431072e-11
252	-1.344538e-11	-1.084637e-11	-3.779027e-12	-1.578638e-11
253	-7.298207e-11	-6.070789e-09	-2.110218e-09	-7.284521e-10
254	-3.003356e-10	-1.814200e-10	-7.947896e-11	-0.000000e+00
255				
256	11	9.467280e+10		
257	1.380949e-11	-4.812711e-12	-5.422728e-12	-4.109232e-12
258	-6.155410e-13	5.049934e-12	3.914920e-11	6.065053e-10
259	2.143057e-10	1.867300e-10	9.413209e-10	1.365976e-09
260	1.344504e-09	3.982919e-10	2.778535e-10	1.704362e-10
261	1.877260e-10	1.406830e-10	1.621224e-10	2.221177e-10
262	4.004597e-10	2.046463e-09	3.973689e-09	7.195630e-09
263	1.044134e-08	1.351229e-08	1.657376e-08	2.050392e-08
264	2.484383e-08	2.967898e-08	3.320721e-08	3.805457e-08
265	4.153830e-08	4.456253e-08	7.141789e-08	1.434320e-07
266	1.589780e-07	1.727522e-07	1.859450e-07	2.003727e-07
267	2.192012e-07	2.418215e-07	2.704511e-07	2.992000e-07
268	3.330642e-07	-0.000000e+00	-0.000000e+00	-0.000000e+00
269	-0.000000e+00	-0.000000e+00	-0.000000e+00	-2.769555e-07
270	3.637914e-08	4.859869e-08	4.198289e-08	3.569339e-08
271	3.002893e-08	2.562582e-08	2.141614e-08	1.751964e-08
272	1.359222e-08	9.417638e-09	5.142628e-09	1.749570e-09
273	6.636547e-10	1.606706e-10	5.733562e-11	-5.104612e-11
274	-7.268420e-11	-1.140152e-10	-3.314764e-11	-3.211926e-11
275	-3.164237e-11	-3.032293e-11	-2.525910e-11	-3.505940e-11
276	-7.880543e-11	-5.118412e-09	-1.811978e-09	-6.492523e-10
277	-2.793325e-10	-1.680435e-10	-6.937764e-11	-0.000000e+00
278				
279	12	1.262304e+11		
280	-1.663557e-09	-1.678686e-09	-1.696725e-09	-1.747012e-09

281	-1.493174e-09	-1.709490e-09	-1.719067e-09	-1.197793e-09
282	-1.728403e-09	-1.432280e-09	-1.136442e-09	-1.501639e-09
283	-5.797101e-10	-1.198040e-09	-1.476945e-09	-1.901472e-09
284	-1.932846e-09	-1.911260e-09	-2.028336e-09	-1.899185e-09
285	-1.592925e-09	5.820820e-10	1.373507e-09	4.191835e-09
286	7.503259e-09	1.008395e-08	1.232408e-08	1.616505e-08
287	1.894313e-08	2.308370e-08	2.785059e-08	3.228527e-08
288	3.608593e-08	3.966448e-08	5.564120e-08	5.723596e-08
289	1.105828e-07	1.182003e-07	1.261936e-07	9.348376e-08
290	1.535656e-07	1.644547e-07	1.458075e-07	2.063981e-07
291	2.223978e-07	-0.000000e+00	-0.000000e+00	-0.000000e+00
292	-0.000000e+00	-0.000000e+00	-0.000000e+00	5.629411e-08
293	4.445695e-08	4.481801e-08	3.900149e-08	3.172685e-08
294	2.711861e-08	2.313674e-08	1.862234e-08	1.591637e-08
295	1.304394e-08	9.765895e-09	6.231336e-09	3.203663e-09
296	1.075188e-09	5.514059e-10	4.465296e-10	1.285849e-10
297	8.354345e-11	1.160053e-10	-3.643476e-13	-2.781912e-12
298	-2.560491e-12	-4.971020e-12	-2.674770e-12	-8.691034e-12
299	5.814761e-11	-2.426767e-09	-1.042527e-09	-3.801604e-10
300	-1.758267e-10	-1.220696e-10	-4.202433e-11	-0.000000e+00
301				
302	13	1.577880e+11		
303	-1.671002e-09	-1.655333e-09	-1.651564e-09	-1.652668e-09
304	-1.654668e-09	-1.599650e-09	-1.674599e-09	-1.242627e-09
305	-1.424410e-09	-1.176040e-09	-9.202613e-10	-1.304364e-09
306	-4.562166e-10	-1.217512e-09	-1.462475e-09	-1.514530e-09
307	-1.472210e-09	-1.493584e-09	-1.601569e-09	-1.449529e-09
308	-1.244483e-09	1.615431e-11	1.185185e-09	3.102368e-09
309	5.626146e-09	7.855019e-09	9.617437e-09	1.247838e-08
310	1.589565e-08	1.936385e-08	2.225979e-08	2.738293e-08
311	3.081780e-08	3.368756e-08	4.383170e-08	6.834094e-08
312	7.393163e-08	6.770949e-08	9.045959e-08	9.677537e-08
313	1.034842e-07	1.020078e-07	1.281222e-07	1.217619e-07
314	1.535189e-07	-0.000000e+00	-0.000000e+00	-0.000000e+00
315	-0.000000e+00	-0.000000e+00	-0.000000e+00	-7.951245e-08
316	4.207681e-08	4.072832e-08	3.356972e-08	2.765715e-08
317	2.225411e-08	1.884778e-08	1.571454e-08	1.287630e-08
318	1.010064e-08	7.194448e-09	4.274922e-09	1.940185e-09
319	7.418676e-10	3.662875e-10	2.822835e-10	1.196672e-10
320	9.601161e-11	8.035662e-11	5.729818e-11	6.689222e-11
321	6.679364e-11	6.253952e-11	7.159613e-11	9.868249e-11
322	5.833668e-11	-1.947391e-09	-6.663103e-10	-2.520442e-10
323	-1.219429e-10	-7.900909e-11	-2.776465e-11	-0.000000e+00
324				
325	14	2.209032e+11		
326	3.301961e-10	3.789775e-10	3.612533e-10	3.346078e-10
327	2.992890e-10	3.172320e-10	3.359323e-10	6.061012e-10
328	1.978170e-10	1.696959e-10	4.225361e-10	5.265151e-10
329	5.066097e-10	3.113413e-10	4.800850e-10	3.200733e-10
330	3.067142e-10	3.359699e-10	3.595172e-10	3.594211e-10
331	4.723519e-10	1.545791e-09	3.094765e-09	4.880052e-09
332	6.732000e-09	8.724016e-09	1.007813e-08	1.265679e-08
333	1.580863e-08	1.874464e-08	2.119037e-08	2.531123e-08
334	2.997491e-08	3.271394e-08	3.966439e-08	5.033420e-08
335	5.383328e-08	5.737732e-08	3.937516e-08	7.000691e-08
336	7.381671e-08	5.659297e-08	8.971629e-08	9.333823e-08
337	7.485957e-08	-0.000000e+00	-0.000000e+00	-0.000000e+00

338	-0.000000e+00	-0.000000e+00	-0.000000e+00	5.187480e-08
339	4.186616e-08	3.726197e-08	3.128940e-08	2.558570e-08
340	2.029732e-08	1.738813e-08	1.459191e-08	1.203810e-08
341	9.457251e-09	6.309492e-09	3.378017e-09	1.367452e-09
342	7.609486e-10	6.709841e-10	5.710638e-10	1.911495e-10
343	1.393200e-10	1.553281e-10	5.976508e-13	-5.719769e-12
344	-8.805510e-12	-8.119463e-12	-7.005476e-12	-7.612674e-12
345	2.831062e-11	2.127468e-10	-2.453901e-10	-1.306293e-10
346	-6.094694e-11	-2.745030e-11	-7.875680e-12	-0.000000e+00
347				
348	15	3.155760e+11		
349	6.612882e-10	7.447578e-10	7.131694e-10	6.828459e-10
350	6.410887e-10	6.363890e-10	6.480363e-10	8.522903e-10
351	1.624841e-10	2.306460e-10	3.631245e-10	3.943250e-10
352	3.987029e-10	1.158473e-10	5.894170e-11	5.727064e-11
353	3.122202e-11	-7.211897e-12	3.349531e-12	3.017709e-11
354	1.284125e-10	1.167434e-09	2.030797e-09	3.437049e-09
355	4.808954e-09	6.452406e-09	7.596126e-09	9.204864e-09
356	1.151371e-08	1.467375e-08	1.666188e-08	1.989567e-08
357	2.259444e-08	2.489979e-08	2.929393e-08	3.223669e-08
358	1.999775e-08	4.049351e-08	4.281771e-08	4.528979e-08
359	4.766787e-08	3.734355e-08	5.709617e-08	5.836729e-08
360	4.472668e-08	-0.000000e+00	-0.000000e+00	-0.000000e+00
361	-0.000000e+00	-0.000000e+00	-0.000000e+00	3.891302e-08
362	3.597871e-08	3.208545e-08	2.588668e-08	2.135727e-08
363	1.724880e-08	1.393927e-08	1.156435e-08	9.457411e-09
364	7.444316e-09	5.420440e-09	3.365381e-09	1.699207e-09
365	6.723915e-10	3.695437e-10	2.831803e-10	9.607827e-11
366	6.742687e-11	6.344559e-11	1.133926e-11	1.173325e-11
367	1.185954e-11	1.162977e-11	1.221471e-11	1.571999e-11
368	3.469135e-11	-1.494034e-11	-1.269242e-10	-3.304329e-11
369	5.745898e-12	-8.080538e-12	-9.435583e-12	-0.000000e+00
370				
371	16	3.155760e+13		
372	-1.082003e-10	-5.221504e-11	-5.199545e-11	-5.177120e-11
373	-5.153404e-11	-5.123393e-11	-5.050667e-11	-5.102696e-11
374	-2.558444e-11	-4.659502e-11	-3.588581e-11	-5.877219e-11
375	-1.792370e-11	-4.186150e-11	-4.862118e-11	-4.917456e-11
376	-4.885122e-11	-4.886155e-11	-4.874107e-11	-4.731215e-11
377	-4.204510e-11	-2.819542e-11	-4.360171e-12	3.412892e-11
378	7.286036e-11	1.088598e-10	1.446045e-10	1.915476e-10
379	2.456554e-10	3.155435e-10	3.765732e-10	4.754490e-10
380	5.634199e-10	6.376057e-10	7.200168e-10	5.824348e-10
381	6.380532e-10	7.014158e-10	7.533466e-10	8.079939e-10
382	8.472829e-10	8.751926e-10	8.809014e-10	8.420590e-10
383	7.408887e-10	-0.000000e+00	-0.000000e+00	-0.000000e+00
384	-0.000000e+00	-0.000000e+00	-0.000000e+00	6.208145e-10
385	1.210728e-09	1.002935e-09	8.206303e-10	6.529402e-10
386	5.203670e-10	4.291965e-10	3.498871e-10	2.805254e-10
387	2.144331e-10	1.464391e-10	7.894893e-11	2.622343e-11
388	1.120083e-11	4.797133e-12	3.809915e-12	2.276718e-12
389	2.001478e-12	1.234107e-12	3.666985e-13	4.125901e-13
390	4.961561e-13	5.534125e-13	5.052088e-13	8.454612e-13
391	2.508503e-12	2.764822e-10	1.019946e-10	4.845023e-11
392	3.380556e-11	2.644769e-11	2.341791e-11	-0.000000e+00

Table VIII-3. Locations of Input and Output Data Checked for Validation of Routine VFLUXPROF.

NUFT Output Time Step #	Input Gas Flux Data (Location in NUFT Output File) [A]	Output Gas Flux Data (Location in VFLUXPROF Output File) [B]
0	Rows 10282 to 10366	Rows 4 to 24
1	Rows 19125 to 19209	Rows 27 to 47
2	Rows 27968 to 28052	Rows 50 to 70
3	Rows 36811 to 36895	Rows 73 to 93
4	Rows 45654 to 45738	Rows 96 to 116
5	Rows 54497 to 54581	Rows 119 to 139
6	Rows 63340 to 63424	Rows 142 to 162
7	Rows 72183 to 72267	Rows 165 to 185
8	Rows 81026 to 81110	Rows 188 to 208
9	Rows 89869 to 89953	Rows 211 to 231
10	Rows 98712 to 98796	Rows 234 to 254
11	Rows 107555 to 107639	Rows 257 to 277
12	Rows 116398 to 116482	Rows 280 to 300
13	Rows 125241 to 125325	Rows 303 to 323
14	Rows 134084 to 134168	Rows 326 to 346
15	Rows 142927 to 143011	Rows 349 to 369
16	Rows 151770 to 151854	Rows 372 to 392

Notes:

A. File: "l4c4-LDTH60-1Dds_ mc-ui-01.f.ext" which has been reformatted as an Excel spreadsheet with line numbers ("AttachmentVIIRev00BCompleteTable2.xls"). Theses files are available in electronic form (Attachment I).

B. Row numbers in Table VIII-2. Based on VFLUXPROF output file: "l4c4-LDTH60-1Dds_mc-ui-01.f.ext.q.gas.vflux" (Attachment I).

ATTACHMENT IX SOFTWARE ROUTINE DOCUMENTATION FOR THERMAL-HYDROLOGY-GAS MODEL CALCULATION SPREADSHEETS

IX.1 ROUTINE IDENTIFICATION

This Attachment describes the issue of software routines:

- th+gas_model-L4C4-ui-04.xls Version 1.1
- th+gas_model-L4C4-li-04.xls Version 1.1
- th+gas_model-L4C1-ui-04.xls_ Version 1.1
- th+gas_model-L4C1-li-04.xls_Version 1.1

These are Excel 97 (SR-2) spreadsheets. The source codes have been submitted in electronic form (Attachment I). These routines were run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 4.00.950 B).

These four spreadsheets contain the same organization, links, and formulae, but with different input data. They are classified as routines per AP-SI.1Q, and are qualified by this Attachment.

IX.2 ROUTINE PURPOSE

The purpose of the subject spreadsheet routines is to assemble the thermal-hydrology (TH) information calculated by NUFT and post-processed using other routines:

- ZONEAVG V1.2 – Calculates zone-averaged scalar variables
- VFLUXPROF V1.1 – Sorts NUFT output for the vertical component of the total gas-phase mass flux along a vertical profile through the drift centerline
- MYPLOT V1.1 – Calculates total (fracture + matrix) gas-phase and liquid-phase water fluxes between zones

and to manipulate this information for interpretation of TH state variables and fluxes (Worksheet: THmodel), evaporation (Worksheet: Evap), gas fluxes and fugacities (Worksheet: Gasmodel), and steel corrosion (Worksheet: Steel). The final results needed for chemical modeling are then summarized in a worksheet that is named for the TH case (e.g. Worksheet: CHEMprobL4C4upper).

Manipulation of the calculated TH results includes parsing the time axis into a number of discrete steps for which the thermal and hydrologic conditions are held constant to facilitate chemical modeling. The beginning and ending time for each time step are determined by user-defined input. For each step, mid-points on the time axis are also assigned, and calculated TH results at the mid-points are used to represent the time steps. State variables such as temperature and air mass-fraction, and mass fluxes between zones, are thus represented in a stepwise manner.

IX.3 ROUTINE DESCRIPTION

The following description applies to each one of the four spreadsheets listed above, which correspond to the four TH cases. Where appropriate, the routine in file: "th+gas_model-L4C4-ui-04.xls" is used as an example. Otherwise, file names are specified using asterisks to indicate how the discussion applies to any of the four routines.

Input Data

Calculated results are transferred manually from the output files of NUFT post-processors, and from other sources as noted:

- Zone-averaged liquid saturation, air mass-fraction, temperature, and evaporation rate in the matrix continuum (from *.m.ext.zavg files). The entire contents of the corresponding *.m.ext.zavg file is transferred to Worksheet: Matrix.zavg. (This file also includes the calculated volume for each grid block.)
- Zone-averaged liquid saturation, air mass-fraction, temperature, and evaporation rate in the fracture continuum (from *.f.ext.zavg files). For each spreadsheet the entire contents of the corresponding *f.ext.zavg file is transferred to Worksheet: Fracture.zavg. (This file also includes the calculated volume for each grid block.)
- Total (fracture + matrix) liquid and gas fluxes between zones (from the *.exl file). For each spreadsheet the entire contents of the corresponding *.exl file are transferred to Worksheet: Zone fluxes.
- The vertical component of gas-phase total mass flux along a vertical profile passing through the center of the drift opening. For each spreadsheet the entire contents of the corresponding *.vflux file are transferred to Worksheet: Vertflux.

Input is transferred directly (manually) from the above source files using Excel, which is described below in more detail. In addition, other information is used as input data:

- Water vapor pressure vs. temperature correlation based on tabulated data (Worksheet: Vapor Pres.).
- Physical constants of water vapor, liquid water, air, CO_2 gas, and O_2 gas (Worksheet: Gasmodel).
- Porosity for EBS backfill and invert materials, from the include-file used with NUFT simulations (Worksheet: Zone.volume).
- Thermal output of spent fuel waste expressed as the average lineal power loading in the emplacement drifts, as a function of time (Worksheet: Evap).
- User-defined input defining the length of each time period, and the time value at which the TH conditions are selected to represent that period (Worksheet: THmodel). This information is "hard-wired" into the spreadsheet, so that to redefine the time periods

would require that many other redefined also. For the current versions of the subject routines the time periods are defined as shown in Table IX-1.

IX.3.1 Worksheet: Matrix.zavg

The entire contents of the *.m.ext.zavg file for the corresponding TH case, are imported to a new Excel workbook, then copied and pasted into this worksheet (the new workbook is discarded). The space-delimiter is selected (with multiple spaces treated as one) so that the information is organized in columns.

IX.3.2 Worksheet: Fracture.zavg

The entire contents of the *.f.ext.zavg file for the corresponding TH case, are imported to a new Excel workbook, then copied and pasted into this worksheet (the new workbook is discarded). The space-delimiter is selected (with multiple spaces treated as one) so that the information is organized in columns.

IX.3.3 Worksheet: Zone fluxes

Calculated flux data from the *.exl file for the corresponding TH case, are imported to a new Excel workbook, then copied and pasted into this worksheet (the new workbook is discarded). The space-delimiter is selected (with multiple spaces treated as one) so that the information is organized in columns. This worksheet is a table with column headings, and the imported data are placed in specific rows for each time step.

IX.3.4 Worksheet: Vertflux

Sorted vertical flux data from the *.vflux file for the corresponding TH case, are imported to a new Excel workbook, then copied and pasted into this worksheet (the new workbook is discarded). The space-delimiter is selected (with multiple spaces treated as one) so that the information is organized in columns. This worksheet is a table in which the columns correspond to grid blocks, with depth increasing to the right. The input data are imported in rows, and are placed in specific rows for each time step.

IX.3.5 Worksheet: Zone.volume

This worksheet tallies the grid block volumes calculated by routine "ZONEAVG V1.2" and imported to worksheet: Fracture.zavg. For the L4C4 location (files: "th+gas_model-L4C4-ui-04.xls" and "th+gas_model-L4C4-li-04.xls") Rows 1 through 426 are copied from that worksheet. For the L4C1 location (files: "th+gas_model-L4C1-ui-04.xls" and "th+gas_model-L4C1-li-04.xls") Rows 1 through 455 are copied. The difference in row count is caused by hydrostratigraphic differences, and thus different model gridding, for the two locations.

The first column of the imported information is the grid block name. For Zones 0 through 6 the grid block name includes the string "An" where n is the zone number. The third column

of the imported information is the calculated grid block volume. The dimension of all grid blocks along the third axis (y-axis) is 1 m, so all volume calculations are based on volume per meter of emplacement drift. This worksheet sums the grid block volumes for all grid blocks in each zone, summing the specific ranges shown in Table IX-2. The results are posted in Column D.

Column E is annotation. Column F is the type of material assigned to each zone, and is defined to be consistent with the material properties assigned to grid blocks in the NUFT input files (e.g., file: "L4C4-LDTH60-1Dds_mc-ui-01.in" for the L4C4 location and the "upper" infiltration distribution; these files are available electronically and are listed in Attachment I). Columns G and H are respectively the fracture and matrix continuum porosity values assigned to these materials in the "rocktab" include-files used as input to NUFT (files: "dkm-afc-EBS_Rev10", "dkm_afc-ds-NBS-l_inf", and "dkm_afc-ds-NBS-u_inf"; these files are available electronically and are listed in Attachment I). Column I sums the fracture and matrix continuum properties to determine the total porosity for each zone.

Columns J, K, and L are void volumes calculated respectively for the fracture continuum, matrix continuum, and both continua, for each zone. These are obtained by multiplying the zone volume in Column D, by the porosities in Columns G, H, and I.

Columns M, N are respectively the solid density values assigned to the fracture and matrix continua, for the materials occupying each zone, in the "rocktab" include-files used as input to NUFT (include-files: "dkm-afc-EBS_Rev10", "dkm_afc-ds-NBS-u_inf", and "dkm_afc-ds-NBS-l_inf"; these are available electronically and are listed in Attachment I). These values are entered for Zones 1 and 2 (tsw35 unit for the L4C4 location, and tsw34 unit for the L4C1 location).

The porosity and density calculations are done differently for the engineered materials. Column O is the resultant solid density (grain density) for the material in each zone. For the tsw35 unit this is the sum of the matrix and fracture contributions. For the engineered materials (Zones 3 through 6) this is calculated from the total porosity in Column I, and the bulk density (input values are justified in the accompanying Analysis/Model Report).

Finally, the solid mass in each zone is obtained in Column P, by multiplying the zone volume in Column D, by the total solid density in Column O.

IX.3.6 Worksheet: Vapor Pres.

The purpose of this worksheet is to develop an interpolating function for the saturated vapor pressure of water, as a function of temperature over the temperature range from 25 to 95°C which defines the range of validation. The data are shown in Columns A and B (from Weast and Astle 1981; p. D-168). In Column C the vapor pressure is converted from mm Hg to atm using the conversion 1 atm = 760 mm Hg (Weast 1984; p. F-282). Column C is plotted against Column A, and the "Add Trendline" feature of Excel is used to find the following 6th-order polynomial least-squares fit:

$$P = -3.7346\times10^{-14}\,T^6+3.6840\times10^{-11}\,T^5+1.9505\times10^{-9}\,T^4+2.7716\times10^{-7}T^3+$$

$$1.5044\times10^{-5}T^2+3.9790\times10^{-4}T+0.0064609 \qquad \text{(IX-1)}$$

The correlation coefficient is calculated by Excel, and reported on the plot (R^2 = 1.0000). The equation for vapor pressure is verified against the tabulated data for vapor pressure (Weast and Astle., p. D-168).

IX.3.7 Worksheet: Evap

The total nonzero evaporation is summed for Zones 1 through 6, for comparison to the thermal output of the waste packages. The zone-averaged qPhCh.gas variable is copied from Worksheet: Matrix.zavg, for Zones 0 through 6, to Range C6:I22. The associate times, and time indices are copied to Columns B and A, respectively. Similarly, the zone-averaged qPhCh.gas variable is copied from Worksheet: Fracture.zavg, for Zones 0 through 6, to Range L6:R22. The associate times, and time indices are copied to Columns K and J, respectively. The corresponding total zone volumes are copied to Row D, from Worksheet: Zone.volume.

In Column S, the nonzero evaporation rates are multiplied by the zone volumes, and summed. Negative evaporation is condensation, which is not of interest in a comparison with thermal output, and therefore not included in the calculation. In Column T the total evaporation rates (all zones) are converted to evaporation power in units of Watts per meter of drift. This involves multiplying by the heat of vaporization of water (2257 kJ/kg at 100°C; Incropera and DeWitt, 1996, p. 846), and multiplying by 2 to represent the full-drift evaporation (the NUFT output is for a half-drift).

In Column U the time values are converted from seconds to years. In Column V the thermal output of a line of representative waste packages, is copied for the specific time steps from file: "LDTH-SDT-0.3Qheat-50y_vent-00" (Attachment I). Finally, in Column W the evaporation power from Column T is expressed as a percentage of the thermal output from Column V.

IX.3.8 Worksheet: THmodel

IX.3.8.1 Input from Other Worksheets

This worksheet assembles and adjusts calculated TH information from various sources, for use in the chemical models. First the zone-to-zone liquid and gas-phase water fluxes are copied from worksheet: Zone fluxes. Range B10:H25 is copied from worksheet: Zone fluxes, Range B13:H28. Range B37:H52 is copied from worksheet: Zone fluxes, Range I13:O28. The times in Column A are copied from Column A of worksheet: Zone fluxes. Data from the pre-closure period prior to 50 yr are not used because the zones are defined differently (backfill and drip shield not yet installed) and the TH processes are dominated by ventilation, which is included as a heat removal process but not as a moisture removal process in the models.

IX.3.8.2 Step-Wise Description of TH Conditions

The discrete time periods are defined in Columns J through L. Column J is the nominal time from which calculated data values are used to represent the time period that begins and ends as shown in Columns K and L, respectively. Based on these definitions, the flux data from Columns B through H are sorted in Columns Z through AG, so that the step-wise functions can be plotted. Range Z3:AG13 represents the step-wise variation of zone-to-zone liquid water fluxes, and is based on input data from Range B10:H24. Range Z17:AG27 represents the step-wise variation of gas-phase water vapor fluxes, and is based on input data from Range B37:H51. Plots are presented in Columns N through X which show the variation of liquid and gas-phase water fluxes, both as step-wise functions and as the finer-scale calculated data from NUFT.

IX.3.8.3 Liquid Mass in Each Zone

The first block of calculations is performed in Columns AI through AP. First, the needed input data are copied from other parts of the spreadsheet. Column AI contains the nominal time information from Column J. Zone-to-zone liquid fluxes are copied into Range AJ4:AP9 from Columns B through H (Rows 11, 15, 17, 19, 22, and 24), only for the nominal times assigned to the time periods. Likewise, gas-phase water vapor fluxes are copied into Range AJ13:AP18 from Columns B through H (Rows 38, 42, 44, 46, 49, 51).

Zone-averaged temperature for the fracture continuum is copied into Range AJ22:AP27 from Worksheet: Fracture.zavg, Columns C through I (Rows 1154, 1158, 1160, 1162, 1166, and 1168). Comparison of fracture temperature (Worksheet: Fracture.zavg, Rows 1153 through 1169) and matrix temperature (Worksheet: Matrix.zavg, Rows 1153 through 1169) shows that they are essentially identical, so fracture temperature is used to represent local temperature in this routine.

Zone-averaged air mass-fraction for the fracture continuum is copied into Range AJ40:AP45 from Worksheet: Fracture.zavg, Columns C through I (Rows 1112, 1116, 1118, 1120, 1124, and 1126).

Zone-averaged liquid saturation for the matrix continuum is copied into Range AJ49:AP54 from Worksheet: Matrix.zavg, Columns C through I (Rows 1112, 1116, 1118, 1120, 1124, and 1126).

Zone volume for Zones 1 through 6, is copied from Worksheet: Zone.volume. The calculated values from Columns J, K, and L of that worksheet are transposed and copied into Ranges AK58:AP58, AK62:AP62, and AK66:AP66, respectively.

The liquid mass in each of Zones 1 through 6 is calculated in Range AK70:AP75 by adding the liquid mass in the matrix and fractures:

$$M_i = (V_{f,i}\, S_{f,i} + V_{m,i}\, S_{m,i}) * 1000 \qquad \text{(IX-2)}$$

where M_i = Liquid mass in the ith zone (kg/m)

$V_{f,i}$ = Fracture void volume of the ith zone (m^3/m)
$S_{f,i}$ = Fracture saturation in the ith zone
$V_{m,i}$ = Matrix void volume of the ith zone (m^3/m)
$S_{m,i}$ = Matrix saturation in the ith zone

and the result is multiplied by 1,000 to convert from cubic meters to kilograms. Note that zero liquid mass is calculated for zones within the drift, for early time periods when the EBS is dry.

IX.3.8.4 Balancing Mass Fluxes for Each Zone

Worksheet: THmodel includes a mass-balance analysis to verify that mass influx and outflux of water and water vapor sum to zero for each zone, for each time period, i.e. that step-wise steady-state flux conditions pertain. This is done as a check for errors associated with stepwise representation of fluxes and state variables, with zero change in storage for each zone during each time period. Also, there are small mass fluxes in and out of Zones 5 and 6 during cooldown that are not included in the NUFT output as it was specified for these models. In summary, the need for these small adjustments arises from temporal and spatial discretization of the NUFT-calculated TH data.

The zone-to-zone liquid mass fluxes needed for chemical modeling are calculated directly from NUFT output using the MYPLOT V1.1 software routine. The balance of influx and outflux for each zone is needed to estimate gas fluxes, which in turn are used to estimate evaporative concentration factors for each zone.

First, the mass balance residuals for each zone are calculated by adding together all the liquid and vapor mass fluxes into and out of the zone, as reported by NUFT output (Range AK79:AP84). This mass balance can be represented as:

$$\text{Mass balance} = \sum_{\text{liquid}} \text{in} + \sum_{\text{gas}} \text{in} - \sum_{\text{liquid}} \text{out} - \sum_{\text{gas}} \text{out} \qquad \text{(IX-3)}$$

This equation is implemented differently for the six zones because of their connectivity:

- **Zone 1 (Range AK79:AK84)** – Mass balance is the sum of liquid and gas influx from Zone 0 (data from Range AJ4:AJ9 and Range AJ13:AJ18, respectively) minus liquid and gas outflux to Zone 2 (from Range AK4:AK9 and Range AK13:AK18, resepectively). The resulting sum approximately represents the mass flux from Zone 1 back to the host rock, diverted around the drift (positive is out of Zone 1), not accounting for mass storage effects.
- **Zone 2 (Range AL79:AL84)** – Mass balance is the sum of liquid and gas influx from Zone 1 (data from Range AK4:AK9 and Range AK13:AK18, respectively) minus liquid and gas outflux to Zone 3 (from Range AL4:AL9 and Range AL13:AL18, resepectively). This sum approximately represents the mass flux from Zone 2 back to Zone 0, diverted around the drift (positive is out of Zone 2), not accounting for mass storage effects.

- **Zone 3 (Range AM7:AM84)** – Mass balance is the sum of liquid and gas influx from Zone 2 (data from Range AL4:AL9 and Range AL13:AL18, respectively), minus liquid and gas outflux to Zone 4 (data from Range AM4:AM9 and Range AM13:AM18, resepectively), minus liquid and gas outflux to Zone 5 (data from Range AN4:AN9 and Range AN13:AN18, respectively). This sum should be zero for steady state flow conditions, however, such conditions do not strictly apply to NUFT output so a correction is needed to represent NUFT output by stepwise constant conditions.
- **Zone 4 (Range AN79:AN84)** – Mass balance is the sum of liquid and gas influx from Zone 3 (data from Range AM4:AM9 and Range AM13:AM18, respectively) minus liquid and gas outflux to Zone 5 (data from Range AO4:AO9 and Range AO13:AO18, respectively). This sum should also be zero for steady state flow conditions, however, such conditions do not strictly apply to the NUFT output so a correction is needed to represent NUFT output by stepwise constant conditions.
- **Zone 5 (Range AO79:AO84)** – Mass balance is the sum of liquid and gas influx from Zone 3 (data from Range AN4:AN9 and Range AN13:AN18, respectively), plus liquid and gas influx from Zone 4 (data from Range AO4:AO9 and Range AO13:AO18, respectively), minus liquid and gas outflux to Zone 6 (data from Range AP4:AP9 and Range AP13:AP18, respectively). This sum approximately represents the mass flux from Zone 5 back to the host rock through the drift wall (positive is out of the drift), not ascounting for mass storage effects.
- **Zone 6 (Range AP79:AP84)** – Mass balance is the sum of liquid and gas influx from Zone 5 (data from Range AP4:AP9 and Range AP13:AP18, respectively). This sum approximately represents the mass flux from Zone 6 back to the host rock through the drift floor (positive is out of the drift), not accounting for mass storage effects.

The next step is to assign the mass flux residuals either to gas fluxes or liquid fluxes, so that the final residuals are zero. This is implemented in new summations of all the gas- and liquid-phase water fluxes into and out of each zone, in Range AK96:AP101 for gas fluxes, and Range AK105:AP110 for liquid fluxes. These summations consider each zone separately, i.e. all the fluxes into and out of each zone, without regard to the respective sources or destinations of the fluxes. The zone-to-zone liquid- and gas-phase fluxes are from Range AJ4:AP9, and Range AJ13:AP18, respectively. The mass flux residuals for each zone are added to either the liquid- or gas-phase flux summations.

The rules used to assign the mass balance residuals to the liquid- or gas-phase are as follows:

- For Zones 1 and 2 mass flux residuals are assigned to the liquid-phase because the fluxes exit the lower boundaries of the zones, and because liquid fluxes tend to greatly exceed vapor fluxes in these zones.
- For Zones 3 and 4 the residuals are assigned to the gas phase which maximizes evaporation (for positive residuals).
- For Zones 5 and 6 the residuals are assigned to the gas phase in early time when the zones are dry (or nearly so), then to the liquid phase after positive liquid mass returns. The transition to liquid-dominated conditions in Zones 5 and 6 occurs at different times for the four TH cases:

- Location L4C1, "lower" infiltration: Liquid mass returns for Time Period 4
- Location L4C1, "upper" infiltration: Liquid mass returns for Time Period 2
- Location L4C4, "lower" infiltration: Liquid mass returns for Time Period 5
- Location L4C4, "upper" infiltration: Liquid mass returns for Time Period 4

The mass balance residuals are recalculated as a check in Range AK114:AP119, by summing the gas phase and liquid phase adjusted net fluxes for each zone, and each time period. Comparison with Range AK79:AP84 shows that the recalculated residuals are very small, or zero.

IX.3.8.5 Relative Humidity

Relative humidity (RH) in each zone is estimated in Worksheet: THmodel for the purpose of timing the onset of steel corrosion, in Worksheet: Steel. (RH can also be calculated and output directly from NUFT, but this was not done for this set of models.) The air mass-fraction (Range AK31:AP36) and the temperature (Range AK22:AP27) are used to calculate RH using the formula:

$$RH = \frac{P_T}{P^*_{H2O}} \left\{ \frac{1-\chi_{air}}{\chi_{air}(MW_{H2O}/MW_{air}) + (1-\chi_{air})} \right\} \qquad \text{(IX-4)}$$

where P_T = Total pressure (atm)
P^*_{H2O} = Saturated vapor pressure of water (atm) as a function of the temperature from Range AK22:AP27
χ_{air} = Air mass-fraction
MW_{H2O} = Molecular weight of water (0.018013 kg/mol; Table IX-3)
MW_{air} = Equivalent molecular weight of air (0.02896 kg/mol; Table IX-3)

The function P^*_{H2O} is based on the polynomial curve fit to tabulated vapor pressure data, developed in Worksheet: Vapor Pres. (see above). The RH is calculated in Range AK124:AP129, using values for the air mass-fraction from Range AK31:AP36.

The total pressure (P_T) is calculated from the arithmetic average of the ground surface pressure (84,511 Pa) and water table pressure (92,000 Pa) boundary conditions. These same values are used in the NUFT runs for the L4C4 location (Section 4.1.1). The resulting average (88,256 Pa) is converted to atm units using a conversion factor of 1.013×10^5 Pa/atm (Weast and Astle 1981; see the conversion from atm to dynes/cm^2 on p. F-282, the conversion from dynes to Newtons on p. F-288, and the conversion from cm^2 to m^2 on p. F-301). For the L4C1 location the ground surface pressure is 85,587 Pa, and the average pressure is 88,794 Pa.

IX.3.8.6 Zone Influx Conditions for Conservative Solute Modeling

Columns AR through BB show the data assembled for the hypothetical, conservative solute calculation. Columns AR and AS are copied from columns K and L, respectively. Similarly, the zone-to-zone liquid flux values in Range AT4:AZ8 are copied from Range AJ4:AP8, and the temperatures in Range AT20:AZ24 are copied from Range AJ22:AP26.

For the conservative solute calculation to be solved by the Runge-Kutta solution algorithm (software routine: "SoluteRKV1.1_*"), the positive magnitudes for all influxes and outfluxes are required for each zone. For example, if an influx to a zone is negative, then zero is assigned and the flux magnitude is accounted as an outflux. This type of accounting is used because solute is transferred among different zones, and the source and destination must be explicit for such transfer (i.e. fluxes in the conservative solute model must be non-negative).

The influxes to Zone 1 through Zone 6 are sorted in Range AT29:BB33 and Range AT38:BA42. The following discussion is organized according to all possible influxes to each zone, listed from Zone 1 to Zone 6.

Zone 1

- Zone 0 to Zone 1 (Range AT29:AT33) – This is the liquid percolation from Zone 0 to Zone 1, from above. Positive values from Range AJ4:AJ8 are copied, otherwise this flow is zero.
- Zone 0 to Zone 1 (Range AU29:AU33) – This is liquid flow upward from the host rock into the lower boundary of Zone 1, calculated from mass balance. Negative values from Range AK79:AK83 are copied and converted to positive values, otherwise this flow is zero.
- Zone 2 to Zone 1 (RangeAV29:AV33) – This is outward liquid flow from the wall rock into the surrounding host rock. Negative values from Range AK4:AK8 are copied and converted to positive values, otherwise this flow is zero.

Zone 2

- Zone 1 to Zone 2 (Range AW29:AW33) – This is inward liquid flow from the host rock to the rock at the drift wall. Positive values from Range AK4:AK8 are copied, otherwise this flow is zero.
- Zone 0 to Zone 2 (Range AX29:AX33) – This is liquid flow upward from the host rock into the lower boundary of Zone 1, calculated from mass balance. Negative values from Range AL79:AL83 are copied and converted to positive values, otherwise this flow is zero.
- Zone 3 to Zone 2 (Range AY29:AY33) – This is liquid flow outward from the backfill to the surrounding host rock. Negative values from Range AL4:AL8 are copied and converted to positive values, otherwise this flow is zero.

Zone 3

- Zone 2 to Zone 3 (Range AZ29:AZ33) – This is liquid inflow from the host rock to the backfill. Positive values from Range AL4:AL8 are copied, otherwise this flow is zero.
- Zone 4 to Zone 3 (Range BA29:BA33) – This is outward liquid flow from the backfill at the drip shield surface, to the upper backfill. Negative values from Range AM4:AM8 are copied and converted to positive values, otherwise this flow is zero.
- Zone 5 to Zone 3 (Range BB29:BB33) – This is upward liquid flow from the lower backfill to the upper backfill. Negative values from Range AN4:AN8 are copied and converted to positive values, otherwise this flow is zero.

Zone 4

- Zone 3 to Zone 4 (Range AT38:AT42) – This is inward liquid flow from the upper backfill, to the backfill at the drip shield surface. Positive values from Range AN4:AN8 are copied, otherwise this flux is zero.
- Zone 5 to Zone 4 (Range AU38:AU42) – This is upward liquid flow from the lower backfill to the backfill at the upper surface of the drip shield. Negative values from Range AO4:AO8 are copied and converted to positive values, otherwise this flow is zero.

Zone 5

- Zone 3 to Zone 5 (AV38:AV42) – This is downward flow from the upper backfill to the lower backfill. Positive values from Range AN4:AN8 are copied, otherwise this flow is zero.
- Zone 4 to Zone 5 (Range AW38:AW42) – This is downward flow from the upper surface of the drip shield, to the lower backfill. Positive values from Range AO4:AO8 are copied, otherwise this flow is zero.
- Zone 0 to Zone 5 (Range AX38:AX42) – This is inward liquid flow from the host rock into the lower backfill, calculated from mass balance. In accordance with the previous discussion of mass balance, for early times this mass flux is assigned to the gas phase so the liquid flux is zero. Negative values from Range AO82:AO83 are copied to Range AX41:AX42 and converted to positive values, otherwise this flow is zero.
- Zone 6 to Zone 5 (Range AY38:AY42) – This is upward flow from the invert to the lower backfill. Negative values from Range AP4:AP8 are copied and converted to positive values, otherwise this flow is zero.

Zone 6

- Zone 5 to Zone 6 (Range AZ38:AZ42) – This is downward flow from the lower backfill to the invert. Positive values from Range AP4:AP8 are copied, otherwise this flow is zero.
- Zone 0 to Zone 6 (Range BA38:BA42) – This is inward flow from the host rock to the invert, calculated from mass balance. In accordance with the previous discussion of mass balance, for early times this mass flux is assigned to the gas phase so the liquid flux is

zero. Negative values from Range AP82:AP83 are copied to Range BA41:BA42 and converted to positive values, otherwise this flow is zero.

IX.3.8.7 Zone Outflux Conditions for Conservative Solute Modeling

For analysis of each zone in the conservative solute calculation, the destination zone for outflux is not needed. Accordingly, the outfluxes for each zone, for each time period, are summed. This information is assembled in Range AU47:AZ51. Similar to the manipulations described above in Section IX.3.7, only positive outflux values are summed (any negative zone-to-zone outflux value is converted to a positive influx value for another zone).

The following discussion is organized according to all possible outfluxes from each zone, listed from Zone 1 to Zone 6. For each term in the flux summations a description is given and an example is provided which corresponds to a nominal time of 5,000 yr.

- Zone 1 (Range AU47:AU51) – Total outflux is the sum of positive values for: the outflux from Zone 1 to Zone 2 (e.g. max{0,AK8}), the negative influx from Zone 0 to Zone 1 (e.g. max{0,-AJ8}), and the outflux from Zone 1 to Zone 0 calculated from mass balance (e.g. max{0,AK83}).
- Zone 2 (Range AV47:AV51) – Total outflux is the sum of positive values for: the outflux from Zone 2 to Zone 3 (e.g. max{0,AL8}), the negative influx from Zone 1 to Zone 2 (e.g. max{0,-AK8}), and the outflux from Zone 2 to Zone 0 calculated from mass balance (e.g. max{0,AL83}).
- Zone 3 (Range AW47:AW51) – Total outflux is the sum of positive values for: the outflux from Zone 3 to Zone 4 (e.g. max{0,AM8}), the outflux from Zone 3 to Zone 5 (e.g. max{0,AN8}), and the negative influx from Zone 2 to Zone 3 (e.g. max{0,-AL8}).
- Zone 4 (Range AX47:AX51) – Total outflux is the sum of positive values for: the outflow from Zone 4 to Zone 5 (e.g. max{0,AO8}), and the negative influx from Zone 3 to Zone 4 (e.g. max{0,-AM8}).
- Zone 5 (Range AY47:AY51) – Total outflux is the sum of positive values for: the outflux from Zone 5 to Zone 6 (e.g. max{0,-AP8}), the negative influx from Zone 3 to Zone 5 (e.g. max{0,-AN8}), the negative influx from Zone 4 to Zone 5 (e.g. max{0,-AO8}), and the outflux from Zone 5 to the host rock (Zone 0) calculated from mass balance (e.g. max{0,AO83}). Note that in accordance with previous discussion of mass balance, for nominal times of 100, 500, and 1,000 yr the outflux from Zone 5 to the host rock is assigned to the gas phase so this liquid flux term is zero.
- Zone 6 (Range AZ47:AZ51) – Total outflux is the sum of positive values for: the negative influx from Zone 5 to Zone 6 (e.g. max{0,-AZ8}), and the outflux from Zone 6 to the host rock (Zone 0) calculated from mass balance (e.g. max{0,AP83}).

IX.3.8.8 Checksums on Zone Influx and Outflux

Range AU56:AZ60 in Worksheet: THmodel contains checksums calculated for each zone and each time period. These checksums total the influx values in Range AT29:BB33 and Range AT38:BA42, and the outflux values in Range AU47:AZ51. The values are zero (or

nearly so) indicating the set of flux values assembled for the conservative solute calculation is consistent.

IX.3.9 Worksheet: Gasmodel

This worksheet calculates the CO_2 and O_2 gas fluxes and fugacities using a 1-D mass transfer model (Section 6.2 of text). Input data are given in Rows 2 through 18, and are described in Table IX-3. The following discussion pertains to Rows 24 through 40, and the accompanying plots in Rows 42 through 64.

IX.3.9.1 Preliminary Calculations

Time values for Rows 24 through 40, Column A are copied from Worksheet: Fracture.zavg, Range B1153:B1169. These values are converted from seconds to years in Column B (dividing by 365.25 day/yr and 86400 sec/day).

Temperature values for Column C are copied from Worksheet: Fracture.zavg, Range E1153:E1169.

Fracture air mass-fraction values for Column D are copied from Worksheet: Fracture.zavg, Range E1132:E1148. This value is the zone-average for Zone 2, and is used as the minimum air mass-fraction along the vertical profile from the drift centerline to the ground surface.

Maximum values for the gas-phase total mass flux are calculated in Column E using the following expression for each row (i.e. each time value):

$$q_{gas} = \max\{\text{vertical profile of vertical flux}\} \qquad \text{(IX-5)}$$

where the vertical profile of vertical flux is obtained from one row of Worksheet: Vertflux, Rows 3 through 19, and Columns C through AU. (Columns AV and beyond correspond to grid blocks that lie below the center of the emplacement drift, for the L4C4 model location.) For the L4C1 location spreadsheets, the vertical profile of vertical flux is obtained from one row of Worksheet: Vertflux, Rows 3 through 19, and Columns C through AO.

The densities for dry air(ρ_{air}) and saturated water vapor(ρ_{vapor}) are calculated in Columns F and G, respectively, using the ideal gas law:

$$\rho = \frac{P}{RT} MW \qquad \text{(IX-6)}$$

where ρ = Density of gas-phase air or water (kg/m^3)
P = Reference total pressure (from Cell A11)
T = Absolute temperature (°K, from Column C)
R = Universal gas constant (from Cell A4)
MW = Molecular weight for air or water vapor (kg/m^3; from Cell A2 or A3)

The air volume-fraction (mole fraction) equivalent to the mass-fraction from Column D, is calculated in Column H using

$$X_{air} = \frac{\chi_{air} MW_{H2O}}{(1-\chi_{air})MW_{air} + \chi_{air} MW_{H2O}} \tag{IX-7}$$

where X_{air} = Volume fraction air (also mole fraction)
χ_{air} = Air mass-fraction (from Column D)

and MW_{air} and MW_{H2O} are defined for Equation IX-4.

The density of moist air is calculated from the air volume-fraction calculated in Column I, using the volume-weighted expression

$$\rho_{gas} = X_{air}\rho_{air} + (1-X_{air})\rho_{vapor} \tag{IX-8}$$

where ρ_{air} = Density of dry air from Column F (kg/m^3)
ρ_{vapor} = Density of saturated water vapor from Column G (kg/m^3)

IX.3.9.2 CO_2 Flux and Fugacity Calculations

The coefficients of a linear mass-transfer expression for CO_2 [Section 6.2.3.4, Equation (31)] are given by

$$m_{gas} = \frac{\phi_{gas} D_{gas} C_{gas,in}}{z} - C_{gas}\left(\frac{q_{gas}}{\rho_{gas}} + \frac{\phi_{gas} D_{gas}}{z}\right) = a \cdot C_{gas,in} + b \cdot C_{gas} \tag{IX-9}$$

where

$$a = \frac{\phi_{gas} D_{gas}}{z} \tag{IX-10}$$

$$b = -\left(\frac{q_{gas}}{\rho_{gas}} + \frac{\phi_{gas} D_{gas}}{z}\right) \tag{IX-11}$$

and m_{gas} = Mass flux or utilization rate of a gas component at depth (kg/m^2-sec)
ϕ_{gas} = Average gas-filled porosity of the UZ above the repository
D_{gas} = Effective diffusive-dispersive mass transfer coefficient (m^2/sec)
z = Repository drift depth below the ground surface (m)
C_{gas} = Concentration of gas component (e.g. CO_2) in the drift (kg/m^3)
$C_{gas,in}$ = Concentration of gas component (e.g. CO_2) at the ground surface (kg/m^3)

The coefficients a and b are calculated using (IX-10) and (IX-11) in Columns K and L, respectively.

In the following discussion, the gas concentrations (e.g. CO_2) are expressed as the normalized ratio $C_{gas}/C_{gas,in}$. The maximum value of this concentration ratio is calculated by setting $m_{gas} = 0$ in (IX-9), and rearranging so that

$$\{C_{gas}/C_{gas,in}\}_{max} = -a/b \qquad \text{(IX-12)}$$

which is implemented in Column M. The maximum value of the mass flux, or rate of utilization at depth for a gas component, is calculated by setting $C_{gas} = 0$ in (IX-9), and rearranging so that

$$\{m_{gas}\}_{max} = a\, C_{gas,in} \qquad \text{(IX-13)}$$

which is implemented in Column N.

The consequence of (IX-9) is that the gas concentration (e.g. CO_2) depends on the mass flux, i.e. depends on the rate of consumption by chemical reactions at depth. In Columns O through U the concentration ratio ($C_{gas}/C_{gas,in}$) is calculated for different values of the ratio $m_{gas}/\max\{m_{gas}\}$from 10^{-4} to 0.99, using the expression

$$\frac{C_{gas}}{C_{gas,in}} = \left(\frac{m_{gas}}{\max\{m_{gas}\}} - 1\right)\frac{a}{b} \qquad \text{(IX-14)}$$

Finally, in Column V, the air mass-fraction is copied from Column D for comparison to the calculated concentration ratios.

IX.3.9.3 O_2 Flux and Fugacity Calculations

The entire set of calculations performed for CO_2 in Columns K through V, is repeated for O_2 in Columns X through AI. The calculations are identical except some input data are different, namely D_{gas}, and $C_{gas,in}$ which are specified in Rows 9 and 18, respectively, of Worksheet: Gasmodel.

IX.3.10 Worksheet: CHEMprobL4C4upper

This worksheet prepares information for direct application in chemical modeling, including fluxes, temperatures, liquid masses, and evaporation factors for composite zones. The composite zones are defined as:

- **Zone 1/2** – Composite of Zone 1 and Zone 2, representing the host rock above the drifts.
- **Zone 3/4** – Composite of Zone 3 and Zone 4, representing the upper backfill, and the backfill at the surface of the drip shield
- **Zone 5/6** – Composite of Zone 5 and Zone 6, representing the lower backfill and the invert

First, the nominal time for each Time Period is copied from Worksheet: THmodel, Range J4:J8, to Range A7:A11. Similarly, the endpoints of the time periods are copied from the same worksheet, Ranges K4:K8 and L4:L8, to Ranges F7:F11 and G7:G11, respectively.

CO_2 and O_2 Gas Fugacities

Reference fugacities for CO_2 and O_2 in the gas phase at the ground surface, are shown in Columns D and E, copied from input data in Cells A12 and A13, respectively, of Worksheet: Gasmodel.

The maximum fugacity ratios for CO_2 and O_2 at depth (i.e. maximum fugacities from [IX-12], normalized to the reference fugacities at the ground surface) for each time period are shown in Columns B and C, respectively. These are copied from Worksheet: Gasmodel, Columns M and Z. Only values for the nominal times shown in Column A are copied (i.e. only from Worksheet: Gasmodel, Rows 25, 29, 31, 33, and 37).

The maximum estimated CO_2 and O_2 fugacities are computed in Columns H and J, respectively, by multiplying the reference fugacities in Columns D and E, by the maximum fugacity ratios in Columns B and C. The base-10 logarithms of the CO_2 and O_2 fugacities are calculated in Columns I and K, respectively.

Air Mass-Fraction

The zone-averaged air mass-fraction values for Zone 4 are copied from Worksheet: Gasmodel, Column D, to Range L7:L11. Only values for the nominal times shown in Column A are copied (i.e. only from Worksheet: Gasmodel, Rows 25, 29, 31, 33, and 37).

IX.3.10.1 Zone 0

The only additional information needed to model water composition in Zone 0 are the zone-averaged temperature data in Column N, which are copied from Worksheet: THmodel, Range AT20:AT24.

IX.3.10.2 Zone 1/2

The liquid influx to composite Zone 1/2 is copied to Column P, from Worksheet: THmodel, Range AT4:AT8. This result is the flux from Zone 0 to Zone 1, calculated by NUFT. Liquid flux into Zone 1/2 is positive.

The net vapor flux to composite Zone 1/2 is computed in Column Q, from the sum of vapor influx to Zone 1 (Worksheet: THmodel, Range AK96:AK100) and vapor influx to Zone 2 (Worksheet: THmodel, Range AL96:AL100). Note that the vapor fluxes between Zone 1 and Zone 2 (and vice versa) cancel in this sum. Vapor flux into Zone 1/2 is positive.

The liquid mass in composite Zone 1/2 is calculated in Column R, from the sum of liquid mass in Zone 1 (Worksheet: THmodel, Range AU12:AU16) and liquid mass in Zone 2 (Worksheet: THmodel, Range AV12:AV16).

The liquid outflux from composite Zone 1/2 is calculated in Column S, from the sum of the liquid outflow from Zone 1 back to Zone 0 (Worksheet: THmodel, Range AK79:AK83), plus liquid outflow from Zone 2 back to Zone 0 (Worksheet: THmodel, Range AL79:AL83), plus the liquid outflow from Zone 2 to Zone 3 (Worksheet: THmodel, Range AV4:AV8). The signs are all adjusted so that outflux from Zone 1/2 is negative.

The evaporative concentration factor for composite Zone 1/2 is calculated in Column T using the expression

$$f = \left(1 + \frac{q_{vapor,in}}{q_{liquid,in}}\right)^{-1} \qquad \text{(IX-15)}$$

where $q_{vapor,in}$ = Gas-phase water vapor mass flux from Column Q
$q_{liquid,in}$ = Liquid-phase water mass flux from Column P

The temperature for composite Zone 1/2 is calculated in Column U, based on an average of the zone-averaged temperatures for Zone 1 and Zone 2. The average is weighted by the liquid mass in each zone:

$$T_{1/2} = \frac{T_1 m_1 + T_2 m_2}{m_1 + m_2} \qquad \text{(IX-16)}$$

where T_1, T_2 = Temperatures for Zones 1 and 2, from Worksheet: THmodel, Ranges AU20:AU24 and Range AV20:AV24, respectively.
m_1, m_2 = Liquid masses for Zones 1 and 2, from Worksheet: THmodel, Ranges AU12:AU16 and Range AV12:AV16, respectively.

A mass balance checksum for composite Zone 1/2 is calculated in Column V, by summing the liquid influx, vapor flux, and liquid outflux from Columns P, Q, and S, respectively. The values should be zero (or nearly so) indicating that the mass fluxes into and out of the zone are balanced in each time period.

Finally, a through-flux from composite Zone 1/2 back to the host rock (diverted around the drift opening) is calculated in Column W, by taking the sum of the liquid outflow from Zone 1 back to Zone 0 (Worksheet: THmodel, Range AK79:AK83), and liquid outflow from Zone 2 back to Zone 0 (Worksheet: THmodel, Range AL79:AL83). This result is calculated for use in computing the CO_2 budget.

IX.3.10.3 Zone 3/4

The liquid influx to composite Zone 3/4 is copied to Column Y from Worksheet: THmodel, Range AV4:AV8. This is the liquid flux from Zone 2 to Zone 3. Liquid flux into Zone 3/4 is positive.

The net vapor flux to composite Zone 3/4 is computed in Column Z, from the sum of vapor influx to Zone 3 (Worksheet: THmodel, Range AM96:AM100) and vapor influx to Zone 4 (Worksheet: THmodel, Range AN96:AN100). Note that the vapor fluxes between Zone 3 and Zone 4 (and vice versa) cancel in this sum. Vapor flux into Zone 3/4 is positive.

The liquid mass in composite Zone 3/4 is calculated in Column AA, from the sum of liquid mass in Zone 3 (Worksheet: THmodel, Range AW12:AW16) and liquid mass in Zone 4 (Worksheet: THmodel, Range AX12:AX16).

The liquid outflux from composite Zone 3/4 is calculated in Column AB from the sum of the liquid outflow from Zone 3 to Zone 5 (Worksheet: THmodel, Range AX4:AX8), plus liquid outflow from Zone 4 to Zone 5 (Worksheet: THmodel, Range AY4:AY8). The signs are adjusted so that outflux from Zone 3/4 is negative.

The evaporative concentration factor for composite Zone 3/4 is calculated in Column AC using (IX-15), where $q_{vapor,in}$ is from Column Z, and $q_{liquid,in}$ is from Column Y. Note that for Time Period 1 and Time Period 2 there is zero liquid outflux so this factor is not defined.

The temperature for composite Zone 3/4 is calculated in Column AD as a weighted combination of the zone-averaged temperatures for Zone 3 and Zone 4. They are weighted by the liquid mass in each zone using (IX-16). Temperatures T_3 and T_4 are from Worksheet: THmodel, Range AW20:AW24 and Range AX20:AX24, respectively. Liquid masses m_3 and m_4 are from Worksheet: THmodel, Range AW12:AW16 and Range AX12:AX16, respectively. Note that for Time Period 1 there is no liquid mass, so a temperature is calculated from the arithmetic average of Zone 3 and Zone 4 temperatures (chemical calculations are not performed for this time period so this temperature value is not used in subsequent calculations).

A mass balance checksum for composite Zone 3/4 is calculated in Column AE, by summing the liquid influx, vapor flux, and liquid outflux from Columns Y, Z, and AB, respectively. The values should be zero (or nearly so) indicating that the mass fluxes into and out of the zone are balanced in each time period.

IX.3.10.4 Zone 5/6

The liquid influx to composite Zone 5/6 is computed in Column AG, and is the sum of the flux from Zone 3 to Zone 5 (copied from Worksheet: THmodel, Range AX4:AX8) and the flux from Zone 4 to Zone 5 (copied from Worksheet: THmodel, Range AY4:AY8). Liquid flux into Zone 5/6 is positive.

The net vapor flux to composite Zone 5/6 is computed in Column AH, and is the sum of the net vapor flux to Zone 5 (copied from Worksheet: THmodel, Range AO96:AO100) and the net vapor flux to Zone 6 (copied from Worksheet: THmodel, Range AP96:AP100). Vapor flux into Zone 5/6 is positive. Note that there is zero net flux of vapor for Time Period 1 and Time Period 2, and that for Time Period 3 the vapor flux is equivalent to the liquid influx, i.e. complete evaporation.

The liquid mass in composite Zone 5/6 is calculated in Column AI, from the sum of liquid mass in Zone 5 (Worksheet: THmodel, Range AY12:AY16) and liquid mass in Zone 6 (Worksheet: THmodel, Range AZ12:AZ16). Note that for Time Period 1 and Time Period 2, there is no liquid mass predicted for composite Zone 5/6.

The liquid outflux from composite Zone 5/6 is calculated in Column AJ from the sum of the liquid outflow from Zone 5 back to Zone 0 (Worksheet: THmodel, Range AO82:AO83), plus liquid outflow from Zone 6 back to Zone 0 (Worksheet: THmodel, Range AP82:AP83). The signs are adjusted so that outflux from Zone 5/6 is negative. Note that for Time Period 1 through Time Period 3, zero liquid outflux is predicted, and the flux residuals are assigned to the gas phase (see previous discussion).

The evaporative concentration factor for composite Zone 5/6 is calculated in Column AK using (IX-15). Note that for Time Period 1 through Time Period 3, there is zero liquid outflux so this factor is not defined.

The temperature for composite Zone 5/6 is calculated in Column AL as a weighted combination of the zone-averaged temperatures for Zone 5 and Zone 6. They are weighted by the liquid mass in each zone using (IX-16). Temperatures T_5 and T_6 are from Worksheet: THmodel, Range AY22:AY24 and Range AZ22:AZ24, respectively. Liquid masses m_5 and m_6 are from Worksheet: THmodel, Range AY14:AY16 and Range AZ14:AZ16, respectively. Note that for Time Period 1 and Time Period 2 there is zero liquid mass, so a temperature is calculated from the arithmetic average of Zone 5 and Zone 6 temperatures (chemical calculations are not performed for these time periods so these temperature values are not used in subsequent calculations).

A mass balance checksum for composite Zone 5/6 is calculated in Column AM, by summing the liquid influx, vapor flux, and liquid outflux from Columns AG, AH, and AJ, respectively. The values should be zero (or nearly so) indicating that the mass fluxes into and out of the zone are balanced in each time period.

Finally, a through-flux from composite Zone 5/6 back to the host rock is calculated in Column AN by taking the sum of the liquid outflow from Zone 5 back to Zone 0 (Worksheet: THmodel, Range AO82:AO83), and liquid outflow from Zone 6 back to Zone 0 (Worksheet: THmodel, Range AP82:AP83). This result is calculated for use in computing the CO_2 budget. For Time Period 1 through Time Period 3, there is zero liquid outflux so these through-flux values are set to zero.

IX.3.11 Worksheet: Steel

This worksheet uses temperature and RH values from Worksheet: THmodel, along with input based on chemical calculations described in the text, to estimate corrosion rates for steel used in the emplacement drifts, and potential for O_2 consumption.

Laboratory-measured rates for humidity-corrosion of steel coupons are used, and the coefficients of the function fitted by these authors to the corrosion data are entered in Rows 4 through 7. The functional form of the fitting equation is shown in Cell A9.

Input data for Worksheet: Steel are shown in Table IX-4.

The following discussion pertains to Rows 27 through 33, which correspond to Time Periods 1, 2, 3A, 3B, 4A, 4B, and 5, respectively.

Column B shows the nominal time assigned to each time period, and is copied from Worksheet: THmodel, Range J4:J8. Note that for thermal-hydrologic input copied from other worksheets, the values for Time Periods 3A and 3B are copied from Time Period 3, and the values for Time Periods 4A and 4B are copied from Time Period 4. Columns C and D give the beginning and ending of each time period, using data copied from Worksheet: THmodel, Columns K and L. Note that Time Period 3 and Time Period 4 are broken up into 3A, 3B, 4A, and 4B using the durations defined in Cells G11 and G12.

IX.3.11.1 Zone 3/4

Column G contains liquid masses for composite Zone 3/4, copied from Worksheet: CHEMprobL4C4upper, Range AC7:AC11. Column H contains the average temperature for composite Zone 3/4, copied from Worksheet: CHEMprobL4C4upper, Range AF7:AF11. The RH for composite Zone 3/4 is copied to Column L, from Worksheet: THmodel, Range AM124:AM128.

The pH and chloride concentration are calculated using a chemical modeling code, as discussed in the text of the report (Section 6.7). The values are entered manually in Columns I and J, from the tables included in the text of the section.

The chloride concentration is converted to equivalent NaCl concentration, which is bounding because the molality of Na greatly exceeds that of chloride, in the calculated water compositions. The formula for converting to weight-percent NaCl in Column K is

$$C_{NaCl} = \frac{100\,(Cl^-)MW_{NaCl}}{(1000 + (Cl^-)MW_{NaCl})} \qquad \text{(IX-17)}$$

where (Cl^-) = Chloride concentration (molal)
MW_{NaCl} = Molecular weight of NaCl (35.45+22.99 = 58.44 g/mole)

The corrosion penetration rate is calculated in Column M using the formula shown in Cell

A9. This equation is (CRWMS M&O 2000b, p.1) is given by:

$$r = \frac{\min\{0, RH - RH_{crit}\}}{RH - RH_{crit}} \exp\left(b_0 + \frac{1000 b_1}{T + 273} + b_2 pH + b_3 C_{NaCl} \right) \qquad \text{(IX-18)}$$

where RH = Relative humidity from Column L
RH_{crit} = Threshold RH for steel corrosion from Cell G10
b_0, b_1, b_2, b_3 = Coefficients of fit to corrosion data, from Range A4:A7
T = Temperature (°C) from Column H
pH = Solution pH from Column I

In Column N the mass rate of corrosion is calculated from

$$r_{mass,Fe} = Ar\rho \qquad \text{(IX-19)}$$

where A = Area of exposed steel in composite Zone 3/4 (m^2/m; from Cell G15)
ρ = Density of steel (kg/m^3) from Cell G14

The time to complete corrosion of the steel in composite Zone 3/4, based on uniform corrosion for which the rate does not depend on the corrosion extent, is calculated in Column O from the ratio of the mass (Cell G18) to the mass rate of corrosion (Column N). Note that for Time Period 1 and Time Period 2, the humidity is too low for corrosion so the rates in Column N are zero, and the time to complete corrosion is not defined.

Finally, the rate of oxygen consumption is calculated in Column P, using the mass rate of steel corrosion from Column N:

$$r_{mass,O} = \frac{1.5\, r_{mass,Fe}\, MW_{Oxygen}}{MW_{Fe}} \qquad \text{(IX-20)}$$

where MW_{Oxygen} = Formula weight of monatomic oxygen (15.9994 g/mole)
MW_{Fe} = Formula weight of iron (55.847 g/mole)

The rate of oxygen consumption ($r_{mass,O}$) is converted to kg per year, per meter of drift, for comparison to fluxes calculated by the Gas Flux and Fugacity Model, as discussed below.

IX.3.11.2 Zone 5/6

Column R contains liquid masses for composite Zone 5/6, copied from Worksheet: CHEMprobL4C4upper, Range AK7:AK11. Column S contains the average temperature for composite Zone 5/6, copied from Worksheet: CHEMprobL4C4upper, Range AN7:AN11. The RH for composite Zone 5/6 is copied to Column W, from Worksheet: THmodel, Range AP124:AP128.

The pH and chloride concentration values are entered manually in Columns T and U from tables included in the text (Section 6.7). In Column V the chloride concentration is converted to equivalent NaCl concentration, in weight-percent NaCl, using (IX-17). Note that for Time Period 3, RH in Zone 5/6 is high enough to support steel corrosion, but no water composition is calculated by the model. Accordingly, the water composition from Zone 3/4 during this same time period, which flows into Zone 5/6, is used and Range I29:J30 is copied into Range T29:U30.

The corrosion penetration rate is calculated in Column X using the formula shown in Cell A9 and implemented in (IX-18). In Column Y the mass rate of corrosion is calculated using (IX-19). The time to complete corrosion of the steel in composite Zone 5/6 is calculated in Column Z from the ratio of the mass (Cell G19) to the mass rate of corrosion (Column Y). Note that for Time Period 1 and Time Period 2, the humidity is too low for corrosion so the rates in Column Y are zero, and the time to complete corrosion is not defined.

Finally, the rate of oxygen consumption is calculated in Column AA, from the mass rate of steel corrosion in Column Y, using (IX-20). The rate of oxygen consumption ($r_{mass,O}$) is converted to kg per year, per meter of drift.

IX.3.11.3 Summary of O_2 Consumption

The total consumption of oxygen calculated for both composite Zones 3/4 and 5/6 is calculated in Column AC, by summing Columns P and AA. The maximum flux of oxygen available is calculated in Column AD, by multiplying the appropriate value for the limiting oxygen gas flux from Worksheet: Gasmodel, Range AA25:AA37, by the drift diameter (Cell G13).

IX.4 VALIDATION BY HAND CALCULATION

Many of the data fields in these spreadsheet routines are simply copied from other locations (or entered manually) and are verified by comparing the values of the output file to the values in the EXCEL spreadsheet . For calculation cells, validation is accomplished by comparison of calculated results to hand calculations. The following sections provide for each worksheet, and for each type of calculation cell, an example hand-calculation using the equations listed previously. The results are compared quantitatively to the spreadsheet values. In every instance the hand-calculated results agree with the the spreadsheet values, with minor differences attributed to round-off.

Statement of Applicability

This routine is valid for any physically realizable combination of input data. In other words, the results from the routine are equally valid for any realistic repository dimensions and operating perameters. However, there are two principal limitations to applicability: 1) the definition of the time periods (Worksheet: THmodel, Columns J, K, and L) should be suitable for representing the time-evolution of temperature, fluxes, and humidity conditions; and 2) the correlation model used to calculate the corrosion rate for steel, may not be applicable to all possible repository environmental conditions. It is important to note that

accumulation of precipitates and salts in the EBS (as described by the data assembled in Worksheet: THmodel) is directly related to, and strongly sensitive to, the duration of the time periods. Accordingly, the calculated accumulation is an estimate of potential accumulation.

IX.4.1 Worksheet: Matrix.zavg

The data in this worksheet are copied verbatim from the *.zavg files generated by software routine ZONEAVG V1.2 in Attachment I, and are verified bycomparing the values in the output to the values in the worksheet. The values match the source data exactly.

IX.4.2 Worksheet: Fracture.zavg

The data in this worksheet are copied verbatim from the *.zavg files generated by software routine ZONEAVG V1.2, and are verified by comparing the values in the output to the values in the worksheet. The values match the source data exactly.

IX.4.3 Worksheet: Zone.fluxes

The data in this worksheet are copied verbatim from the *.exl file, for which the file name is listed in Cell A1. The *.exl files are generated by the software routine MYPLOT V1.1. Rows of data values are selected from the source file, to correspond with specific simulation times shown in Column A, and copied directly into the worksheet. These values are verified by comparing the values in the output to the values in the worksheet, and match the source data exactly.

IX.4.4 Worksheet: Vertflux

The data in this worksheet are copied verbatim from the *.vflux file, for which the file name is listed in Cell E2. The *.vflux files are generated by the software routine VFLUXPROF V1.1. Rows of data values are copied directly into the worksheet, and verified by comparing the values in the output to the values in the worksheet. The values match the source data exactly.

IX.4.5 Worksheet: Zone.volume

The calculated data in this worksheet are in Columns D, I, J, K, L, O, and P. These calculations use the basic formula for porosity (CRWMS M&O 2000g, p. 17) to calculate void volume based upon void volume for each zone. The porosities for fractures and matrix at the repository horizon are presented in Tables 4 and 5.Table 11 presents the porosity for the natural and engineered barrier system materials. The zone volume summations in Column C are verified using the basic formula for porosity presented above, as shown in Table IX-2. The other calculated data are summarized by Columns L and P. Hand calculations of the total void volume (Column L) and total solid mass (Column P) are also compared with spreadsheet values in Table IX-2. The hand-calculated values agree exactly with the spreadsheet values in this table.

IX.4.6 Worksheet: Vapor Pres.

This worksheet includes only two calculation operations: conversion of pressure units from mm Hg to atm, and curve fitting using the built-in "Add Trendline" function of Excel 97. The pressure unit conversion is verified by simple hand calculation using the conversion factor, and the trendline fit (Eq. IX-1) is verified from the Figure IX-1, obtained directly from the spreadsheet.

IX.4.7 Worksheet: Evap

This worksheet includes calculations in Columns S, T, U, and W. These are verified by hand calculation, for a representative time step, in Table IX-5. Use of a representative time (1,000 yr) is justified because the formulae for all time steps are exact replicates (with automatically incremented row indices). All the hand calculations in Table IX-5 agree closely with the spreadsheet values.

Column S is the summation of evaporation in each zone. The evaporation rate, expressed as mass per unit volume per unit length of drift, for each zone, is shown in Columns C through I (matrix continuum) and Columns L through R (fracture continuum). The zone volumes are shown in the same columns, in Row D. In Column S, the product of the evaporation rate for each zone, times the zone volume, is summed for all zones and both continua. Each product is compared to zero, so that negative values are not summed. The results are in units of kg water per meter of drift. Comparison of the spreadsheet value with hand-calculated results, for the 1000-yr nominal time, is shown in Table IX-5.

In Column T the evaporation rates are converted to units of Watts per meter of drift, by multiplying the rates from Column S, by the heat of vaporization at a nominal boiling temperature of 100°C (2,257 kJ/kg; Incropera and DeWitt, 1996, p. 846). Note that the result is multiplied by 2 to represent the full drift, whereas all NUFT-generated data are for the half-drift symmetry models. The results are converted units of Joules per second per meter of drift, and are compared with hand-calculations in Table IX-5.

In Column U the nominal time is converted from seconds to years. This calculation is verified by comparing the hand calculation for the simple conversion from seconds to years to the calculated value in the spreadsheet.

In Column W the evaporation power from Column T, is converted to a percentage of the thermal input power used in NUFT models (expressed in Watts per meter of drift; full drift basis) DTN SN9907T0872799.001 file: "heatTSPA-SR-99184-Ta.xls worksheet: DRFT-Scale (2-D models). The results are compared with hand calculations in Table IX-5.

IX.4.8 Worksheet: THmodel

Much of this worksheet, from Columns A through BB, consists of data copied from other worksheets. The accuracy of these data is verified by comparing the values in the respective worksheets to the values presented in this worksheet as discussed below. In addition, there are some calculated data which are verified by hand calculation as discussed below. Hand

calculations are performed to verify accurate implementation, for one representative time step (1000 yr). Use of a representative time step is justified because the formulae for all time steps are replicates (with automatically incremented row indices). The values from the simple hand calculations in Table IX-6 agree closely with the spreadsheet values.

In Range AK70:AP75 the total mass of liquid water (M_i) in each zone is calculated based on Equation (IX-2) with volumes ($V_{f,i}$, $V_{m,i}$) and saturations ($S_{f,i}$, $S_{m,i}$) calculated in the following manner. The volumes are calculated in the worksheet Zone fluxes. The saturations are calculated from the mass of water in worksheet Thmodel, and the Zone.Volume worksheet. The void volume is multiplied by the saturation, for both the fracture and matrix continua within each zone. The results are added to yield the total liquid, which is converted to mass units assuming 10^3 kg/m^3 for water. These are verified by hand calculation, for a representative time step, in Table IX-6.

In Range AK79:AP84 the residual mass fluxes are calculated based on the zone-to-zone liquid and gas-phase water fluxes reported by NUFT and copied to columns A through H, from which data are copied to Ranges AJ4:AP9 and AJ13:AP18, respectively. The fluxes into each zone are added, and the fluxes out of the each zone are subtracted, to computed the residual as shown in Equation (IX-3). The results are in units of kg water per meter of drift. The spreadsheet results are compared with hand calculations utilizing Equation (IX-3) with zone fluxes for water and water vapor from Worksheet Zone fluxes, for a representative time (1000 yr) in Table IX-6.

In Ranges AK96:AP101 and AK105:AP110, the respective net vapor and liquid fluxes into each zone are calculated, adjusted for the residuals calculated above. For each zone the calculated value is either the gas-phase, or the liquid-phase, component of the residual calculated in Range AK79:AP84. In addition, the calculated residual values are assigned to the net fluxes as discussed in Section IX.3.8, and the assignments vary for the different cases run (L4C4 and L4C1 locations; "upper" and "lower" infiltration). For the L4C4 location and the "upper" infiltration, for Time Period 1 through Time Period 3 the residual is assigned to (subtracted from) the gas-phase, and for Time Period 4 and Time Period 5 the residual is assigned to (subtracted from) the liquid-phase. The results are in units of kg water per meter of drift. The spreadsheet results are compared with hand calculations, for a representative time (1000 yr) in Table IX-6. In Range AK114:AP119 the residuals are recalculated by summing the net vapor and liquid fluxes for each zone, and the results are zero (or nearly so).

Relative humidity for each zone is calculated from the temperature and air mass-fraction, in Range AK124:AP129, using Equation (IX-4) presented above for RH. The total pressure (P_T) is calculated in Cell AK134, and is the average of the boundary pressures used at the ground surface and the water table, in the NUFT model. The saturated vapor pressure (P^*_{H2O}) is calculated from the temperature in Range AK22:AP27 using Equation (IX-1). Note that the vapor pressure function is not supported by data for temperatures greater than 95°C, so the RH calculated at early time when temperatures exceed boiling is not accurate. Also, for certain conditions the RH may be calculated to exceed unity, even for temperatures less than boiling. This probably occurs because the air mass-fraction value reported by NUFT actually corresponds to a total pressure that is greater than the reference value in Cell AK134. The air

mass-fraction (χ_{air}) is obtained from Range AK31:AP36. The spreadsheet results are compared with hand calculations, for a representative time (1000 yr) in Table IX-6.

Zone-to-zone non-negative fluxes are compiled for the conservative solute analysis in Range AT38:BA42, and Range AU47:AZ51. Each value is compared to zero, such that only positive values are retained (negative values imply fluxes in the opposite direction, which belong in another column). The spreadsheet results are compared with hand calculations, for a representative time (1000 yr) in Table IX-6.

IX.4.9 Worksheet: Gasmodel

Much of this worksheet, specifically Rows 2 through 18, and Columns A, B, C, D, V, and AI, consists of data copied from other worksheets and sources. The accuracy of these data is verified by comparing the values in the other worksheets to the values in this worksheet, and demonstrating that the results are identical. Calculations performed for the other columns are verified by hand calculation as discussed below. In the discussion all references to columns are for Rows 24 through 40 only. Hand calculations are performed to verify accurate implementation, for one representative time step (1000 yr). Use of a representative time step is justified because the formulae for all time steps are replicates (with automatically incremented row indices). All the hand calculations as presented in Table IX-7, and as discussed below agree closely with the spreadsheet values.

Column E contains the maximum value of the vertical component of the gas-phase total mass flux (air + water vapor), for each time step using the EXCEL maximum value function as obtained from the Vert.flux worksheet. Comparison of the spreadsheet value with a hand-calculated result is shown in Table IX-7.

Columns F and G contain the calculated densities for dry air (ρ_{air}), and saturated water vapor (ρ_{vapor}), respectively, calculated from the Ideal Gas Law using Eq. (IX-6). The input temperature (T) is obtained from Column C, and the total pressure (P), gas constant (R), and molecular weights are obtained from among the constants in Rows 2 through 18. Comparison of the spreadsheet values with hand-calculated results is shown in Table IX-7.

The air volume-fraction corresponding to the minimum (Zone 4) air mass-fraction in Column D, is calculated in Column H using Eq. (IX-7) from the air mass fraction (χ_{air}), and the molecular weights for air (MW_{air}) and water (MW_{H2O}) . The volume-averaged density of moist air is calculated in Column I, using Eq. (IX-8) Comparison of spreadsheet values with hand-calculated results is shown in Table IX-7.

Coefficients a and b, for the gas-phase mass transfer function Eq. (IX-9) for CO_2, are calculated in Columns K and L using Eq. (IX-10) and Eq. (IX-11). The maximum concentration ratio ($C_{gas}/C_{gas,in}$) for CO_2 is calculated in Column M, using Eq. (IX-12). The maximum mass flux for CO_2 is calculated in Column N, using Eq. (IX-13). Spreadsheet values for these calculations are compared with hand-calculated results in Table IX-7.

The CO_2 concentration, normalized by the maximum concentration at the ground surface ($C_{gas}/C_{gas,in}$), is calculated in Columns O through U, using Eq. (IX-14). Each column shows

the concentration ratio for a different value of the mass flux ratio, i.e. the consumption rate of CO_2 at depth, normalized by the maximum flux. The mass flux ratio values for each column are given in Row 22. Spreadsheet values for these calculations are compared with hand-calculated results in Table IX-7.

Coefficients a and b, for the gas-phase mass transfer function (IX-9) for O_2, are calculated in Columns X and Y using Eq. (IX-10) and Eq. (IX-11). The maximum concentration ratio ($C_{gas}/C_{gas,in}$) for O_2 is calculated in Column Z, using Eq. (IX-12). The maximum mass flux for O_2 is calculated in Column AA, using Eq. (IX-13). Spreadsheet values for these calculations are compared with hand-calculated results in Table IX-7.

The O_2 concentration, normalized by the maximum concentration at the ground surface ($C_{gas}/C_{gas,in}$), is calculated in Columns AB through AH, using Eq. (IX-14). Each column shows the concentration ratio for a different value of the mass flux ratio, i.e. the consumption rate of O_2 at depth, normalized by the maximum flux. The mass flux ratio values for each column are given in Row 22. Spreadsheet values for these calculations are compared with hand-calculated results in Table IX-7.

IX.4.10 Worksheet: CHEMprobL4C4upper

This worksheet is named differently for each of the cases considered (L4C4 and L4C1 locations; "upper" and "lower" infiltration). The following discussion pertains directly to the L4C4/upper case (file: "th+gas_model-L4C4—04.xls") but applies to the others also.

Columns A through G (Worksheets Gasmodel, and THmodel), L (Worksheet Gasmodel), P (Worksheet THmodel), and R (Worksheet THmodel) present the values for the nominal times, CO_2, and O_2 fugacity ratios, reference CO_2, and O_2 fugacity and simulation times. The values in this worksheet are verified are verified by comparing the values to source worksheets listed above. Calculations performed for the partial pressure of CO_2 (P_{CO2}) and O_2(P_{O2}) are verified by hand calculation as discussed below. All hand-calculation results agree closely with spreadsheet values.

The estimated P_{CO2} is calculated in Column H by multiplying the reference CO_2 fugacity ($C_{gas,in}$ which is an independent datum) from Column D, by the maximum CO_2 fugacity ratio ($C_{gas}/C_{gas,in}$) from Column B. The $\log_{10}$ of P_{CO2} is calculated in Column I. Similarly, the estimated P_{O2} is calculated in Column J, using the reference O_2 fugacity in Column E, and the maximum O_2 fugacity ratio in Column C. The maximum fugacities (without decreases from consumption) are used in this worksheet. Spreadsheet results for the 1000-yr time step are compared to hand-calculated values in Table IX-8. Use of a representative time step for these results is justified because the formulae for all time steps are replicates (with automatically incremented row indices).

Column S contains the sum of vapor influx to Zones 1 and 2, which constitute composite Zone 1/2. Similarly, Column T is the sum of liquid masses in the zones. Column U is the liquid outflux from Zone 1/2, computed from the sum of the flux from Zone 2 to 3 (Worksheet: THmodel, Range AV4:AV8), plus the residuals representing outflow from Zones 1 and 2 back to the host rock (Range AK79:AK83 and Range AL79:AL83,

respectively). Column V is the evaporative concentration factor for Zone 1/2, computed using Eq. (IX-15). Column W is the temperature of Zone 1/2, computed from the zone-averages both zones weighted by the liquid mass in each zone according to Eq. (IX-16). Spreadsheet results for the 1000-yr time step are compared to hand-calculated values in Table IX-8. Use of a representative time step for these results is justified because the formulae for all time steps are replicates.

Column AB contains the sum of vapor influx to Zones 3 and 4, which constitute composite Zone 3/4. Similarly, Column AC is the sum of liquid masses in the zones. Column AD is the liquid outflux from Zone 3/4, computed from the sum of the flux from Zone 3 to 5 (Worksheet: THmodel, Range AX4:AX8) plus the flux from Zone 4 to 5 (Worksheet: THmodel, Range AY4:AY8). Column AE is the evaporative concentration factor for Zone 3/4, computed using Eq. (IX-15). Column AF is the temperature of Zone 3/4, computed from the zone-averages both zones weighted by the liquid mass in each zone according to Eq. (IX-16). For early time (100 yr in Table IX-8) the temperature is calculated from a simple average of the two zoes. Spreadsheet results are compared to hand-calculated values in Table IX-8.

Column AI is the liquid influx to composite Zone 5/6, computed from the sum of the inflow from Zones 3 and 4, to Zone 5. Column AJ contains the sum of vapor influx to Zones 5 and 6. Similarly, Column AK is the sum of liquid masses in the zones. Column AL is the liquid outflux from Zone 5/6, computed from the sum of the residuals representing outflow from Zones 5 and 6 back to the host rock (Range AO79:AO83 and Range AP79:AP83, respectively). Column AM is the evaporative concentration factor for Zone 5/6, computed using Eq. (IX-15). Column AN is the temperature of Zone 5/6, computed from the zone-averages both zones weighted by the liquid mass in each zone according to Eq. (IX-16). Spreadsheet results are compared to hand-calculated values in Table IX-8.

IX.4.11 Worksheet: Steel

The source data for Columns A through E is obtained from Worksheet THmodel. The source data for Columns G through H is obtained from Worksheet CHEMprobl4c4lower. The source data for Columns I and J that is the pH, and the Chloride (Cl^-) concentration is obtained from the results of the EQ3/E6 analysis as presented in the file CHEMprobl4c4upper.xls as presented in Attachment I.The values in this worksheet are verified by comparison with the source worksheets as identified above. The weight-percent NaCl in Column K is obtained from Equation (IX-17) based upon the molecular weight of NaCL, and the Cl^- in Column J. The source data for the RH in Column L is obtained from the THmodel worksheet. Calculations performed for the other columns are verified by hand calculation as discussed below. The penetration rate of steel corrosion is calculated in Column M, using Eq. (IX-18), along with input data in Columns H, I, and K, and input data from Rows 4 through 7, and Row 10. The mass rate of corrosion is calculated in Column N, using Eq. (IX-19). The corresponding elapsed time to complete depletion of the steel by corrosion is calculated in Column O, from the ratio of the total mass (Cell G18) to the mass rate of corrosion. The corresponding rate of oxygen consumption by steel corrosion in Zone 3/4 is calculated in Column P, using Eq. (IX-20). Spreadsheet results are compared to hand-

calculated values using the equations presented above in Table IX-9. All hand-calculation results agree closely with spreadsheet values.

In addition, Columns R through AA have the same formulae, with different input data, as Columns G through P, which is verified by comparing the results of hand calculations to the spreadsheet calculations. Accordingly, the following discussion pertains directly to Columns G through P, and also applies to Columns R through AA.

The total O_2 consumption rate for Zone 3/4 and Zone 5/6 is computed in Column AC, and is the sum of Columns P and AA. The maximum 1-D flux of O_2 into the drift opening is calculated in Column AD,multiplying the maximum flux value from Worksheet: Gasmodel (Column AA) by the drift diameter. Columns AC and AD are verified by comparing the hand calculation to the value in the spreadsheet.

Table IX-1 Time Periods for the EBS Physical and Chemical Environment Model.

Time Period	Nominal (yr)	From (yr)	To (yr)
1	100	50	300
2	500	300	700
3	1000	700	1500
4	2000	1500	2500
5	5000	2500	10000

Table IX-2. Rows Corresponding to Each Zone, in Worksheet: Zone.volume, with Verification by Hand-Calculation of Values for the L4C4 Location

Zone #	Rows for L4C4 Location	Rows for L4C1 Location	Spread-sheet Volume (Cell)	Hand Calc. Volume	Spread-sheet Void Vol. (Cell)	Hand Calc. Void Volume	Spread-sheet Solid Mass (Cell)	Hand Calc. Solid Mass
1	19 to 330	20 to 359	642.5226 (D330)	642.52264	91.2382 (L330)	91.238	1.632E+06 (P330)	1.6320E+06
2	331 to 346	360 to 375	1.7308 (D346)	1.7307756	0.2458 (L346)	0.24577	4.396E+03 (P346)	4396.1
3	347 to 411	376 to 440	6.2761 (D411)	6.2760807	2.5732 (L411)	2.5732	8.473E+03 (P411)	8472.7
4	412 to 415	441 to 444	0.5869 (D415)	0.5868979	0.2406 (L415)	0.24063	7.923E+02 (P415)	792.31
5	416 to 420	445 to 449	1.2913 (D420)	1.29134	0.5294 (L420)	0.52945	1.743E+03 (P420)	1743.3
6	421 to 426	450 to 455	0.7668 (D426)	0.7668021	0.4179 (L426)	0.41791	9.635E+02 (P426)	963.49

Table IX-3 Input data settings for the Worksheet: Gasmodel

Input Value	Description
0.02896	Equivalent molecular weight of air (kg/mole; Weast and Astle, 1981; p. F-12)
0.01801	Molecular weight of water (kg/mole; Weast and Astle, 1981; p. B-105)
8.307	Universal gas constant (Pa m^3/mole K; calculated from the ideal gas law [R=PV/nT] using the following data for standard conditions: $P = 1.013x10^5$ Pa, V = 0.0224 m^3, n = 1 mole, and T = 273.16°K)
0.01207	Volume fraction gas (from borehole SD-12 analysis; spreadsheet routine: "gasC14-SD-12-1996dataV1.2.xls")
1.040E-03	Fitted diffusion-dispersion coefficient for CO_2 (m^2/sec; computed from the molecular diffusion coefficient multiplied by a value of $\tau = 65$ to represent gas-phase dispersion from large-scale circulation and barometric pumping)
1.600E-05	Molecular diffusion coefficient for CO_2 at 25°C (m^2/sec; Incropera and DeWitt 1994; Table A.8, page 849)
2.100E-05	Molecular diffusion coefficient for O_2 at 25°C (m^2/sec; Incropera and DeWitt 1994; Table A.8, page 849)
2.636E-04	Diffusion-dispersion coefficient for O_2 (m^2/sec; calculated from the fitted coefficient for CO_2 above)
3.954E+02	Repository depth (in meters; from the model grid for the L4C4 location, in NUFT input file: "L4C4-LDTH60-1Dds_mc-ui-01v.in")
8.826E+04	Referene total gas-phase pressure (Pa) estimated from the average of the ground-surface and water table pressure boundary conditions, and copied from Worksheet: THmodel, Cell AK134.
1.000E+03	CO_2 relative abundance at surface boundary (ppmv; used as $C_{gas,in}$ for CO_2 calculation)
2.000E+05	O_2 relative abundance at surface boundary (ppmv; assumed value; used as $C_{gas,in}$ for O_2 calculation described in Section 6.2)
0.04402	Molecular weight of CO_2 (kg/mole; Weast and Astle, 1981; p. B-90)
0.03200	Molecular weight of O_2 (kg/mole; Weast and Astle, 1981; p. B-126)
289.1	Average temperature at the surface (°K) equal to the ground-surface temperature boundary conditions in NUFT input file: "L4C4-LDTH60-1Dds_mc-ui-01v.in"
1.617E-03	CO_2 concentration at the surface boundary (kg/m^3) calculated using the ideal gas law, with the average temperature and total pressure at the surface, and molecular weight for CO_2
0.2352	O_2 concentration at the surface boundary (kg/m^3) calculated using the ideal gas law, with the average temperature and total pressure at the surface, and molecular weight for O_2

Table IX-4 Input data for Worksheet: Steel

	Value	Source
Threshold relative humidity for steel corrosion =	0.7	User-defined input
Time to redissolve in Zone 3/4 (Time Period 3A) =	14.65	Spreadsheet: "normative_hiCO2_L4C4_ui-zone34-500V1.2.xls" Worksheet: 700-1500 yr, Cell E56
Time to redissolve in Zone 5/6 (Time Period 4A) =	7.45	Spreadsheet: "normative_hiCO2_L4C4_ui-zone56-1000V1.2.xls" Worksheet: 700-1500 yr, Cell E56
Drift diameter (m) =	5.5	Values justified in accompanying Analysis/Model Report
Steel density (kg/m^3) =	7850	AISC Manual of Steel Construction, Ninth Ed., p. 6-8
Steel surface area in Zone 3/4 (m^2/m) =	6.95	Values justified in accompanying Analysis/Model Report
Steel surface area in Zone 5/6 (m^2/m) =	3.49	Values justified in accompanying Analysis/Model Report
Ratio of O:Fe in corrosion products =	1.5	User-defined input
Initial mass of steel in Zone 3/4 (kg) =	260	Values justified in accompanying Analysis/Model Report
Initial mass of steel in Zone 5/6 (kg) =	925	Values justified in accompanying Analysis/Model Report

Table IX-5 Comparison of Results from Worksheet: Evap, with Hand Calculations (L4C4 location; "upper" infiltration)

Calculation	Spreadsheet Value (Cell)	Hand-Calculated Value
Sum of Evaporation Fluxes (Column S)	7.882E-06 (S14)	7.8818E-06
Evaporation Power (Column T)	3.558E+01 (T14)	3.5579E+01
Proportion of Thermal Output (Column W)	72.44% (W14)	72.447%

Table IX-6 Comparison of Results from Worksheet: THmodel, with Hand Calculations (L4C4 location; "upper" infiltration)

Calculation	Zone #	Spreadsheet Value (Cell)	Hand-Calculated Value
Calculated Zone Liquid Mass (1000 yr)	1	8.220E+04 (AK72)	8.219E+04
	2	2.184E+02 (AL72)	218.1
	3	2.553E+02 (AM72)	255.3
	4	0.000E+00 (AN72)	0
	5	7.242E+00 (AO72)	7.242
	6	0.000E+00 (AP72)	0
Calculated Residual Water Mass Balance Corrections Expressed as Rates (1000 yr)	1	5.915E-05 (AK81)	5.915E-05
	2	-2.000E-09 (AL81)	-2.000E-09
	3	6.430E-08 (AM81)	6.430E-08
	4	4.000E-10 (AN81)	4.000E-10
	5	1.390E-06 (AO81)	1.390E-06
	6	4.993E-07 (AP81)	4.993E-07
Net Water Vapor Input Rate (1000 yr)	1	7.762E-06 (AK98)	7.762E-06
	2	7.880E-07 (AL98)	7.880E-07
	3	-5.238E-06 (AM98)	-5.238E-06
	4	-4.773E-06 (AN98)	-4.773E-06
	5	-1.039E-06 (AO98)	-1.039E-06
	6	0.000E+00 (AP98)	0.000E+00
Net Liquid Water Input Rate (1000 yr)	1	-7.762E-06 (AK107)	-7.760E-06
	2	-7.880E-07 (AL107)	-7.880E-07
	3	5.238E-06 (AM107)	5.238E-06
	4	4.773E-06 (AN107)	4.773E-06
	5	1.039E-06 (AO107)	1.039E-06
	6	0.000E+00 (AP107)	0.000E+00
Relative Humidity Calculation (1000 yr)	1	9.703E-01 (AK126)	9.703E-01
	2	9.610E-01 (AL126)	9.610E-01
	3	9.607E-01 (AM126)	9.607E-01
	4	8.416E-01 (AN126)	8.416E-01
	5	8.572E-01 (AO126)	8.572E-01
	6	7.772E-01 (AP126)	7.772E-01
Liquid Water Zone-to-Zone Positive Influx (1000 yr)	0 to 1	6.165E-05 (AT31)	6.165E-05
	0 to 1	0.000E+00 (AU31)	0.000E+00
	2 to 1	0.000E+00 (AV31)	0.000E+00
	1 to 2	1.026E-05 (WT31)	1.026E-05
	0 to 2	2.000E-09 (AX31)	2.000E-09
	3 to 2	0.000E+00 (AY31)	0.000E+00
	2 to 3	1.105E-05 (AZ31)	1.105E-05
	4 to 3	0.000E+00 (BA31)	0.000E+00
	5 to 3	0.000E+00 (BB31)	0.000E+00

Calculation	Zone #	Spreadsheet Value (Cell)	Hand-Calculated Value
Liquid Water Zone-to-Zone Positive Influx, continued.	3 to 4	4.773E-06 (AT40)	4.773E-06
	5 to 4	0.000E+00 (AU40)	0.000E+00
	3 to 5	1.039E-06 (AV40)	1.039E-06
	4 to 5	0.000E+00 (AW40)	0.000E+00
	0 to 5	0.000E+00 (AX40)	0.000E+00
	6 to 5	0.000E+00 (AY40)	0.000E+00
	5 to 6	0.000E+00 (AZ40)	0.000E+00
	0 to 6	0.000E+00 (BA40)	0.000E+00
Liquid Water Zone-to-Zone Positive Outflux (1000 yr)	1	6.941E-05 (AU49)	6.941E-05
	2	1.105E-05 (AV49)	1.105E-05
	3	5.812E-06 (AW49)	5.812E-06
	4	0.000E+00 (AX49)	0.000E+00
	5	0.000E+00 (AY49)	0.000E+00
	6	0.000E+00 (AZ49)	0.000E+00

Table IX-7 Comparison of Results from Worksheet: Gasmodel, with Hand Calculations (L4C4 location; "upper" infiltration; 1000 yr)

Calculation	Description	Spreadsheet Value (Cell)	Hand-Calculated Value
Max. Gas Mass Flux (Column E)	MAX function	2.068E-06	2.07E-06
Density of Air (Column F; kg/m^3)	Eq. IX-6	0.8335	0.8335
Density of Water Vapor (Column G; kg/m^3)	Eq. IX-6	0.5184	0.5183
Min. Air Volume-Fraction (Column H)	Eq. IX-7	1.414E-03	1.414E-03
Density of Gas (Column I; kg/m^3)	Eq. IX-8	0.5189	0.5188
Coefficient a CO_2 (Column K; kg/m^2-sec)	Eq. IX-10	3.18E-08	3.175E-08
Coefficient b CO_2 (Column L; kg/m^2-sec)	Eq. IX-11	-4.02E-06	-4.017E-06
Max. CO_2 Conc. Ratio (Column M)	Eq. IX-12	0.00791	0.007916
Max. CO_2 Mass Flux (kg/m^2-sec)	Eq. IX-13	5.13E-11	5.14E-11
CO_2 Conc. Ratio (mass flux ratio = 10^{-4})	Eq. IX-14	7.90E-03	7.910E-03
CO_2 Conc. Ratio (mass flux ratio = 0.01)	Eq. IX-14	7.83E-03	7.831E-03
CO_2 Conc. Ratio (mass flux ratio = 0.1)	Eq. IX-14	7.11E-03	7.119E-03
CO_2 Conc. Ratio (mass flux ratio = 0.2)	Eq. IX-14	6.32E-03	6.328E-03
CO_2 Conc. Ratio (mass flux ratio = 0.5)	Eq. IX-14	3.95E-03	3.955E-03
CO_2 Conc. Ratio (mass flux ratio = 0.9)	Eq. IX-14	7.91E-04	7.910E-04
CO_2 Conc. Ratio (mass flux ratio = 0.99)	Eq. IX-14	7.91E-05	7.910E-05
Coefficient a for O_2 (Column K; kg/m^2-sec)	Eq. IX-10	4.17E-08	4.167E-08
Coefficient b for O_2 (Column L; kg/m^2-sec)	Eq. IX-11	-4.03E-06	-4.027E-06
Max. CO_2 Conc. Ratio (Column M)	Eq. IX-12	0.01035	0.01035
Max. CO_2 Mass Flux (kg/m^2-sec)	Eq. IX-13	9.80E-09	9.801E-09
CO_2 Conc. Ratio (mass flux ratio = 10^{-4})	Eq. IX-14	0.0103	0.01035
CO_2 Conc. Ratio (mass flux ratio = 0.01)	Eq. IX-14	0.0102	0.01024
CO_2 Conc. Ratio (mass flux ratio = 0.1)	Eq. IX-14	9.32E-03	9.313E-03
CO_2 Conc. Ratio (mass flux ratio = 0.2)	Eq. IX-14	8.28E-03	8.278E-03
CO_2 Conc. Ratio (mass flux ratio = 0.5)	Eq. IX-14	5.18E-03	5.174E-03
CO_2 Conc. Ratio (mass flux ratio = 0.9)	Eq. IX-14	1.04E-03	1.035E-03
CO_2 Conc. Ratio (mass flux ratio = 0.99)	Eq. IX-14	1.04E-03	1.035E-04

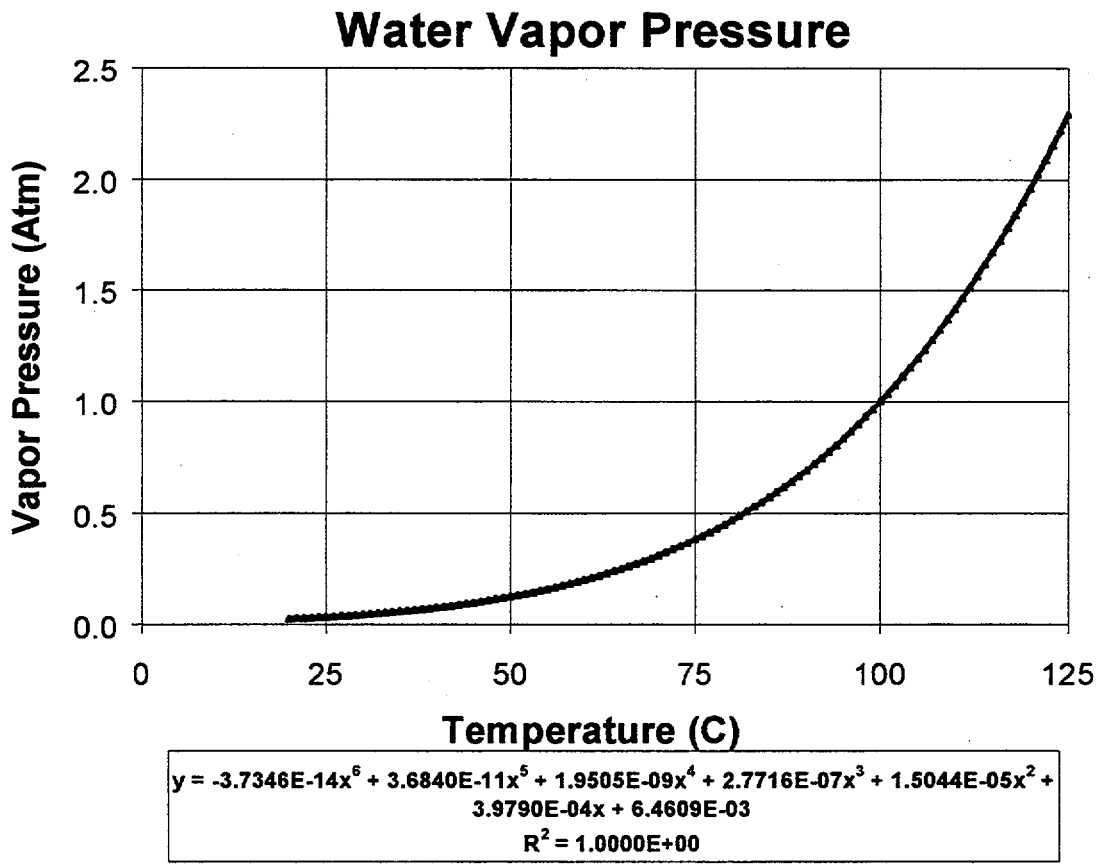
Table IX-8 Comparison of Results from Worksheet: CHEMprobL4C4upper, with Hand Calculations (L4C4 location; "upper" infiltration)

Calculation (Column)	Description	Spreadsheet Value (Cell)	Hand-Calculated Value
Estimated P_{CO2} (atm; Column H)	1000 yr	1.5361E-06	1.536E-06
Estimated $\log_{10}P_{CO2}$ (Column I)	1000 yr	-5.8136	-5.8136
Estimated P_{O2} (atm; Column J)	1000 yr	4.0304E-04	4.030E-04
Estimated $\log_{10}P_{O2}$ (Column K)	1000 yr	-3.3947	-3.3947
Zone 1/2 Vapor Influx (kg/m-sec; Column S)	1000 yr	8.550E-06	8.550E-06
Zone 1/2 Liquid Mass (kg/m; Column T)	1000 yr	8.241E+04	8.242E+04
Zone 1/2 Liquid Outflux (kg/m-sec; Column U)	1000 yr	-7.020E-05	-7.020E-05
Zone 1/2 Evap. Conc. Factor (Column V)	1000 yr	0.8782	0.8782
Zone 1/2 Weighted Avg. Temp. (Column W)	1000 yr	88.42	88.42
Zone 1/2 Thru-Flux to Host Rock (Column Y)	1000 yr	5.915E-05	5.915E-05
Zone 3/4 Vapor Influx (kg/m-sec; Column AB)	1000 yr	-1.001E-05	-1.001E-05
Zone 3/4 Liquid Mass (kg/m; Column AC)	1000 yr	255.3	255.3
Zone 3/4 Liquid Outflux (kg/m-sec; Column AD)	1000 yr	-1.039E-06	-1.039E-06
Zone 3/4 Evap. Conc. Factor (Column AE)	1000 yr	10.64	10.63
Zone 3/4 Weighted Avg. Temp. (Column AF)	100 yr	189.77	189.75
Zone 3/4 Weighted Avg. Temp. (Column AF)	1000 yr	96.05	96.00
Zone 5/6 Liquid Influx (kg/m-sec; Column AI)	1000 yr	1.039E-06	1.039E-06
Zone 5/6 Vapor Influx (kg/m-sec; Column AJ)	1000 yr	-1.039E-06	-1.039E-06
Zone 5/6 Liquid Mass (kg/m; Column AK)	1000 yr	7.242	7.242
Zone 5/6 Liquid Outflux (kg/m-sec; Column AL)	2000 yr	-4.931E-06	-4.931E-06
Zone 5/6 Evap. Conc. Factor (Column AM)	2000 yr	1.046	1.046
Zone 5/6 Weighted Avg. Temp. (Column AN)	100 yr	200.53	200.50
Zone 5/6 Weighted Avg. Temp. (Column AN)	2000 yr	88.46	88.45
Zone 5/6 Thru-Flux to Host Rock (Column AP)	2000 yr	4.931E-06	4.931E-06

Table IX-9 Comparison of Results from Worksheet: Steel, with Hand Calculations (L4C4 location; "upper" infiltration; all results for Time Period 3B, Zone 3/4)

Calculation (Column)	Description	Spreadsheet Value (Cell)	Hand-Calculated Value
Equivalent C_{NaCl} (wt %; Column K)	Eq. (IX-17)	0.01212	0.01212
Penetration Rate (um/yr; Column M)	Eq. (IX-18)	80.36	80.53
Mass Rate of Corrosion (kg/m-yr; Column N)	Eq. (IX-19)	4.384	4.393
Elapsed Time to Depletion (yr; Column O)		59.30	59.19
Oxygen Consumption Rate (kg/m-yr; Column P)	Eq. (IX-20)	5.970E-08	5.982E-08

Figure IX-1. Polynomial Curve Fit to Tabulated Vapor Pressure Data for Water *** replace with current figure



ATTACHMENT X SOFTWARE ROUTINE DOCUMENTATION FOR RUNGE-KUTTA SOLUTION ALGORITHM

ROUTINE IDENTIFICATION

This documentation describes the initial issue of the following routines:

SoluteRKV1.2__50-300-l4c1-li.mcd Version 1.1
SoluteRKV1.2__300-700-l4c1-li.mcd Version 1.1
SoluteRKV1.2__700-1500-l4c1-li.mcd Version 1.1
SoluteRKV1.2__1500-2500-l4c1-li.mcd Version 1.1
SoluteRKV1.2__2500-10000-l4c1-li.mcd Version 1.1
SoluteRKV1.2__50-300-l4c1-ui.mcd Version 1.1
SoluteRKV1.2__300-700-l4c1-ui.mcd Version 1.1
SoluteRKV1.2__700-1500-l4c1-ui.mcd Version 1.1
SoluteRKV1.2__1500-2500-l4c1-ui.mcd Version 1.1
SoluteRKV1.2__2500-10000-l4c1-ui.mcd Version 1.1
SoluteRKV1.2__50-300-l4c4-li.mcd Version 1.1
SoluteRKV1.2__300-700-l4c4-li.mcd Version 1.1
SoluteRKV1.2__700-1500-l4c4-li.mcd Version 1.1
SoluteRKV1.2__1500-2500-l4c4-li.mcd Version 1.1
SoluteRKV1.2__2500-10000-l4c4-li.mcd Version 1.1
SoluteRKV1.2__50-300-l4c4-ui.mcd Version 1.1
SoluteRKV1.2__300-700-l4c4-ui.mcd Version 1.1
SoluteRKV1.2__700-1500-l4c4-ui.mcd Version 1.1
SoluteRKV1.2__1500-2500-l4c4-ui.mcd Version 1.1
SoluteRKV1.2__2500-10000-l4c4-ui.mcd Version 1.1

These routines were developed and compiled using Mathcad 8 Professional (MathSoft 1998), run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 V4.00.950 B). The source code has been provided on the CD, in a submittal described in Attachment I. Each of the above routines contains exactly the same set of Mathcad operations, with different input data. This software is a classified as a routine per AP-SI.1Q, and is qualified by this Attachment. This routine executes the expected mathematical operations accurately, and is therefore appropriate.

ROUTINE PURPOSE

The purpose of this software is to use an intrinsic Mathcad function RKadapt(Runge-Kutta method with adaptive step size) to solve a set of simultaneous, linear, ordinary differential equations (Equation 15) that describe the movement of a conservative, ideal solute through a lumped-parameter model of the Engineered Barrier System (EBS). Each of the above files (herein called "SoluteRK" files) solves this problem for all zones (mixing cells) representing the EBS, for one thermal-hydrology (T-H) case, and for one of the time periods used to describe EBS evolution during the 10,000-yr performance period.

INPUT AND OUTPUT DATA

There are no input or output files associated with this software. Rather, the input data are entered manually into specific fields within the Mathcad files. These input data consist of liquid inflow, liquid outflow, and liquid masses for each zone during the time period. These are obtained from specified calculation cells within the software routine spreadsheets

th+gas_model-l4c1-li-04.xls
th+gas_model-l4c1-ui-04.xls
th+gas_model-l4c4-li-04.xls
th+gas_model-l4c4-ui-04.xls

Each of these contains input information for one of four T-H cases representing two locations (l4c1 and l4c4) and two infiltration distributions (upper and lower, represented by "ui" and "li" respectively).

In addition, the input data also include the mass of conservative solute remaining in the zone from the previous time period. These data are obtained from the SoluteRK file for the previous time period. Finally, the input include the duration of each time period in years, which is a a fixed constant in each SoluteRK file (because each such file represents a specific time period).

The output data consist of calculated normalized mass of the conservative solute as a function of time, for all zones, during one time period. Output also includes the final solute mass present in each zone at the end of the time period.

VALIDATION TEST CASE

The routine includes algebraic calculations that set up the problem for Runge-Kutta solution. These set-up calculations are validated in this Attachment using a test case. The Runge-Kutta algorithm (the "Rkadapt" function call in Mathcad) validation is presented below..

The test case is selected from the SoluteRK files ("SoluteRKV1.2__Test_Case.mcd"). The hand calculation that verifies the accuracy of the test case is described below. The input data for the test case hand calculation are shown in Table X-1. The model term coefficients are calculated using the formulae shown in Figure X-1, and the hand-calculated results are shown in Table X-2. The initial concentrations are calculated using

$$C(i) = \text{Initial Mass (kg) / Volume (or mass) of Liquid in Zone} \qquad \text{(X-1)}$$

and are also shown in Table X-2. The model system coefficients are calculated using the formulae shown in Figure X-2, and the hand-calculated results are shown in Table X-2. Note that the parameter C_0 is the reference concentration and is assigned a value of unity.

Comparisons with hand-calculated results in Table X-2 show that the SoluteRK results match exactly as reported. The input data are given to a minimum of four significant digits, so calculations should not be reported to greater precision. However, Mathcad performs all operations to 15 digits of precision, so in order to reproduce the Mathcad values the hand calculations were taken to more than four significant digits, and rounded off for comparison in

Table X-2. The actual values for intermediate results that were used in the hand calculations, are shown with the actual number of digits used, in Table X-2.

The conservative solute system of simultaneous ordinary differential equations with initial concentrations represents an initial value problem. In order to verify that the Rkadapt MathCad routine has converged to a steady state solution, the final concentrations in the analysis as represented by the final concentration vector are substituted into the right-hand-side (RHS) of the system of ordinary differential equations below:

The final steady state concentrations when substituted into the RHS result in the equaling zero. The solution satisfies the system of ordinary differential equations (Equation 15), and the Rkadapt MathCad function is verifed for the given set of parameters.

The final comparison to hand-calculated results is the post-processing of the Runge-Kutta solution results in SoluteRK array Zm, which contains the concentration of solute in each zone, at each time step. These values are multiplied by the zone volumes, in the form of a diagonal matrix P:

$$Mm = Zm * P \tag{X-3}$$

to obtain the mass of solute in each zone, for every time step. This calculation is also done for the final mass in each zone. The last row of array Zm corresponds to the last time step (y=7500 yr), and mass is calculated from

$$m(i) = Zm(y+1,i+1)*V(i) \tag{X-2}$$

The calculation shown in Equation X-2 for the last time step is used as a test case. The results are shown in Table X-3, and the hand-calculations match the SoluteRK values exactly.

This foregoing process documents the accuracy of this routine for calculating changes in mass of a conservative solute, within each zone in the EBS lumped parameter model, for one time step.

The algorithm implemented in this routine describes solute accumulation in a network of zones or cells, for steady-state flow conditions. The algorithm is applied successively to different time periods, which represent the evolution of the simulation problem in a step-wise manner. This routine is valid for any set of input data that describes a system of such zones with the same connectivity as the system developed in Section 6.1. In addition, the liquid flux from Zone 3 to Zone 2 must be zero (i.e. from the drift into the overlying host rock).

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Table X-1. Input Data for SoluteRK Test Case.

Inflow and Outflow Data			
Zone	**Flow In to Zone (kg/m-sec)**	**Flow Out of Zone (kg/m-sec)**	**Volume or Mass (kg/m)**
1	q_{01}=1.049E-4 q_{21}=0	q_{1out}=1.049E-4	V_1=8.212E+4
2	q_{02}=9.8E-10 q_{12}=8.639E-6	q_{2out}=8.684E-6	V_2=220.7
3	q_{23}=8.684E-6 q_{43}=0 q_{53}=0	q_{3out}=9.282E-6	V_3=397.2
4	q_{34}=3.352E-6 q_{54}=0	q_{4out}=2.717E-6	V_4=44.08
5	q_{05}=0.0 q_{35}=5.93E-6 q_{45}=2.717E-6 q_{65}=0	q_{5out}=8.583E-6	V_5=161.7
6	q_{06}=0 q_{56}=8.376E-6	q_{6out}=8.418E-6	V_6=61.47
Initial Solute Mass in Zones			
Zone	**Initial Mass (kg)**		
1	8.254E+4		
2	196.875		
3	214.752		
4	75.572		
5	154.768		
6	57.637		
Duration of Time Period (yr)			
y=7500			

Table X-2. Results from Hand Calculation of Model Coefficients

Model Term Coefficients		
Coefficient	**Hand-Calc. Value**	**SoluteRK**
A_{1a}	0.040238	0.040238
A_{1b}	0.040238	0.040238
A_{1c}	0	0.0
A_{2a}	1.3989E-4	1.3989E-4
A_{2b}	1.233024	1.233024
A_{2c}	1.239447	1.239447
A_{3a}	0.688686	0.688686
A_{3b}	0.736110	0.736110
A_{3c}	0	0
A_{3d}	0	0
A_{4a}	2.395372	2.395372
A_{4b}	1.941595	1.941595
A_{4c}	0	0
A_{5a}	0	0
A_{5b}	1.155195	1.155195
A_{5c}	0.529286	0.529286
A_{5d}	1.672013	1.672013
A_{5e}	0	0
A_{6a}	0	0
A_{6b}	4.292240	4.292240
A_{6c}	4.313763	4.313763
Initial Concentrations		
Zone	**Hand-Calc. Value**	**SoluteRK Value**
C(1)	1.005	1.005
C(2)	0.892	0.892
C(3)	0.541	0.541
C(4)	1.714	1.714
C(5)	0.957	0.957
C(6)	0.938	0.938
Model Coefficients		
Zone	**Hand-Calc. Value**	**SoluteRK Value**
D(1)	-1.862E-4	-1.862E-4
D(2)	0.133	0.133
D(3)	0.216	0.216
D(4)	-2.034	-2.034
D(5)	-0.068	-0.068
D(6)	0.063	0.063

Table X-3. Results from Hand Calculation of Final Masses

Zone (i)	Zm(751,I)	Hand-Calc. Value m(i)	SoluteRK Value m(i)
1	1.000000	8.212E+4	8.212E+4
2	0.995	219.581	219.581
3	0.931	369.726	369.726
4	1.148	50.621	50.621
5	1.007	162.773	162.773
6	1.002	61.601	61.601

$$A_{1a} := \frac{q_{01} \cdot 3.15 \cdot 10^7}{V_1} \quad A_{1b} := \frac{q_{1out} \cdot 3.15 \cdot 10^7}{V_1} \quad A_{1c} := \frac{q_{21} \cdot 3.15 \cdot 10^7}{V_1}$$

$$A_{2a} := \frac{q_{02} \cdot 3.15 \cdot 10^7}{V_2} \quad A_{2b} := \frac{q_{12} \cdot 3.15 \cdot 10^7}{V_2} \quad A_{2c} := \frac{q_{2out} \cdot 3.15 \cdot 10^7}{V_2}$$

$$A_{3a} := \frac{q_{23} \cdot 3.15 \cdot 10^7}{V_3} \quad A_{3b} := \frac{q_{3out} \cdot 3.15 \cdot 10^7}{V_3} \quad A_{3c} := \frac{q_{43} \cdot 3.15 \cdot 10^7}{V_3} \quad A_{3d} := \frac{q_{53} \cdot 3.15 \cdot 10^7}{V_3}$$

$$A_{4a} := \frac{q_{34} \cdot 3.15 \cdot 10^7}{V_4} \quad A_{4b} := \frac{q_{4out} \cdot 3.15 \cdot 10^7}{V_4} \quad A_{4c} := \frac{q_{54} \cdot 3.15 \cdot 10^7}{V_4}$$

$$A_{5a} := \frac{q_{05} \cdot 3.15 \cdot 10^7}{V_5} \quad A_{5b} := \frac{q_{35} \cdot 3.15 \cdot 10^7}{V_5} \quad A_{5c} := \frac{q_{45} \cdot 3.15 \cdot 10^7}{V_5} \quad A_{5d} := \frac{q_{5out} \cdot 3.15 \cdot 10^7}{V_5}$$

$$A_{6a} := \frac{q_{06} \cdot 3.15 \cdot 10^7}{V_6} \quad A_{6b} := \frac{q_{56} \cdot 3.15 \cdot 10^7}{V_6} \quad A_{6c} := \frac{q_{6out} \cdot 3.15 \cdot 10^7}{V_6} \quad A_{5e} := \frac{q_{65} \cdot 3.15 \cdot 10^7}{V_5}$$

Figure X-1. Formulae for Hand-Calculated Model Term Coefficients.

$$D(t,C) := \begin{bmatrix} A_{1a} \cdot C_0 - A_{1b} \cdot C_1 + A_{1c} \cdot C_2 \\ A_{2a} \cdot C_0 + A_{2b} \cdot C_1 - A_{2c} \cdot C_2 \\ A_{3a} \cdot C_2 - A_{3b} \cdot C_3 + A_{3c} \cdot C_4 + A_{3d} \cdot C_5 \\ A_{4a} \cdot C_3 - A_{4b} \cdot C_4 + A_{4c} \cdot C_5 \\ A_{5a} \cdot C_0 + A_{5b} \cdot C_3 + A_{5c} \cdot C_4 - A_{5d} \cdot C_5 + A_{5e} \cdot C_6 \\ A_{6a} \cdot C_0 + A_{6b} \cdot C_5 - A_{6c} \cdot C_6 \end{bmatrix}$$

Figure X-2. Formulae for Hand-Calculating Model Coefficients

ATTACHMENT XI SOFTWARE ROUTINE DOCUMENTATION FOR SD-12 BOREHOLE ^{14}C ACTIVITY AND CO_2 ABUNDANCE DATA PLOTTING AND FITTING SPREADSHEET

XI.1 ROUTINE IDENTIFICATION

This Attachment describes the initial issue of software routine: "gasC14-SD-12-1996dataV1.2.xls" Version 1.1 which is an Excel 97 (SR-2) spreadsheet. The source file has been submitted in electronic form (Attachment I). The routine was run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 4.00.950 B). The spreadsheet is classified as a routine per AP-SI.1Q, and is qualified by this Attachment.

XI.2 ROUTINE PURPOSE

The purpose of this routine is to assemble data from borehole SD-12, consisting of in situ gas-phase and porewater CO_2 abundance and ^{14}C activity, unit contact depths, matrix saturation, matrix porosity, and fracture porosity. The routine compiles and plots CO_2 data from borehole SD-12; and calculates and plots an exponential solution for gaseous mass transfer. These data are manipulated and plotted to support interpretation of the natural, ambient transport of CO_2 into the unsaturated zone (UZ) by gas-phase diffusive-dispersive mass-transfer processes. This routine supports the Engineered Barrier System (EBS) Physical and Chemical Environment Analysis/Model Report.

Specific purposes for Worksheet: SD-12 stratigraphy, are to calculate the depth-averaged fracture porosity and depth-averaged matrix volumetric porewater content for the UZ geologic section at borehole SD-12. These quantities are expressed as the thickness-volumetric water product, and the thickness-fracture porosity product. Each measure is calculated for the depth interval between the ground surface and the bottom of the welded host rock (which corresponds to the top of an inferred perched water zone). The calculations are valid within the range of borehole depth for SD-12 presented from the geologic framework model (DTN: MO9811MWDGFM03.000)

XI.3 ROUTINE DESCRIPTION

XI.3.1 Worksheet: SD-12 stratigraphy

Columns A, B, and C are copied from a table of stratigraphic picks prepared for borehole SD-12, which was prepared to support the Groundwater Flow Model (GFM) V3.0 (DTN: MO9811MWDGFM03.000, file "pix98usgs.xls"). This constitutes a list of all geologic units logged in the SD-12 borehole, and the contact depths.

Columns D and E represent depth intervals abstracted from the geologic intervals in Columns A and B, which best correspond to hydrostratigraphic intervals at the SD-12 location. The depth intervals in Columns D and E honor the intervals from Columns A and B, but may roll up several geologic units into one hydrostratigraphic interval. A hydrostratigraphic unit is

assigned to each abstracted depth interval, in Column F. Assignment of hydrostratigraphic units to geologic units is supported by the UZ Site-Scale Model for Viability Assessment (Bodvarsson et al. 1997, Table 3.4-1).

Column G is a list of all available hydrostratigraphic units from a "rocktab" file used in thermal-hydrology calculations from DTN: LB997141233129.001 (file: "dkm_afc-ds-NBS-m_inf" described in Attachment I). This file corresponds to the hydrostratigraphic property set developed for "median" infiltration conditions. Column H is the unit thickness calculated from Columns D and E, converted from feet to meters. Because some geologic units listed in Column G are not present in borehole SD-12, some of the thickness values in Column H are zero. Columns I and J sum all the zero and nonzero thickness values, and calculate depth intervals for every individual hydrostratigraphic unit, whether present or not. Columns K and L show the abstracted intervals, each of which incorporates one or more discrete hydrostratigraphic units.

Column M copies the matrix porosity values for each hydrostratigraphic unit from the "rocktab" file (DTN: LB997141233129.001) discussed above. Column N is an approximate value for the saturation of each hydrostratigraphic unit present in borehole SD-12. The values in Column N were picked visually to represent the central tendency of scattered measurements for each hydrostratigraphic unit present (DTN: LB970201233129.001, Figure 6.4.10). Matrix saturation is used to estimate an *average* volumetric water-thickness product for the UZ, so approximate values for saturation are acceptable. Column O calculates the volumetric water content for each hydrostratigraphic unit, using the matrix porosity and approximate saturation from Columns M and N, respectively. Column P calculates a volumetric water-thickness product for each hydrostratigraphic unit present, and Column Q sums these values for each abstracted interval.

Column R copies the fracture porosity values for each hydrostratigraphic unit from the "rocktab" file discussed above. Column S calculates a fracture porosity-thickness product for each hydrostratigraphic unit, and Column T sums these values for each abstracted interval.

XI.3.2 Worksheet: gas and porewater C-14

This worksheet has four functions: 1) assign values for ^{14}C activity to the abstracted intervals defined in Worksheet: SD-12 stratigraphy; 2) assign values for total dissolved CO_2 in the same abstracted intervals; 3) estimate the influx of modern carbon to the UZ from ^{14}C mass balance; and 4) plot the exponential solution for ^{14}C activity vs. and compare graphically with ^{14}C data from borehole SD-12.

^{14}C Activity Data and Assignment of Values to Abstracted Intervals

Columns A through G contain geologic data for borehole SD-12 that are copied from the DTN: GS961108312271.002. . Two types of data are copied:

- Borehole Gas Samples – Rows 6 through 23 are for gas samples. The depth information is reported in meters and is copied to Column I (DTN: GS961108312271.002). Depth values in feet are calculated in Row G.

- Extracted Porewater Samples – Rows 28 through 39 and Rows 44 through 56, report ^{14}C activity analyses for extracted porewaters (DTN: GS961108312271.002). Each measurement represents the result of processing a small interval of rock core, which is reported as the Depth Range in feet. The approximate midpoint of this range is entered in Column H, and converted to meters in Column I.

The end result of the foregoing discussion is Column C with ^{14}C activity, and Column I with depth in meters. These data are plotted along with the exponential function discussed below.

Column J contains the depths for the abstracted depth intervals, copied from Worksheet: SD-12 stratigraphy, Column L. Column K calculates the interval thickness, from the depth information in Column J. Column L contains user-defined values for ^{14}C activity, which are assigned to the abstracted depth intervals. The ^{14}C activity values are selected so that the abstracted profile in Figure 1 is a reasonable fit to the plotted data (from Columns C and I). The depth intervals were developed in Worksheet: SD-12 stratigraphy, and only the ^{14}C activity values are assigned here. Use of the abstracted profile is limited to integration over depth, for the purpose of calculating the overall ^{14}C required for steady-state replacement of ^{14}C decay in situ. This application depends on matching the overall trend vs. depth, for which the approximate values assigned here are suitable.

Total Dissolved CO_2 Data and Assignment of Values to Abstracted Intervals

Columns M through O and Q through S, contain data for borehole SD-12 that are copied from the Technical Data Management System (Data Tracking Numbers provided as noted). These data are limited to bicarbonate analyses for extracted porewaters from core samples obtained in borehole SD-12, plus two core samples from Alcove 5 boreholes PERM-1 and PERM-3. The concentration data are expressed in units of bicarbonate mass per volume of porewater. These data are converted in Column P to units of CO_2 mass per volume of porewater, whereby total dissolved inorganic carbon is represented by bicarbonate. This approximation is appropriate for waters with near-neutral pH and typical alkalinity, because relatively small amounts of inorganic carbon are found as carbonic acid (H_2CO_3), carbonate (CO_3^{2-}), or other complexes.

Each measurement of porewater bicarbonate concentration represents the result of processing a small interval of rock core, which is reported as the Depth Range in feet. The approximate midpoint of this range is entered in Column T, and converted to meters in Column U. The end result of the foregoing discussion is Column P with porewater CO_2 concentration, and Column U with depth in meters.

Column V contains the depths for the abstracted depth intervals, copied from Worksheet: SD-12 stratigraphy, Column L. Column W calculates the interval thickness, from the depth information in Column V. Column X contains user-defined values for porewater CO_2 concentration, which are assigned to the abstracted depth intervals. The porewater CO_2 values are selected so that the abstracted profile in Figure 2 is a reasonable fit to the plotted data (from Columns P and U). The depth intervals were developed in Worksheet: SD-12 stratigraphy, and only the porewater CO_2 values are assigned here. Application of the abstracted profile is limited to integration over depth, which depends on matching the overall trend vs. depth, for which the approximate values assigned here are suitable.

^{14}C Mass Balance

Column Y contains the depths for the abstracted depth intervals, copied from Worksheet: SD-12 stratigraphy, Column L. Column Z contains the volumetric water-thickness product copied from Worksheet: SD-12 stratigraphy, Column Q.

Column AA calculates the flux of CO_2 to each abstracted depth interval, required to replace the CO_2 lost to radioactive decay. This result is calculated from

$$m_{incr} = C_{total}(\theta\,\Delta z)\lambda_{14}\,{}^{14}a/{}^{14}a_{in} \qquad \text{(XI-1)}$$

where C_{total} = Assigned value of the total CO_2 concentration, from Column X (mg/l)
$\theta\Delta z$ = Volumetric water-thickness product from Column Z (m)
λ_{14} = Decay constant for ^{14}C (sec^{-1})
^{14}a = ^{14}C activity in each depth interval from Column L (pmc)
$^{14}a_{in}$ = ^{14}C activity in recharge, from Cell AC32 (pmc) (Fritz and Fontes 1980, pp. 51–53)

The right hand side is divided by 1,000 so that m_{incr} is in units of kg/m^2-sec. This is converted to units of mg/m^2-yr in Column AB. In Column AC the incremental fluxes in Column AB are integrated, so as to compute the cumulative CO_2 demand as a function of depth. Both Columns AB and AC are plotted vs. depth, in Figure 3.

Additional calculations in Column AC, Rows 32 through 49, summarize the mass balance calculations. Cell AC33 contains user-defined input for the total CO_2 concentration of recharge water. The value input (94 mg CO_2/l) is based on J-13 water. The total CO_2 demand (mg CO_2/m^2-yr) is copied from Cell AC28 to Cell AC34.

Cell AC37 contains user-defined input for the ^{14}C activity of recharge through-flow to the saturated zone. This value is used for argument purposes, to compare the required influx of modern $^{14}CO_2$ to the UZ from gas- and liquid-phase advective processes. Cell AC38 contains user-defined input for the ^{14}C activity of the average recharge. Cell AC39 calculates the minimum required -flux of modern CO_2 below a depth of 396.97 m in borehole SD-12, found from the difference between Cell AC34 and Cell AC20. Cell AC41 calculates the minimum required flux of modern CO_2 below a depth of 397 m, corrected for discharge to SZ of CO_2 with nonzero ^{14}C activity described by Cell AC37. Column AC42 calculates an estimate of the aqueous flux needed to deliver this CO_2 flux below 397 m, calculated by dividing the contents of Cell AC41 by Cell AC33.

Any excess percolation flux that could potentially support CO_2 transport to the UZ above 397 m, is calculated in Cell AC45. Fracture waters run rapidly through the fractured tuff, to the perching horizon near 397 m, without interacting with the UZ above this depth. For the borehole SD-12 location, if the net infiltration flux is less than approximately 5 mL/yr, then this excess percolation flux is zero, and much or all of the CO_2 flux to the host rock is transported in the gas phase. Cell AC46 calculates the minimum required flux of modern CO_2 to replace decay between the surface and a depth of 397 m, found from the difference between Cell AC34 and Cell AC20. Cell AC47 calculates the amount transported by liquid flux, which is zero if Cell AC45 is zero. Cell AC49 corrects the minimum required CO_2 flux (Cell AC46) by the amount transported in liquid flux (Cell AC47) to determine the minimum

flux of modern CO_2 in the gas phase, to replace that lost to radioactive decay above 397 m depth in borehole SD-12.

Plot the Exponential Solution for ^{14}C Activity vs. Depth

Columns AD through AH implement the exponential solution developed in the text for ^{14}C activity vs. depth in the UZ, which is based on steady-state, retarded, 1-D advective-dispersive transport (Equation 22):

$$^{14}a = {}^{14}a_{in} \exp\left\{ z \left[\frac{uK_d - \sqrt{u^2K_d^2 + 4\lambda_{14}\phi_{gas}D_{gas}\left(\phi_{gas} + \phi_{liquid}K_d\right)}}{2\phi_{gas}D_{gas}} \right] \right\} \qquad \text{(XI-2)}$$

where u = Advective velocity (based on flux divided by ϕ_{liquid})
K_d = Partition coefficient for CO_2 between the immobile liquid phase and the gas phase; assigned a dimensionless value of 53.1
ϕ_{gas} = Average fracture porosity in the UZ, corrected for fracture saturation
D_{gas} = Effective dispersion-diffusion coefficient (fitting parameter; m^2/sec)
ϕ_{liquid} = Average liquid-filled porosity in the UZ

The average fracture porosity (ϕ_{gas}) is calculated in Cell AD15, from the fracture porosity-thickness product calculated in Worksheet: SD-12 stratigraphy, Cell T43, using the following formula:

$$\phi_{gas} = (1 - S_{frac})(\phi_{frac}\Delta z)/\Delta z \qquad \text{(XI-3)}$$

where S_{frac} = Fracture saturation, for which a value of 0.01 is used
$(\phi_{frac}\Delta z)$ = Fracture porosity-thickness product (m)
Δz = Depth interval (397 m)

Application of Eq. (XI-2) is relatively insensitive to the value selected for fracture saturation, as long as the value is small (e.g. < 0.1). Similarly, the average liquid-filled porosity (ϕ_{liquid}) is calculated by dividing the volumetric water-thickness product ($\theta\Delta z$) calculated in Worksheet: SD-12 stratigraphy, Cell Q43, by the total depth increment (Δz = 397 m).

A summary of the input data for this portion of the worksheet is shown in Table XI-1. The coefficient of z, in Eq. (XI-2) is calculated for the lower, median, and upper infiltration values, in Cells AD22, AD23, and AD24, respectively. Columns AD and AE are used to set up a column of depth (z) values, in Range AD30:AE70. Equation (XI-2) is calculated in Columns AF, AG, and AH, for the average lower, average mean, and average upper infiltration values, respectively (Rows 30 through 70). These calculated results are plotted against depth (Column AE) in Figure 4.

XI.4 VALIDATION TEST CASE

Statement of Applicability

The results of these routines meet the objectives, and have been found by direct comparison of the spreadsheet calculations with the hand calculations to accurately perform the required numerical manipulations, so the routines are therefore appropriate and valid. It should be noted that the 1-D mass transfer model Eq. (XI-2) is generally a bounding-type model, but involves some approximations and assumptions that may restrict its use.

XI.4.1 Worksheet: SD-12 Stratigraphy

The calculations consist of differencing and summation of depths, unit conversions, multiplying to form thickness-products, and summation of the thickness products from the source data identified above. The accuracy of these results is verified by simple hand calculations that are compared with the worksheet calculations.

XI.4.2 Worksheet: gas & porewater C-14

The simple calculations are verified by comparing simple hand calculations to the results of the worksheet calculations from the source data identified above. In addition, there are several ranges containing calculations, that are verified by comparison to hand calculations as described below.

Incremental CO_2 Flux for Decay

Column AA calculates the required mass flux of modern CO_2, required to replenish radioactive decay within each of the abstracted depth intervals. Comparison of spreadsheet values from Column AA with hand-calculations using Eq. (XI-1) is shown in Table XI-2. The hand-calculated values agree closely with the spreadsheet values in this table.

Exponent Coefficient

The coefficient of depth (z) in the exponent of Eq. (XI-2) is calculated in Cells AD22, AD23, and AD24, for lower, median, and upper infiltration conditions, respectively. Comparison of spreadsheet values from these cells with hand calculations is shown in Table XI-3. Input data for the hand calculations are listed in Table XI-1. The hand-calculated values agree closely with the spreadsheet values in this table.

Calculated ^{14}C Activity

The resulting ^{14}C activity calculated using Eq. (XI-2) is calculated for lower, median, and upper infiltration conditions in Ranges AF30:AF70, AG30:AG70, and AH30:AH70, respectively. The same formula is copied to all cells in each range, with automatic indexing of precedent cells, so it is necessary to verify only a few representative calculations by hand calculation. Comparison of a few representative spreadsheet values with hand calculations, is shown in Table XI-4. The input depth is obtained from Range AE30:AE70, the ^{14}C activity at the surface is from Cell AD20, and the exponent coefficients are from the cells discussed above. The hand-calculated values agree closely with the spreadsheet values in this table.

The above results from the validation test case show agreement with hand calculations, therefore the routine executes the desired operations accurately, and is determined to be valid for its intended use. The routine provides correct results for the range of parameters obtained from the input sources.

Table XI-1 Input Data for Fitting Exponential Solution to Observed ^{14}C Activity vs. Depth

Cell	Value	Description	Source
AD3	0.56	Aqueous flux - lower average (mm/yr)	Spreadsheet file "infiltration.xls"
AD4	1.77778E-11	Aqueous flux (m/sec)	Calculated
AD5	5.98	Aqueous flux - medial average (mm/yr)	Spreadsheet file "infiltration.xls"
AD6	1.89841E-10	Aqueous flux (m/sec)	Calculated
AD7	14.56	Aqueous flux - upper average (mm/yr)	Spreadsheet file "infiltration.xls"
AD8	4.62222E-10	Aqueous flux (m/sec)	Calculated
AD9	1.00E+03	CO_2 concentration in air (ppmv)	See report Section 4.1.2
AD10	94.0	CO_2 concentration in porewater (mg/l)	See report Section 4.1.2
AD11	8.826E+04	Reference pressure (Pa)	Avg. total pressure at the repository horizon (l4c4 location; Section 4.1.1)
AD12	303.0	Reference temperature (K)	See report Section 4.1.1
AD13	53.1	Distribution coefficient (dimensionless)	See report Section 6.2
AD14	0.01	Average assumed fracture saturation	Assumed value; used for sensitivity testing only
AD15	0.01207	Average volume fraction gas in fractures	Calculated; see text
AD16	1.60E-05	CO_2 diffusion coefficient in air (m^2/sec)	See report Section 4.1.2
AD17	5.00E+00	Tortuosity-dispersion coefficient	Fitting parameter (value shown is for SD-12)
AD18	3.84E-12	^{14}C decay constant (sec^{-1})	Accepted data
AD19	0.1065	Average volume fraction liquid	Calculated; see text
AD20	100	Reference ^{14}C activity	See report Section 4.1.2

Table XI-2 Comparison of Calculated CO_2 Flux Values with Hand Calculations

Abstracted ^{14}C Activity pmc	Abstracted CO_2 Conc. Conc. (mg/l)	Vol. Water x Thickness Product	CO_2 Flux for Decay (kg/m^2-sec)	Hand-Calc. Value (kg/m^2-sec)
95	100	5.401	1.970E-12	1.970E-12
80	100	3.338	1.025E-12	1.025E-12
65	100	2.986	7.452E-13	7.452E-13
50	144	9.695	2.681E-12	2.681E-12
40	144	3.727	8.243E-13	8.243E-13
35	144	9.243	1.789E-12	1.789E-12
30	50	7.874	4.536E-13	4.536E-13
25	50	3.803	1.825E-13	1.825E-13
85	50	18.187	2.968E-12	2.968E-12
70	110	4.086	1.208E-12	1.208E-12
60	110	18.668	4.731E-12	4.731E-12

Table XI-3 Comparison of Calculated Exponent Coefficients with Hand-Calculated Values

Infiltration State	Average Net Infiltration Flux (mm/yr)	Spreadsheet Value (Cell)	Hand Calculated Value
Lower	0.56	-4.28E-03 (AD22)	-4.284E-03
Median	5.98	-1.84E-03 (AD23)	-1.838E-03
Upper	14.56	-8.59E-04 (AD22)	-8.592E-04

Table XI-4 Comparison of Calculated ^{14}C Activities with Hand-Calculated Values

Infiltration State	Depth (m)	^{14}C Activity Spreadsheet Value (Cell)	Hand Calculated Value
Lower	99	65.44 (AF39)	65.46
	396	18.34 (AF66)	18.36
Median	99	83.37 (AG39)	83.36
	396	48.30 (AG66)	48.29
Upper	99	91.85 (AH39)	91.85
	396	71.17 (AH66)	71.16

ATTACHMENT XII SOFTWARE ROUTINE DOCUMENTATION FOR BOREHOLE ^{14}C ACTIVITY DATA PLOTTING AND FITTING SPREADSHEETS

XII.1 ROUTINE IDENTIFICATION

This Attachment describes the initial issue of software routines:

- gasC14-SD-7-1996dataV1.2.xls Version 1.1
- gasC14-NRG-5-1996dataV1.2.xls Version 1.1
- gasC14-UZ-6-1995dataV1.2.xls Version 1.1
- gasC14-UZ-1-1985dataV1.2.xls Version 1.1

These routines are Excel 97 (SR-2) spreadsheets. The source codes have been submitted in electronic form (Attachment I). The routine was run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 4.00.950 B). The spreadsheet is classified as a routine per AP-SI.1Q, and is qualified by this Attachment.

XII.2 ROUTINE PURPOSE AND DESCRIPTION

The purpose of these four functionally equivalent routines is to assemble data from boreholes SD-7, NRG-5, UZ-6, and UZ-1, consisting of in situ gas-phase and porewater ^{14}C activity. Each routine compiles and plots CO_2 data from a different borehole, for comparison to an exponential solution for ^{14}C activity vs. depth. The result is a plot showing measured data and the exponential solution, and a key parameter is adjusted to control fit to the measured data.

XII.3 ROUTINE DESCRIPTION

XII.3.1 Equivalent Worksheets: gasC14-SD-7-1996dataV1.2, gasC14-NRG-5-1996dataV1.2, gasC14UZ-6-1995dataV1.2, and gasC14UZ-1-1985dataV1.2

This worksheet (referring to all four) has these functions: 1) compile data on ^{14}C activity vs. depth from the respective boreholes, and 2) plot the exponential solution for ^{14}C activity vs. depth (developed in Section 6.2) and compare graphically with measured data.

^{14}C Activity Data

Columns A through I contain data from the respective boreholes, which are copied from the Technical Data Management System, accessed using the Data Tracking Numbers (DTNs) cited in Section 8.3.2 provided. The data from the boreholes UZ-6/6s, UZ-1, NRG-5, and SD-7 are recovered over the range of borehole depth for each of the respective boreholes. The analysis performed for each of the respective borehole is valid over the range of depth of

each borehole. The data consist of ^{14}C analyses of borehole gas samples, plus associated sample numbers, depth information, and other ancillary descriptive fields. Importantly, the types of ancillary fields vary among the data records copied, but they are readily traced to the source data. For all data records, the ^{14}C activity is stated in units of percent modern carbon (pmc).

For much of the data copied, a representative single-valued depth in meters must be calculated from the depth information provided in the data records. Where a single value of the depth is provided in units of feet, it is converted to meters. Where the endpoints of a depth range are provided, the midpoint of the range is calculated and converted to meters. The columns in each data record are shifted so that Column F always contains the calculated single-valued depth values, and Column C always contains the ^{14}C activity. The other columns vary according to the structure of the individual data records (i.e. DTNs).

The end result of the foregoing discussion is Column C with ^{14}C activity, and Column F with depth in meters. These data are plotted with the exponential function discussed below.

Plot the Exponential Solution for ^{14}C Activity vs. Depth

Columns J through N implement the exponential solution developed in the text for ^{14}C activity vs. depth in the UZ, which is based on steady-state, retarded, 1-D advective-dispersive transport:

$$^{14}a = {}^{14}a_{in} \exp\left\{ z \left[\frac{uK_d - \sqrt{u^2K_d^2 + 4\lambda_{14}\phi_{gas}D_{gas}\left(\phi_{gas} + \phi_{liquid}K_d\right)}}{2\phi_{gas}D_{gas}} \right] \right\} \qquad \text{(XII-1)}$$

where u = Advective velocity (based on flux divided by ϕ_{liquid})
K_d = Partition coefficient for CO_2 between the immobile liquid phase and the gas phase, in th UZ (Section 6.2; assigned a dimensionless value of 53.1)
ϕ_{gas} = Average fracture porosity in the UZ, corrected for fracture saturation
D_{gas} = Effective dispersion-diffusion coefficient (fitting parameter; m^2/sec)
ϕ_{liquid} = Average liquid-filled porosity in the UZ

The input data used with Eq. XII-1 in this worksheet are described in more detail in the documentation of spreadsheet routine: gasC14-SD-12-1996dataV1.2.xls, Worksheet: gas & porewater C-14. The same input values are used with this routine, except for the tortuosity-dispersion coefficient in Cell J16, which is adjusted in each of the subject routines to control the fit to measured data.

A summary of the input data for this portion of the worksheet is shown in Table XII-1. The coefficient of z, in Eq. XII-1 is calculated for the lower, median, and upper infiltration values, in Cells J22, J23, and J24, respectively. Columns J and K are used to set up a column of depth (z) values, in Range K30:K70. Equation XII-1 is calculated in Columns L, M, and N, for the lower, median, and upper infiltration values, respectively (Rows 30 through 70). These calculated results are plotted against depth (Column K) in Figure 1.

The tortuosity-dispersion coefficient in Cell J16 is adjusted to control the fit of the calculated curves for lower, median, and upper infiltration, to the measured data. The upper infiltration

curve is generally above the measured data (i.e. greater ^{14}C activity at all depths), which is appropriate because few locations at the site have present-day net infiltration as great as 14.56 mm/yr (Cell J8). The tortuosity-dispersion coefficient is adjusted so that the lower infiltration curve is approximately below the measured data (less ^{14}C activity), and most of the measured data in the host rock depth interval (Figure 1) lie between the lower infiltration curve and the mean infiltration curve (average infiltration over the site).

XII.4 VALIDATION TEST CASE

Statement of Applicability

The results of these routines meet the objectives, and have been found by comparing the values from hand calculations to worksheet calculations. The worksheet calculations accurately perform the required numerical manipulations, so the routines are therefore appropriate and valid for the range of parameters obtained from the data sources. It should be noted that the 1-D mass transfer model Eq. XII-1 involves some approximations and assumptions that may restrict its use (these are discussed in Sections 4.1.2, 5.2, and 6.2 of the text).

XII.4.1 Worksheet: C-14 activity vs. depth

Much of this worksheet consists of data copied from other worksheets and sources, or simple calculations based on those data. The accuracy of these results is verified by comparing the results of hand calculations to the worksheet calculations. In addition, there are several ranges containing calculations, that are verified by comparison to hand calculations as described below.

Exponent Coefficient

The coefficient of depth (z) in the exponent of Eq. XI-1 is calculated in Cells J22, J23, and J24, for lower, median, and upper infiltration conditions, respectively. Comparison of spreadsheet values from these cells with hand calculations is shown in Table XII-2. Input data for the hand calculations are listed in Table XII-1. The hand-calculated values agree closely with the spreadsheet values in this table.

Calculated ^{14}C Activity

The resulting ^{14}C activity calculated using Eq. XII-1 is calculated for lower, median, and upper infiltration conditions in Ranges L30:L70, M30:M70, and N30:N70, respectively. The same formula is copied to all cells in each range, with automatic indexing of precedent cells, so it is necessary to verify only a few representative calculations by hand calculation. Comparison of a few representative spreadsheet values with hand calculations, is shown in Table XII-3. The input depth is obtained from Range K30:K70, the ^{14}C activity at the surface is from Cell J20, and the exponent coefficients are from the cells discussed above. The hand-calculated values agree closely with the spreadsheet values in this table.

Table XII-1 Input Data for Fitting Exponential Solution to Observed ^{14}C Activity vs. Depth

Cell	Value	Description	Source
J3	0.56	Aqueous flux - lower average (mm/yr)	Spreadsheet file "infiltration.xls"
J4	1.77778E-11	Aqueous flux (m/sec)	Calculated
J5	5.98	Aqueous flux - medial average (mm/yr)	Spreadsheet file "infiltration.xls"
J6	1.89841E-10	Aqueous flux (m/sec)	Calculated
J7	14.56	Aqueous flux - upper average (mm/yr)	Spreadsheet file "infiltration.xls"
J8	4.62222E-10	Aqueous flux (m/sec)	Calculated
J9	1.00E+03	CO_2 concentration in air (ppmv)	Section 4.1.2 of text
J10	94.0	CO_2 concentration in porewater (mg/l)	Section 4.1.2 of text
J11	8.826E+04	Reference pressure (Pa)	Avg. total pressure at the potential repository horizon (l4c4 location; Section 4.1.1)
J12	303.0	Reference temperature (K)	Section 4.1.1 of text
J13	53.1	Distribution coefficient (dimensionless)	Section 6.2 of text
J14	0.01207	Average volume fraction gas in fractures	Calculated in spreadsheet routine: gasC14-SD-12-1996dataV1.2.xls, Worksheet: gas & porewater C-14
J15	1.60E-05	CO_2 diffusion coefficient in air (m^2/sec)	Section 4.1.2 of text
J16	1.30E+01	Tortuosity-dispersion coefficient	Fitting parameter (adjusted for each borehole; composite value representing all boreholes shown)
J17	3.84E-12	^{14}C decay constant (sec^{-1})	Accepted data
J18	0.1065	Average volume fraction liquid	Calculated in spreadsheet routine: gasC14-SD-12-1996dataV1.2.xls, Worksheet: gas & porewater C-14
J19	100	Reference ^{14}C activity	Section 4.1.2 of text

Table XII-2 Comparison of Calculated Exponent Coefficients with Hand-Calculated Values (spreadsheet routine: gasC14-SD-7-1996dataV1.2)

Infiltration State	Average Net Infiltration Flux (mm/yr)	Spreadsheet Value (Cell)	Hand Calculated Value
Lower	0.56	-1.62E-03 (J22)	-1.619E-03
Median	5.98	-1.15E-03 (J23)	-1.149E-03
Upper	14.56	-7.22E-04 (J24)	-7.233E-04

Table XII-3 Comparison of Calculated ^{14}C Activities with Hand-Calculated Values (spreadsheet routine: gasC14-SD-7-1996dataV1.2)

Infiltration State	Depth (m)	^{14}C Activity Spreadsheet Value (Cell)	Hand Calculated Value
Lower	135	80.38 (L39)	80.37
	540	41.74 (L66)	41.72
Median	135	85.64 (M39)	85.63
	540	53.80 (M66)	53.77
Upper	135	90.71 (N39)	90.70
	540	67.71 (N66)	67.67

ATTACHMENT XIII SOFTWARE ROUTINE DOCUMENTATION FOR LABORATORY EVAPORATION DATA NORMATIVE MINERAL ASSEMBLAGE SPREADSHEETS

ROUTINE IDENTIFICATION

This attachment describes the initial issue of routines "normative_hiCO2_SPWV1.2.xls" Version 1.2 and "normative_hiCO2_synJ13V1.2.xls Version 1.2". These are Excel 97 (SR-2) spreadsheets. Submittal of the source files in electronic form is described in Attachment I.

Spreadsheets "normative_hiCO2_SPWV1.2.xls" and "normative_hiCO2_synJ13V1.2.xls" are classified as routines per AP-SI.1Q, and are qualified by this Attachment. The routines execute the expected mathematical operations accurately, and are therefore appropriate. These routines were run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 4.00.950 B).

ROUTINE PURPOSE

The purpose of these routines is to calculate a normative mineral assemblage that forms when a water of specified composition is taken to dryness. This result is used to assign mineral precipitates to zones within the Engineered Barrier System (EBS) where waters evaporate to dryness.

ROUTINE DESCRIPTION ("normative_hiCO2_synJ13V1.2.xls")

Input data consists of the influent water composition, specifically the following constituents: Ca, Cl^-, F^-, HCO_3^-, K, Mg, Na, NO_3^-, SO_4^{2-}, Si(aq), and Al. In this routine the species are then treated as Ca^{2+}, Cl^-, F^-, HCO_3^-, K^+, Mg^{2+}, Na^+, NO_3^-, SO_4^{2-}, Si(aq), and Al^{3+}.

Water composition data are input in units of mg/L in Worksheet: "Influent Water" Column B. These values are converted to molal units (mol/kg) in Column D, using the formula weights in Column C, and using the approximation for dilute waters that 1 molar $\approx$ 1 molal (i.e. solution density is approximately the same as that of pure water).

The water composition data in molal units are linked to Worksheet: "Evaporation" Row 4. In this worksheet a series of calculations is performed starting in Row 6 and ending in Row 52. Each normative precipitate is evaluated in turn. The process starts with niter (KNO_3). In Column K (Cell K6) the value is set to the smaller of the molalities for K^+ and NO_3^- in Row 4. This value becomes the molality of niter produced from 1 kg of input solution. The same value is subtracted from the molalities of K^+ and NO_3^- in solution, and the results are entered on Row 7 (Cells C7 and F7, respectively).

A similar calculation is then done for Na-niter ($NaNO_3$). In Column K (Cell K9) the value is set to the smaller of the molalities for Na^+ and NO_3^- in Row 7. This value becomes the molality of Na-niter produced from 1 kg of input solution. The molality is subtracted from the molality in solution, and entered on Row 10 (Cells C10 and E10).

Similar calculations are then done for fluorite (CaF_2), villiaumite (NaF), sylvite (KCl), halite (NaCl), Mg-smectite ($Mg_{0.165}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), Ca-smectite ($Ca_{0.165}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), Na-smectite ($Na_{0.333}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), thenardite ($Na_2SO_4$), anhydrite ($CaSO_4$),

tachyihydrite ($CaMg_2Cl_6O_{10}:12H_2O$), calcite ($CaCO_3$), magnesite ($MgCO_3$), thermonatrite ($Na_2CO_3:H_2O$), and amorphous silica (SiO_2).

For each normative precipitate the calculation is the same except that: 1) the formulae used in Column K will differ depending on the constituents and the stiochiometry for each mineral, and 2) the formulae used to change the composition of the remaining solution in Columns A through J will differ also.

The same type of calculation is done for all of the other normative precipitates, which are listed in Worksheet: "Evaporation" Column M. If the precipitates are identified appropriately for the input water composition, and calculated in an appropriate order, by the end of the process all of the solution constituents will be used and the concentrations shown on Row 52 will be zero. The selection of precipitates and the order of calculation is described in the EBS Physical and Chemical Environment Analysis/Model Report, Section 6.5.

ROUTINE DESCRIPTION ("normative_hiCO2_SPWV1.2.xls")

The spreadsheet "normative_hiCO2_SPWV1.2.xls" is exactly the same as the other routine described above, except that a different water composition is used as input (Worksheet: "Influent Water" Column B). The same chemical consitituents are quantified.

The input composition for synthetic porewater that is used in this routine was obtained from the EBS Physical and Chemical Environment Analysis/Model Report, Section 4.1.5

VALIDATION TEST CASE

The accuracy of this routine is determined by documentation of hand-calculations. For each calculation the following are verified:

- The evaluation in Column K uses the correct stoichiometry for the mineral.
- Changes to the solution concentrations of the constituents are correct.
- Other solution species compositions do not change.

The results of comparison of spreadsheet results with hand calculations are shown in Table XIII-1. The indicated cells compare to file: "normative_hiCO2_synJ13V1.2.xls" Worksheet: "Evaporation". Small differences are attributed to round-off. These results demonstrate that the routine performs the operations accurately, so the routine are therefore appropriate and valid for the range of parameters obtained from the data sources.

The file: "normative_hiCO2_SPWV1.2.xls" has exactly the same structure and formulae as the file tested above. By inference, this routine also performs the operations accurately, and is determined to be valid for its intended use.

Table XIII-1 Comparison of Spreadsheet Results with Hand-Calculations for Routine "normative_hiCO2_synJ13V1.2.xls"

Mineral	Consti-tuents	Remaining Conc.	Hand Calc. Moles Produced (Compare to Cell)	Hand Calc. New Conc. (Compare to Cell)
Niter (KNO_3)	K^+	1.330E-4	1.274E-4 (K6)	5.590E-6 (F7)
	NO_3^-	1.274E-4		0 (C7)
Na-Niter	Na^+	1.966E-3	0 (K9)	1.966E-3 (E10)
($NaNO_3$)	NO_3^-	0		0 (C10)
Fluorite (CaF_2)	Ca^{2+}	1.447E-4	6.263E-5 (K12)	8.208E-5 (G13)
	F^-	1.253E-4		0 (D13)
Villiaumite	Na^+	1.966E-3	0 (K15)	1.966E-3 (E16)
(NaF)	F^-	0		0 (D16)
Sylvite (KCl)	K^+	5.590E-6	5.590E-6 (K18)	0 (F19)
	Cl^-	2.031E-4		1.975E-4 (A19)
Halite (NaCl)	Na^+	1.966E-3	1.975E-4 (K21)	1.770E-3 (E22)
	Cl^-	1.975E-4		0 (A22)
Mg-smectite	Mg^{2+}	8.638E-5	0 (K24)	8.638E-5 (H25)
($Mg_{0.165}Al_{2.33}$	Al^{3+}	0		0 (J25)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I25)
Ca-smectite	Ca^{2+}	8.208E-5	0 (K27)	8.208E-5 (G28)
($Ca_{0.165}Al_{2.33}$	Al^{3+}	0		0 (J28)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I28)
Na-smectite	Na^+	1.76E-3	0 (K30)	1.76E-3 (E31)
($Na_{0.33}Al_{2.33}$	Al^{3+}	0		0 (J31)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I31)
Thenardite (Na_2SO_4)	Na^+	1.770E-3	1.926E-4 (K33)	1.385E-3 (E34)
	SO_4^{2+}	1.926E-4		0 (B34)
Anhydrite ($CaSO_4$)	Ca^{2+}	8.208E-5	0 (K36)	8.208E-5 (G37)
	SO_4^{2+}	0		0 (B37)
Tachyihydrite	Ca^{2+}	8.208E-5	0 (K39)	8.208E-5 (G40)
	Mg^{2+}	8.638E-5		8.638E-5 (H40)
($CaMg_2Cl_6O_{10}:12H_2O$)	Cl^-	0		0 (A40)
Calcite ($CaCO_3$)	Ca^{2+}	8.208E-5	8.208E-5 (K42)	0 (G43)
Celestite ($MgCO_3$)	Mg^{2+}	8.638E-5	8.638E-5 (K45)	0 (H46)
Thermonatrite ($Na_2CO_3:H_2O$)	Na^+	1.385E-3	6.924E-4 (K48)	0 (E49)
Amor. Silica (SiO_2)	Si(aq)	3.702E-4	3.702E-4 (K51)	0 (I52)

ATTACHMENT XIV SOFTWARE ROUTINE DOCUMENTATION FOR IN-DRIFT UPPER BACKFILL PREDICTIVE MODEL NORMATIVE MINERAL ASSEMBLAGE SPREADSHEETS

ROUTINE IDENTIFICATION

This attachment describes the initial issue of routine "normative_hiCO2_l4c4_ui-zone34-500.xlsV1.2" Version 1.2. This is an Excel 97 spreadsheet. Submittal of the source files in electronic form is described in Attachment I.

Spreadsheet "normative_hiCO2_l4c4_ui-zone34-500.xlsV1.2"is classified as a routine per AP-SI.1Q, and is qualified by this Attachment. The routine executes the expected mathematical operations accurately, and is therefore appropriate. This routine was run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 4.00.950 B).

ROUTINE PURPOSE

The purpose of this routine is to calculate a normative mineral assemblage that forms when a water of specified composition is taken to dryness. The spreadsheet then calculates the total mass of precipitates that form in Zone 3/4 of the Engineered Barrier System (EBS) model during Time Period 2 (300 to 700 yr; nominally 500 yr). The calculations are valid over this range of time. In addition, the spreadsheet calculates the mass of liquid, and the number of years, required to redissolve this mass of precipitates given a solution of a specified composition.

ROUTINE DESCRIPTION ("normative_hiCO2_l4c4_ui-zone34-500.xlsV1.2")

Input data include influent water compositions, specifically the following constituents: Ca, Cl^-, F^-, HCO_3^-, K, Mg, Na, NO_3^-, SO_4^{2-}, Si(aq), and Al. In this routine the species are then treated as Ca^{2+}, Cl^-, F^-, HCO_3^-, K^+, Mg^{2+}, Na^+, NO_3^-, SO_4^{2-}, Si(aq), and Al^{3+}.

Description of the Evaporation Calculation

Water composition data are obtained from the "Current Basis" table in EQ3NR output file describing the composition of water in composite Zone 1/2, during Time Period 2. Concentrations in molal units are transferred to Worksheet: EQ3-6 Data Input, Range B21:B38. These values are sorted, and only the above listed constituents are retained, in Range J99:J108. These are the input data for the evaporation calculation. They are transferred to Worksheet: Zone1-2water, Row 4, from where they are transferred to Worksheet: 300-700 yr, Row 4.

In Worksheet: 300-700 yr, a series of calculations is performed starting in Row 6 and ending in Row 52, and Columns A through M. Each normative precipitate is evaluated in turn. The process starts with niter (KNO_3). In Column K (Cell K6) the value is set to the smaller of the molalities for K^+ and NO_3^- in Row 4. This value becomes the molality of niter produced from 1 kg of input solution. The same value is subtracted from the molalities of K^+ and NO_3^- in solution, and the results are entered on Row 7 (Cells C7 and F7, respectively).

A similar calculation is then done for Na-niter ($NaNO_3$). In Column K (Cell K9) the value is set to the smaller of the molalities for Na^+ and NO_3^- in Row 7. This value becomes the

molality of Na-niter produced from 1 kg of input solution. The molality is subtracted from the molality in solution, and entered on Row 10 (Cells C10 and E10).

Similar calculations are then done for the following minerals (listed in order): fluorite (CaF_2), villiaumite (NaF), sylvite (KCl), halite (NaCl), Mg-smectite ($Mg_{0.165}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), Ca-smectite ($Ca_{0.165}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), Na-smectite ($Na_{0.333}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), thenardite ($Na_2SO_4$), anhydrite ($CaSO_4$), tachyihydrite ($CaMg_2Cl_6O_{10}{:}12H_2O$), calcite ($CaCO_3$), magnesite ($MgCO_3$), thermonatrite ($Na_2CO_3{:}H_2O$), and amorphous silica (SiO_2).

The same type of calculation is done for all of the other minerals, in the order that they are listed in Worksheet: 300-700 yr, Column M. For each mineral the calculation is the same except that: 1) the formulae used in Column K will differ depending on the constituents and the stiochiometry for each mineral, and 2) the formulae used to change the composition of the remaining solution in Columns A through J will differ also.

If the minerals are identified appropriately for the input water composition, and calculated in appropriate order, by the end of the process all of the solution constituents will be used and the concentrations shown on Row 52, Columns A through J, will be zero. The selection of precipitates and the order of calculation is described in the EBS Physical and Chemical Environment Analysis/Model Report, Section 6.5.

The total mass accumulation for each precipitate is calculated in Worksheet: 300-700 yr, Columns P, Q, and R. In Column P the accumulation of each precipitate in moles per meter of drift is calculated from

$$M_i = SK_i\Delta t \qquad \text{(XIV-1)}$$

where M_i = moles of the ith mineral precipitate (mol/m; Column P)
S = liquid inflow rate to Zone 3/4 per meter of drift (kg/m-sec) during Time Period 2 (Cell S1)
K_i = rate of precipitation (Column K)
Δt = duration of Time Period 2 (400 yr)

The result calculated from (XIV-1) is transferred from Column P to Worksheet: Zone 3-4 Ppt Summary, Row 5. A further calculation in that worksheet converts each mineral to a mole fraction, i.e. to a fraction of the total moles of all precipitates. This can be written

$$F_i = M_i / \sum_i M_i \qquad \text{(XIV-2)}$$

where F_i = mole fraction

Returning the discusion to Worksheet: 300-700 yr, the accumulation in moles per meter is converted to mass per meter in Column R, using

$$G_i = M_i W_i \qquad \text{(XIV-3)}$$

where G_i = mass of the ith mineral precipitate (kg/m; Column R)
W_i = molecular weight of the ith precipitate (kg/mol; Column Q)

and the total mass of all precipitates is summed in Cell R54.

Description of the Dissolution Calculation

This calculation determines the total mass of liquid and the time required to redissolve the precipitate accumulation, given a specified removal rate for each precipitate. The removal rates are calculated by EQ6 in units of moles precipitate dissolved per kg of liquid inflow to the zone.

As input to this calculation, EQ6 output file describing dissolution of precipitates and salts from composite Zone 3/4, during Time Period 3, was summarized by copying into File: "water34_3A_qtz.xls" which was copied directly into Worksheet: EQ3-6 Data Input, Rows 118 through 209. The removal rates are transferred from Worksheet: EQ3-6 Data Input, Range D172:D180 plus Cell F190, to Worksheet: 700-1500 yr, Column C (aligning the data with the correct mineral name in Column A).

The mass of liquid required to redissolve each precipitate is calculated in Column D, using

$$L_i = M_i R_i \qquad \text{(XIV-4)}$$

where L_i = liquid mass for the ith precipitate, per meter of drift (kg/m)
R_i = removal rate of the ith precipitate per kg of influent liquid (mol/kg)

The time for removal is calculated in Column E, using

$$T_i = L_i/Q \qquad \text{(XIV-5)}$$

where T_i = time to dissolve the ith precipitate (converted from sec to yr)
Q = rate of liquid inflow to Zone 3/4 (kg/m-sec)

The minimum liquid mass and flow time for redissolution of all precipitates are determined from the values calculated in Columns D and E, and representative values are estimated and entered manually in Cells D56 and E56, respectively.

TEST CASE

The accuracy of this routine is determined using a test case, with documentation of hand-calculations. File: "normative_hiCO2_testcase34" is a copy of routine "normative_hiCO2_l4c4_ui-zone34-500.xlsV1.2" except that the composition of a synthetic water is entered in Worksheet: Zone1-2water, Row 4, and test values (0.001) are entered for all removal rates. Documentation of electronic submittal of the test case file is provided in Attachment I.

For accuracy determination, the results in File: "normative_hiCO2_testcase34.xls" Worksheet: 300-700 yr, Column K are compared with the hand-calculated values in Table XIV-1. Also, Columns P and R of this worksheet are hand-calculated in Table XIV-2. The values match, with small differences attributed to round-off. These results demonstrate that the routine performs the operations accurately.

The mole fraction calculations in Worksheet: Zone 3-4 Ppt Summary, are also evaluated by comparison to hand calculations. Using File: "normative_hiCO2_testcase34.xls" the computed mole fractions in Row 12 are compared with hand-calculated values in Table XIV-2. The values match, with small differences attributed to round-off. These results demonstrate that the routine performs the operations accurately.

Finally, the redissolution calculations in File: "normative_hiCO2_testcase34.xls" Worksheet: 700-1500 yr, are hand-calculated in Table XIV-3. Again, the values match, with small differences attributed to round-off. These results demonstrate that the routine performs the operations accurately.

This routine has been compared with hand calculations and found to execute the required operations accurately. The routine are therefore appropriate and valid for the range of parameters obtained from the data sources.

This routine is valid for input data that describe the concentrations of the same constituents listed above. The final concentrations in Row 52 of Worksheet: 300-700 yr, must be zero (or nearly so) for the normative model to be valid. This is a restriction on the chemical system that can be modeled (a variation on the normative approach, with new minerals supported by new test data, could be needed). In addition, specific results from EQ3NR and EQ6 calculations are needed to implement this routine.

Table XIV-1 Comparison of Spreadsheet Mineral Assemblage Results with Hand-Calculations for Routine "normative_hiCO2_testcase.xls"

Mineral	Consti-tuents	Remaining Conc.	Moles Produced (Compare to Cell)	New Conc. (Compare to Cell)
Niter (KNO_3)	K^+	1.330E-4	1.274E-4 (K6)	5.590E-6 (F7)
	NO_3^-	1.274E-4		0 (C7)
Na-Niter	Na^+	1.966E-3	0 (K9)	1.966E-3 (E10)
($NaNO_3$)	NO_3^-	0		0 (C10)
Fluorite (CaF_2)	Ca^{2+}	1.447E-4	6.263E-5 (K12)	8.208E-5 (G13)
	F^-	1.253E-4		0 (D13)
Villiaumite	Na^+	1.966E-3	0 (K15)	1.966E-3 (E16)
(NaF)	F^-	0		0 (D16)
Sylvite (KCl)	K^+	5.590E-6	5.590E-6 (K18)	0 (F19)
	Cl^-	2.031E-4		1.975E-4 (A19)
Halite (NaCl)	Na^+	1.966E-3	1.975E-4 (K21)	1.770E-3 (E22)
	Cl^-	1.975E-4		0 (A22)
Mg-smectite	Mg^{2+}	8.638E-5	0 (K24)	8.638E-5 (H25)
($Mg_{0.165}Al_{2.33}$	Al^{3+}	0		0 (J25)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I25)
Ca-smectite	Ca^{2+}	8.208E-5	0 (K27)	8.208E-5 (G28)
($Ca_{0.165}Al_{2.33}$	Al^{3+}	0		0 (J28)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I28)
Na-smectite	Na^+	1.76E-3	0 (K30)	1.76E-3 (E31)
($Na_{0.33}Al_{2.33}$	Al^{3+}	0		0 (J31)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I31)
Thenardite (Na_2SO_4)	Na^+	1.770E-3	1.926E-4 (K33)	1.385E-3 (E34)
	SO_4^{2+}	1.926E-4		0 (B34)
Anhydrite ($CaSO_4$)	Ca^{2+}	8.208E-5	0 (K36)	8.208E-5 (G37)
	SO_4^{2+}	0		0 (B37)
Tachyihydrite	Ca^{2+}	8.208E-5	0 (K39)	8.208E-5 (G40)
	Mg^{2+}	8.638E-5		8.638E-5 (H40)
($CaMg_2Cl_6O_{10}$:$12H_2O$)	Cl^-	0		0 (A40)
Calcite ($CaCO_3$)	Ca^{2+}	8.208E-5	8.208E-5 (K42)	0 (G43)
Magnesite ($MgCO_3$)	Mg^{2+}	8.638E-5	8.638E-5 (K45)	0 (H46)
Thermonatrite (Na_2CO_3:H_2O)	Na^+	1.385E-3	6.924E-4 (K48)	0 (E49)
Amor. Silica (SiO_2)	Si(aq)	3.702E-4	3.702E-4 (K51)	0 (I52)

Table XIV-2 Comparison of Spreadsheet Mole Fraction and Cumulative Mass Results with Hand-Calculations for Routine "normative_hiCO2_testcase.xls"

Mineral	Moles Produced, (mol/kg) [A]	Total Moles (mol/m) [B]	Mole Fraction [C]	Molar Mass (kg/mol)	Total Mass (kg/m) [D]
Niter	1.274E-4	4.036	7.012E-2	1.011E-01	0.4080
Na-Niter	0	0	0	8.500E-02	0
Fluorite	6.263E-5	1.984	3.447E-2	7.808E-02	0.1549
Villiaumite	0	0	0	4.199E-02	0
Sylvite	5.590E-6	0.1771	3.077E-3	7.455E-02	0.01320
Halite	1.975E-4	6.257	0.1087	5.844E-02	0.3657
Mg-smectite	0	0	0	3.667E-01	0
Ca-smectite	0	0	0	3.676E-01	0
Na-smectite	0	0	0	1.420E-01	0
Thenardite	1.926E-4	6.102	0.1060	1.420E-01	0.8665
Anhydrite	0	0	0	1.361E-01	0
Tachyihydrite	0	0	0	6.776E-01	0
Calcite	8.208E-5	2.601	4.519E-2	1.001E-01	0.2604
Magnesite	8.638E-5	2.737	4.755E-2	8.431E-02	0.2308
Thermonatrit	6.924E-4	21.94	0.3812	1.240E-01	2.721
Amor. Silica	3.702E-4	11.73	0.2038	6.009E-02	0.7049
Totals	1.817E-3	57.56	1.0000		5.725

Notes:

A. Compare with File: "normative_hiCO2_testcase34.xls" Worksheet: 300-700 yr, Column K

B. Multiply by the total inflow to Zone 3/4 in Time Period 2 (2.510×10^{-6} kg/m-sec for 400 yr = 3.168×10^{4} kg/m). Compare with Worksheet: 300-700 yr, Column P.

C. Calculated as fraction of Total Moles. Compare with Worksheet: Zone 3-4 Ppt Summary, Row 12.

D. Multiply Total Moles by Molar Mass. Compare with Worksheet: 300-700 yr, Column R.

Table XIV-3 Comparison of Spreadsheet Redissolution Time and Liquid Mass Results with Hand-Calculations for Routine "normative_hiCO2_testcase.xls"

Mineral	Total Moles (mol/m) [A]	Removal Rate (mol/kg) [B]	Mass Water to Remove (kg/m) [C]	Time to Remove (yr) [D]
Niter	4.036	1.000E-3	4036	123.1
Na-Niter	0	N/A	N/A	N/A
Fluorite	1.984	1.000E-3	1984	60.51
Villiaumite	0	N/A	N/A	N/A
Sylvite	0.1771	N/A	N/A	N/A
Halite	6.257	1.000E-3	6257	190.8
Mg-smectite	0	N/A	N/A	N/A
Ca-smectite	0	N/A	N/A	N/A
Na-smectite	0	N/A	N/A	N/A
Thenardite	6.102	1.000E-3	6102	186.1
Anhydrite	0	N/A	N/A	N/A
Tachyihydrite	0	N/A	N/A	N/A
Calcite [E]	2.601	N/A	N/A	N/A
Magnesite	2.737	N/A	N/A	N/A
Thermonatrit	21.94	1.000E-3	**2.194E4**	**669.2**
Amor. Silica	11.73	1.000E-3	1.173E4	340.8
Totals	57.56			

Notes:

A. From Table XIV-2

B. Use 0.001 mol/kg removal rate for test case. "N/A" indicates zero accumulation so no calculation was done.

C. Calculated from Total Moles divided by Removal Rate. Compare with Worksheet: 700-1500 yr, Column D. Bold entry indicates determining value; compare to Cell D56.

D. Divide Mass Water to Remove by 1.039×10^{-6} kg/m-sec, and convert sec to yr. Compare with Worksheet: 700-1500 yr, Column E. Bold entries indicate determining values; compare to Cell E56.

E. Calcite is precipitated during Time Period 3, so there is no removal.

ATTACHMENT XV SOFTWARE ROUTINE DOCUMENTATION FOR IN-DRIFT LOWER BACKFILL/INVERT PREDICTIVE MODEL NORMATIVE MINERAL ASSEMBLAGE SPREADSHEETS

ROUTINE IDENTIFICATION

This attachment describes the initial issue of routine "normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls" Version 1.2. This is an Excel 97 spreadsheet. Submittal of the source files in electronic form is described in Attachment I.

Spreadsheet "normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls"is classified as a routine per AP-SI.1Q, and is qualified by this Attachment. The routine executes the expected mathematical operations accurately, and is therefore appropriate. This routine was run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 4.00.950 B).

ROUTINE PURPOSE

The purpose of this routine is to calculate a normative mineral assemblage that forms when a water of specified composition is taken to dryness. The spreadsheet then calculates the total mass of precipitates that form in Zone 5/6 of the Engineered Barrier System (EBS) model during Time Period 3 (700 to 1500 yr; nominally 1000 yr). The calculations are valid over this time range. In addition, the spreadsheet calculates the mass of liquid, and the number of years, required to redissolve this mass of precipitates given a solution of a specified composition.

ROUTINE DESCRIPTION ("normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls")

Input data include influent water compositions, specifically the following constituents: Ca, Cl^-, F^-, HCO_3^-, K, Mg, Na, NO_3^-, SO_4^{2-}, Si(aq), and Al. In this routine the species are then treated as Ca^{2+}, Cl^-, F^-, HCO_3^-, K^+, Mg^{2+}, Na^+, NO_3^-, SO_4^{2-}, Si(aq), and Al^{3+}.

Description of the Evaporation Calculation

The composition of influent water to composite Zone 5/6 is obtained from the Current Basis table in EQ6 output files corresponding to composite Zone 3/4, Time Period 3A and Time Period 3B (Attachment I). These data are compiled in file: "water34_3A_qtz.xls" and file: "water34_3B_qtz.xls" whch are transferred to worksheet: EQ3-6 Data Input. The data for Time Period 3A are transferred to worksheet: Zone3-4water, Row 6, from where they are transferred to worksheet: 700-1500 yr, Row 4. The data for Time Period 3B are transferred to worksheet: Zone3-4water, Row 15, from where they are transferred to worksheet: 700-1500 yr, Row 66.

In worksheet: 700-1500 yr, a series of normative precipitate calculations is performed twice, starting in Row 6 and ending in Row 52 for Time Period 3A water, and again starting in Row 68 and ending in Row 114 for Time Period 3B water. These calculations are restricted to Columns A through M.

Within each set of calculations, each normative precipitate is evaluated in turn. The following discussion describes Rows 6 through 52, but applies also to Rows 68 through 114. The process starts with niter (KNO_3). In Column K (Cell K6) the value is set to the smaller of the molalities for K^+ and NO_3^- in Row 4. This value becomes the molality of niter produced

from 1 kg of input solution. The same value is subtracted from the molalities of K^+ and NO_3^- in solution, and the results are entered on Row 7 (Cells C7 and F7, respectively).

A similar calculation is then done for Na-niter ($NaNO_3$). In Column K (Cell K9) the value is set to the smaller of the molalities for Na^+ and NO_3^- in Row 7. This value becomes the molality of Na-niter produced from 1 kg of input solution. The molality is subtracted from the molality in solution, and entered on Row 10 (Cells C10 and E10).

Similar calculations are then done for the following minerals (listed in order): fluorite (CaF_2), villiaumite (NaF), sylvite (KCl), halite (NaCl), Mg-smectite ($Mg_{0.165}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), Ca-smectite ($Ca_{0.165}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), Na-smectite ($Na_{0.333}Al_{2.33}Si_{3.67}O_{10}(OH)_2$), thenardite ($Na_2SO_4$), anhydrite ($CaSO_4$), tachyihydrite ($CaMg_2Cl_6O_{10}{:}12H_2O$), calcite ($CaCO_3$), magnesite ($MgCO_3$), thermonatrite ($Na_2CO_3{:}H_2O$), and amorphous silica (SiO_2).

The same type of calculation is done for all of the other minerals, in the order that they are listed in worksheet: 700-1500 yr, Column M. For each mineral the calculation is the same except that: 1) the formulae used in Column K will differ depending on the constituents and the stiochiometry for each mineral, and 2) the formulae used to change the composition of the remaining solution in Columns A through J will differ also.

If the minerals are identified appropriately for the input water composition, and calculated in appropriate order, by the end of the process all of the solution constituents will be used and the concentrations shown on Row 52, Columns A through J, will be zero (likewise those on Row 114). The selection of precipitates and the order of calculation is described in the EBS Physical and Chemical Environment Analysis/Model Report, Section 6.5.

The total mass accumulation for each precipitate is calculated in worksheet: 700-1500 yr, Columns P through T. In Column P the accumulation of each precipitate in Zone 5/6, during Time Period 3A, in moles per meter of drift, is calculated from

$$M_i = SK_i\Delta t \qquad \text{(XV-1)}$$

where M_i = Moles of the ith mineral precipitate (mol/m; Column P)
S = Liquid inflow rate to Zone 3/4 per meter of drift (kg/m-sec) during Time Period 3A (Cell R1)
K_i = Rate of precipitation (Column K)
Δt = Duration of Time Period 3A (Cell R2)

In Column Q the same formula (XV-1) is used to calculate the accumulation of each precipitate in Zone 5/6, during Time Period 3B, in moles per meter of drift. The duration of Time Period 3B is calculated from the total duration of Time Period 3 (Cell U1) minus the duration of Time Period 3A (Cell R2).

Column R sums Columns P and Q, to calculate the total accumulation of each precipitate in moles per meter of drift. The result calculated in Column R is transferred to worksheet: Zone 5-6 Ppt Summary, Row 6. A further calculation in that worksheet converts each mineral to a mole fraction, i.e. to a fraction of the total moles of all precipitates. This can be written

$$F_i = M_i / \sum_i M_i \qquad \text{(XV-2)}$$

where F_i = Mole fraction

Returning the discusion to worksheet: 700-1500 yr, the accumulation in moles per meter is converted to mass per meter in Column T, using

$$G_i = M_i W_i \tag{XV-3}$$

where G_i = Mass of the ith mineral precipitate (kg/m; Column T)
W_i = Molecular weight of the ith precipitate (kg/mol; Column S)

and the total mass of all precipitates is summed in Cell T54.

Description of the Dissolution Calculation

This calculation determines the total mass of liquid and the time required to redissolve the precipitate accumulation, given a specified removal rate for each precipitate. The removal rates are calculated by EQ6 in units of moles precipitate dissolved per kg of liquid inflow to the zone.

As input to this calculation, EQ6 output data corresponding to Zone 5/6, Time Period 4A was copied into file: "water56_4A_qtz.xls" which was then copied directly into worksheet: EQ3-6 Data Input, Rows 186 through 266. The removal rates are transferred from worksheet: EQ3-6 Data Input, Range D237:D246 plus Cell D254, to worksheet: 1500-2500 yr, Column C (aligning the data with the correct mineral name in Column A).

The mass of liquid required to redissolve each precipitate is calculated in Column D, using

$$L_i = M_i R_i \tag{XV-4}$$

where L_i = Liquid mass for the ith precipitate, per meter of drift (kg/m)
R_i = Removal rate of the ith precipitate per kg of influent liquid (mol/kg)

The time for removal is calculated in Column E, using

$$T_i = L_i/Q \tag{XV-5}$$

where T_i = Time to dissolve the ith precipitate (converted from sec to yr)
Q = Rate of liquid inflow to Zone 5/6 (kg/m-sec)

The minimum liquid mass and flow time for redissolution of all precipitates are selected from the values calculated in Columns D and E, and representative values are estimated and entered manually in Cells D56 and E56, respectively.

TEST CASE

The accuracy of this routine is determined using a test case, with documentation of hand-calculations. file: "normative_hiCO2_testcase-56.xls" is a copy of routine "normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls" except that the composition of a synthetic water is entered in worksheet: Zone3-4water, Row 6 and Row 15, and test values (0.001) are entered for all removal rates. Documentation of electronic submittal of the test case file is provided in Attachment I.

For accuracy determination, the results in file: "normative_hiCO2_testcase56.xls" worksheet: 700-1500 yr, Column K are compared with the hand-calculated values in Table XV-1. Also, Columns P and R of this worksheet are hand-calculated in Table XV-2. The values match, with small differences attributed to round-off. These results demonstrate that the routine performs the operations accurately.

The mole fraction calculations in worksheet: Zone 5-6 Ppt Summary, are also evaluated by comparison to hand calculations. Using file: "normative_hiCO2_testcase56.xls" worksheet: Zone 5-6 Ppt Summary, the computed mole fractions in Row 13 are compared with hand-calculated values in Table XV-2. The values match, with small differences attributed to round-off. These results demonstrate that the routine performs the operations accurately.

Finally, the redissolution calculations in file: "normative_hiCO2_testcase56.xls" worksheet: 1500-2500 yr, are hand-calculated in Table XV-3. Again, the values match, with small differences attributed to round-off. These results demonstrate that the routine performs the operations accurately.

This routine has been compared with hand calculations and found to execute the required operations accurately. The routine is therefore appropriate and valid for the range of parameters obtained from the data sources.

This routine is valid for input data that describe the concentrations of the same constituents listed above. The final concentrations in Row 52 of Worksheet: 700-1500 yr, must be zero (or nearly so) for the normative model to be valid. This is a restriction on the chemical system that can be modeled (a variation on the normative approach, with new minerals supported by new test data, could be needed). In addition, specific results from EQ3NR and EQ6 calculations are needed to implement this routine.

Table XV-1 Comparison of Spreadsheet Mineral Assemblage Results with Hand-Calculations for Routine "normative_hiCO2_testcase56.xls"

Mineral	Consti-tuents	Remaining Conc.	Moles Produced (Compare to Cell)	New Conc. (Compare to Cell)
Niter (KNO_3)	K^+	1.330E-4	1.274E-4 (K6)	5.590E-6 (F7)
	NO_3^-	1.274E-4		0 (C7)
Na-Niter	Na^+	1.966E-3	0 (K9)	1.966E-3 (E10)
($NaNO_3$)	NO_3^-	0		0 (C10)
Fluorite (CaF_2)	Ca^{2+}	1.447E-4	6.263E-5 (K12)	8.208E-5 (G13)
	F^-	1.253E-4		0 (D13)
Villiaumite	Na^+	1.966E-3	0 (K15)	1.966E-3 (E16)
(NaF)	F^-	0		0 (D16)
Sylvite (KCl)	K^+	5.590E-6	5.590E-6 (K18)	0 (F19)
	Cl^-	2.031E-4		1.975E-4 (A19)
Halite (NaCl)	Na^+	1.966E-3	1.975E-4 (K21)	1.770E-3 (E22)
	Cl^-	1.975E-4		0 (A22)
Mg-smectite	Mg^{2+}	8.638E-5	0 (K24)	8.638E-5 (H25)
($Mg_{0.165}Al_{2.33}$	Al^{3+}	0		0 (J25)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I25)
Ca-smectite	Ca^{2+}	8.208E-5	0 (K27)	8.208E-5 (G28)
($Ca_{0.165}Al_{2.33}$	Al^{3+}	0		0 (J28)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I28)
Na-smectite	Na^+	1.76E-3	0 (K30)	1.76E-3 (E31)
($Na_{0.33}Al_{2.33}$	Al^{3+}	0		0 (J31)
$Si_{3.67}O_{10}(OH)_2$)	Si(aq)	3.702E-4		3.702E-4 (I31)
Thenardite (Na_2SO_4)	Na^+	1.770E-3	1.926E-4 (K33)	1.385E-3 (E34)
	SO_4^{2+}	1.926E-4		0 (B34)
Anhydrite ($CaSO_4$)	Ca^{2+}	8.208E-5	0 (K36)	8.208E-5 (G37)
	SO_4^{2+}	0		0 (B37)
Tachyihydrite	Ca^{2+}	8.208E-5	0 (K39)	8.208E-5 (G40)
	Mg^{2+}	8.638E-5		8.638E-5 (H40)
($CaMg_2Cl_6O_{10}:12H_2O$)	Cl^-	0		0 (A40)
Calcite ($CaCO_3$)	Ca^{2+}	8.208E-5	8.208E-5 (K42)	0 (G43)
Magnesite ($MgCO_3$)	Mg^{2+}	8.638E-5	8.638E-5 (K45)	0 (H46)
Thermonatrite ($Na_2CO_3:H_2O$)	Na^+	1.385E-3	6.924E-4 (K48)	0 (E49)
Amor. Silica (SiO_2)	Si(aq)	3.702E-4	3.702E-4 (K51)	0 (I52)

Table XV-2 Comparison of Spreadsheet Mole Fraction and Cumulative Mass Results with Hand-Calculations, Using Software Routine "normative_hiCO2_testcase56.xls" (for Time Periods 3A and 3B combined for the test case)

Mineral	Moles Produced, (mol/kg) [A]	Total Moles (mol/m) [B]	Mole Fraction [C]	Molar Mass (kg/mol)	Total Mass (kg/m) [D]
Niter	1.274E-4	3.342	7.012E-2	1.011E-01	0.3379
Na-Niter	0	0	0	8.500E-02	0
Fluorite	6.263E-5	1.643	3.447E-2	7.808E-02	0.1283
Villiaumite	0	0	0	4.199E-02	0
Sylvite	5.590E-6	0.1466	3.077E-3	7.455E-02	0.01093
Halite	1.975E-4	5.181	0.1087	5.844E-02	0.3028
Mg-smectite	0	0	0	3.667E-01	0
Ca-smectite	0	0	0	3.676E-01	0
Na-smectite	0	0	0	1.420E-01	0
Thenardite	1.926E-4	5.052	0.1060	1.420E-01	0.7174
Anhydrite	0	0	0	1.361E-01	0
Tachyihydrite	0	0	0	6.776E-01	0
Calcite	8.208E-5	2.153	4.519E-2	1.001E-01	0.2155
Magnesite	8.638E-5	2.266	4.755E-2	8.431E-02	0.1911
Thermonatrit	6.924E-4	18.16	0.3812	1.240E-01	2.252
Amor. Silica	3.702E-4	9.711	0.2038	6.009E-02	0.5835
Totals	1.817E-3	47.66	1.0000		4.739

Notes:

A. Compare with file: "normative_hiCO2_testcase56.xls" worksheet: 700-1500 yr, Column K

B. Multiply by the total inflow to Zone 5/6 in Time Period 3 (for the test case, assigned a value of 1.039×10^{-6} kg/m-sec for 800 yr = 2.623×10^{4} kg/m). Compare with worksheet: 700-1500 yr, Column T.

C. Calculated from Total Moles, divided by sum of Total Moles. Compare with worksheet: Zone 5-6 Ppt Summary, Row 13.

D. Multiply Total Moles by Molar Mass. Compare with worksheet: 700-1500 yr, Column T.

Table XV-3 Comparison of Spreadsheet Redissolution Time and Liquid Mass Results with Hand-Calculations for Routine "normative_hiCO2_testcase56.xls"

Mineral	Total Moles (mol/m) [A]	Removal Rate (mol/kg) [B]	Mass Water to Remove (kg/m) [C]	Time to Remove (yr) [D]
Niter	3.342	1.000E-3	3342	101.9
Na-Niter	0	N/A	N/A	N/A
Fluorite	1.643	1.000E-3	1643	50.11
Villiaumite	0	N/A	N/A	N/A
Sylvite	0.1466	1.000E-3	146.6	4.471
Halite	5.181	1.000E-3	5181	158.0
Mg-smectite	0	N/A	N/A	N/A
Ca-smectite	0	N/A	N/A	N/A
Na-smectite	0	N/A	N/A	N/A
Thenardite	5.052	1.000E-3	5052	154.1
Anhydrite	0	N/A	N/A	N/A
Tachyihydrite	0	N/A	N/A	N/A
Calcite [E]	2.153	N/A	N/A	N/A
Magnesite [E]	2.266	N/A	N/A	N/A
Thermonatrite	18.16	1.000E-3	**1.816E4**	**553.9**
Amor. Silica	9.711	1.000E-3	9.711E3	296.2
Totals	47.66			

Notes:

A. From Table XV-2

B. Use 0.001 mol/kg removal rate for test case. "N/A" indicates zero accumulation so no calculation was done.

C. Calculated from Total Moles divided by Removal Rate. Compare with worksheet: 1500-2500 yr, Column D.

D. Divide Mass Water to Remove by 1.039×10^{-6} kg/m-sec, and convert sec to yr. Compare with worksheet: 1500-2500 yr, Column E. Bold entries indicate determining values; compare to Cells D56 and E56.

E. Calcite is precipitated during Time Period 4 so no removal.

ATTACHMENT XVI SOFTWARE ROUTINE DOCUMENTATION FOR MEASURED DATA FROM COLLOID SAMPLING

ROUTINE IDENTIFICATION

This attachment describes the initial issue of routine "GWcolloidsV1.2.xls" Version 1.2. This is an Excel 97 (SR-2) spreadsheet. Submittal of the source files in electronic form is described in Attachment I.

Spreadsheet "GWcolloidsV1.2.xls"is classified as a routine per AP-SI.1Q, and is qualified by this Attachment. The routine executes the expected mathematical operations accurately, and is therefore appropriate. This routine was run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 4.00.950 B).

ROUTINE PURPOSE

The purpose of this routine is to manipulate measured data from colloid sampling in well intervals from the vicinity of Yucca Mountain, to implement the EBS colloid model. This includes statistical manipulation of the measured data, and a bounding calculation of the mass of ferric colloids in the EBS.

ROUTINE DESCRIPTION ("GWcolloidsV1.2.xls")

Input Data from Nye County Wells (Worksheet: Nye Co Data)

The measured colloid size data from Nye County wells is shown in Columns A through J (DTN: LA0002SK831352.001). The mass concentration of particles in each measured size range is calculated in Columns N through V using the formula

$$\text{(Mass Concentration)} = \text{(Mass per Particle)} * \text{(Measured Concentration)} \quad \text{Eq. XVI-1}$$

and the mass per particles is calculated in Column M using

$$\text{(Mass per Particle)} = \text{(Particle Volume)} * \text{(Density)} = (4/3)\pi(D/2)^3 * \text{(Density)} \quad \text{Eq. XVI-2}$$

where the density is equal to $10^{12}\mu g/m^3$ (i.e. density of water), and D is the particle size from Column A or L. All columns are summed to Row 19.

Nye County Data Normalized (Worksheet: Nye Co Normalized)

The measured data (Columns A through J) from Worksheet: Nye Co Data, are normalized in this worksheet, by dividing each data column by the corresponding sum value from Row 19 of that worksheet.

A set of descriptive statistics are calculated from the sizes and the normalized frequency data. These consist of the following measures:

$$\sum D_i w_i \quad \text{(Eq. XVI-3)}$$

$$\sum D_i^2 w_i \quad \text{(Eq. XVI-4)}$$

$$\sum D_i^3 w_i \quad \text{(Eq. XVI-5)}$$

$$\sum \ln(D_i) w_i \quad \text{(Eq. XVI-6)}$$

$$\sum[\ln(D_i)]^2 w_i \qquad \text{(Eq. XVI-7)}$$

$$\sum[\ln(D_i)]^2 w_i - [\sum Ln(D_i)w_i]^2 \qquad \text{(Eq. XVI-8)}$$

which are calculated in Rows 21 through 26, respectively. These measures are used in later worksheets.

The measures calculated in Rows 24 and 26 are the estimated mean, and standard deviation, respectively, of the log-normal distributions of the measured data from the different well intervals. The average and standard deviation of these mean values, are calculated in Columns K and L, respectively, using the Excel intrinsic functions AVERAGE and STDEV. These are the parameters of the "average" log-normal distribution for the Nye County data, and are used in later worksheets.

In addition, a check of the assumption that the observed size-concentration data are log-normally distributed, is made in Row 29. This is done by calculating

$$\exp\left(\sum Ln(D_i)w_i + \frac{1}{2}\left\{\sum[\ln(D_i)]^2 w_i - [\sum Ln(D_i)w_i]^2\right\}^2\right) \qquad \text{(Eq. XVI-9)}$$

and comparing the result to the value in Row 21 (from Eq. XVI-1). The two values should be close, if the data are log-normal. Visual inspection shows that this is the case.

Cumulative Nye County Normalized Data (Worksheet: NC Cumulative)

Each of the normalized data columns (Columns B through J) from Worksheet: Nye Co Normalized (Rows 3 through 18), is summed to the same locations in this worksheet, in a manner that produces a discretized cumulative distribution. The cumulative values are multiplied by 100 to convert to percentage. The final value of the cumulative distribution (for the maximum particle size of 200 nm) in each column is 100%, which verifies the operations are correct.

In addition, the "average" log-normal distribution for the Nye County data, is calculated in Column K, for each value of particle size in Column A. The parameters of the "average" distribution are obtained from Cells K24 and K26, in Worksheet Nye Co Normalized.

The computed discretized cumulative distributions (Columns B through J), and the "average" log-normal distribution curve, are plotted on this worksheet.

Input Data from Yucca Mountain Wells (Worksheet: YM Data)

The measured colloid size data from Yucca Mountain wells is shown in Columns A through J (DTN: LA0002SK831352.002). The mass concentration of particles in each measured size range is calculated in Columns N through V using Eq. XVI-1, and the mass per particles is calculated in Column M using Eq. XVI-2. ll columns are summed to Row 19.

Yucca Mountain Data Normalized (Worksheet: YM Normalized)

The measured data (Columns A through J) from Worksheet: YM Data, are normalized in this worksheet, by dividing each data column by the corresponding sum value from Row 19 of that worksheet.

A set of descriptive statistics are calculated from the sizes and the normalized frequency data. These consist of the measures calculated using Eq. XVI-3 through Eq. XVI-8, which are calculated in Rows 21 through 26, respectively. These measures are used in later worksheets.

The measures calculated in Rows 24 and 26 are the estimated mean, and standard deviation, respectively, of the log-normal distributions of the measured data from the different well intervals. The average and standard deviation of these mean values, are calculated in Columns K and L, respectively, using the Excel intrinsic functions AVERAGE and STDEV. These are the parameters of the "average" log-normal distribution for the Yucca Mountain data, and are used in later worksheets.

In addition, a check of the assumption that the observed size-concentration data are log-normally distributed, is made in Row 29. This is done by calculating

$$\exp\left(\sum \mathrm{Ln}(D_i)w_i + \frac{1}{2}\left\{\sum [\ln(D_i)]^2 w_i - \left[\sum \mathrm{Ln}(D_i)w_i\right]^2\right\}^2\right) \qquad \text{(Eq. XVI-9)}$$

and comparing the result to the value in Row 21 (from Eq. XVI-1). The two values should be close, if the data are log-normal. Visual inspection shows that this is the case.

Cumulative Yucca Mountain Normalized Data (Worksheet: YM Cumulative)

Each of the normalized data columns (Columns B through J) from Worksheet: YM Normalized (Rows 3 through 18), is summed to the same locations in this worksheet, in a manner that produces a discretized cumulative distribution. The cumulative values are multiplied by 100 to convert to percentage. The final value of the cumulative distribution (for the maximum particle size of 200 nm) in each column is 100%, which verifies the operations are correct.

In addition, the "average" log-normal distribution for the Yucca Mountain data, is calculated in Column K, for each value of particle size in Column A. The parameters of the "average" distribution are obtained from Cells K24 and K26, in Worksheet YM Normalized.

The computed discretized cumulative distributions (Columns B through J), and the "average" log-normal distribution curve, are plotted on this worksheet.

Statistical Analysis Part 1 (Worksheet: Distributions)

The total mass concentration values for Nye County data (Worksheet: Nye Co Data, Range N19:V19) are copied to Column A. The total mass concentration values for Yucca Mountain data (Worksheet: YM Data, Range N19:V19) are copied to Column B. These two columns are combined and rearranged in ascending order in Column C. The rank series of Column C is shown in Column D. In Column E the ascending series is multiplied by the density of hematite (Cell C1).

F-statistic values are calculated in Column F, using the formula

$$F_i = 100*(\text{Rank})/(\text{Max. Rank}) \qquad \text{Eq. XVI-10}$$

Where the result is multiplied by 100 to give a percentage. The natural logs of the ascending series values from Column E, are calculated pointwise in Column G using the formula

$$G_i = \ln (E_i) \qquad \text{Eq. XVI-11}$$

The mean and standard deviation of the natural-log values are computed using Excel intrinsic functions AVERAGE and STDIV in Cells G21 and G22. The series of inverse variates is calculated in Column H using Excel intrinsic function NORMSINV, taking as the argument, the values in Column F (divided by 100 to convert from percentage).

The colloid concentration values for Nye County data (Worksheet: Nye Co Data, Range B19:J19) are copied to Column J. The colloid concentration values for Yucca Mountain data (Worksheet: YM Data, Range B19:J19) are copied to Column K. These two columns are combined and rearranged in ascending order in Column L. Columns M through Q then contain the same manipulations and results for colloid concentration data, as Columns D through H contained for the total mass concentration data, except that the ascending series in Column N is not multiplied by the specific gravity for hematite.

The parameters of the log-normal distribution estimated using regression of Column P on Column Q, in Worksheet: Particle Count, are copied to Cells P25 and P26, from Worksheet: Particle Count, Cells B17 and B18, respectively. These are the coefficients to the regressed linear fit to the log data.

In Columns S, T, and U the cumulative distribution of the colloid concentration (expressed as the F-statistic) is calculated using the parameters of the log-normal distribution estimated using two different approaches. First, Column S contains a series of logarithmically spaced increments of colloid concentration, at which the cumulative distribution is calculated. Column T contains the cumulative distribution calculated using the Excel intrinsic function LOGNORMDIST, with the parameters calculated from the data, in Cells P23 and P24. Column U contains the cumulative distribution also calculated using LOGNORMDIST, but with the parameters estimated from regression (Worksheet: Particle Count) and copied to Cells P25 and P26. Both Columns T and U compare favorably to the normalized rank data in Columns O and F.

A plot comparing the various estimates of the F-statistic series is included on the worksheet. The calculated values lie closest to the F-series generated in Column T.

Statistical Analysis Part 2 (Worksheet: Mass Conc.)

This worksheet contains a regression analysis performed using the Excel intrinsic function "Regression" which is accessed via the Tools:Data Analysis:Regression menu. The options selected included "Output Range" and "Residuals." The Y-Range selected is G5:G21 from Worksheet: Distributions. The X-Range selected is H5:H21 from Worksheet: Distributions. These selections regress the rank-ordered mass concentration values, against the inverse normal variate computed from the F-values estimated from the data.

The regression curve is calculated automatically (by the Regression function) at each of the points corresponding to the range of discrete data (i.e. Range H5:H21). (The regression curve is calculated using the log-normal distribution parameters estimated by the regression procedure.) The resulting curve is plotted with the discrete values, on this worksheet.

The regression curve is calculated automatically (by the Regression function) at each of the points corresponding to the range of discrete data (i.e. Range H5:H21). The regression curve is calculated using the log-normal distribution parameters estimated by the regression procedure. These calculated values are tabulated in Range A25:C41, in Worksheet: Mass Conc. The resulting curve in Range B25:B41 is plotted along with the discrete values, on this worksheet.

This worksheet also contains an analysis of the enhancement factor for mobilization of radionuclides by pseudocolloids, relative to solubility limits. This analysis is shown in Columns V through Z. Column V contains several arbitrarily selected quantiles (p) of the cumulative distribution on mass concentration. Column W contains the values of the standardized normal variable at these quantiles $\Phi^{-1}(p)$, calculated using Excel intrinsic function NORMINV. Column X contains the calculated colloidal concentrations (C_p) for the selected quantiles, expanded using

$$C_p = \exp\{\mu + \sigma\, \Phi^{-1}(p)\} \qquad \text{(Eq. XVI-12)}$$

Where μ and σ are the mean and standard deviation, respectively, of the log-normal distribution for colloid concentration, based on averages (Cells P23 and P24, Worksheet: Distributions). Column Y contains the equivalent mass of colloidal materials (M_C), calculated from the colloid concentration C_p using an average particle mass (m_{avg}):

$$M_p = C_p\, m_{avg} \qquad \text{(Eq. XVI-13)}$$

where the average particle mass is estimated from independent analysis, and entered in Cell W2. Finally, the enhancement factor is calculated in Column Z from

$$E = 1 + K_d\, M_C \qquad \text{(Eq. XVI-14)}$$

where K_d is the sorption coefficient estimated independently (e.g. from laboratory data) and entered in Cell W3.

Statistical Analysis Part 3 (Worksheet: Particle Count)

This worksheet contains a regression analysis performed using the Excel intrinsic function "Regression" which is accessed via the Tools:Data Analysis:Regression menu. The options selected included "Output Range" and "Residuals." The Y-Range selected is P5:P21 from Worksheet: Distributions. The X-Range selected is Q5:Q21 from Worksheet: Distributions. These selections regress the rank-ordered colloid concentration values, against the inverse normal variate computed from the F-values estimated from the data.

The regression curve is calculated automatically (by the Regression function) at each of the points corresponding to the range of discrete data (i.e. Range Q5:Q21). The regression curve is calculated using the log-normal distribution parameters estimated by the regression procedure. These calculated values are tabulated in Range A25:C41, in Worksheet: Particle Count. The resulting curve in Range B25:B41 is plotted along with the discrete values, as the uppermost plot in this worksheet.

The cumulative distributions of the colloid concentration calculated in Columns T and U, in Worksheet: Distributions, are plotted along with the discrete F-values based on averages (Column O in the same worksheet), as the lowermost plot on this worksheet.

Colloid Diffusivity Analysis (Worksheet: Colloid Diffusivity)

This worksheet contains two types of information about particle diffusivity in water, as a function of size. Columns A and B contain handbook data relating diffusivity and particle size (Perry and Chilton 1973; Table 17-10). The units are converted in Columns C and D.

Columns S and T contain a particle size-diffusivity calculation based on the Stokes-Einstein Equation (Bird et al. 1960). Column S contains a range of particles sizes for plotting, and Column T contains the diffusivity (D_{AB}) calculated from

$$D_{AB} = k_B \cdot \frac{T + 273}{3 \cdot \pi \cdot \mu \cdot D_A} \qquad \text{(Eq. XVI-15)}$$

where k_B is the Boltzmann constant (1.380662×10^{-23} J/K; see Weast and Astle, 1981; p. F-203), T is the temperature (25°C), D_A is the particle size, and μ is the dynamic viscosity of water (0.0008904 kg/m-sec; Weast and Astle 1981; p. F-42 and F-286). The handbook data and the Stokes-Einstein result are plotted on this worksheet

ROUTINE VALIDATION

The accuracy of the manipulations in this routine, and the appropriateness of the statistical operations, are established through the following measures:

- Checksums in Row 19 of Worksheet: NYE Co Data, and Worksheet: YM Data.
- Checksums in Row 19 of Worksheet: NYE Co Normalized, and Worksheet: YM Normalized. Also, calculation of the log-normal statistics, especially in Rows 24 and 26 of these worksheets, facilitates comparison among the well interval data sets used. The resulting similarity between well intervals is helps to justify the approach.
- Checking the assumption of log-normality by calculations in Rows 28 and 29 of these worksheets.
- Plotting the well interval data, expressed as cumulative distributions, in Worksheet: NC Cumulative, and Worksheet: YM Cumulative. In addition, the best-fit log-normal distributions representing the Nye County and Yucca Mountain data sets, are plotted, and compare favorably with the plotted data.
- The parameters of the best-fit log-normal distribution to the composite of all well interval data, is computed by two complimentary methods in Worksheet: Distributions (Cells P23 and P24, and Cells P25 and P26).
- Comparison of cumulative distributions fit using complimentary methods, to the cumulative tabulation of the composite well interval data, in Worksheet: Particle Count. The distributions are a close fit to the tabulated data.

Based on these features of the routine and the results obtained, the routine is determined to be valid for its intended use. Validity of the results depends on the goodness-of-fit of the data used, to the log-normal distribution. This routine supports a bounding model of colloid effects from steel used in the emplacement drifts. The routine is therefore appropriate and valid for the range of parameters obtained from the data sources.

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ATTACHMENT XVII SOFTWARE ROUTINE DOCUMENTATION FOR SAND SURFACE AREA CALCULATION SPREADSHEET

ROUTINE IDENTIFICATION

OvertonSandAreaV1.2 Version 1.2, initial issue of routine. This routine is an Excel 97 spreadsheet. The source code is "OvertonSandAreaV1.2.xls" (Attachment I).

OvertonSandAreaV1.2 is classified as a routine per AP-SI.1Q, and is qualified by this Attachment. This routine executes the expected mathematical operations accurately. OvertonSandAreaV1.2 was run on a Dell Poweredge 2200 PC (Pentium Pro; Windows 95 V4.00.950 B).

ROUTINE PURPOSE AND VALIDATION

The purpose of the routine is to calculate an estimate of the surface area of the sand, based on measured particle size classification data.

INPUT DATA

The particle size distributions for several samples of Overton Sand are entered in Worksheet: "Sand Surface Area" Rows 8 through 12. Backfill particle density (solid density) and porosity values are entered in cells from the thermal-hydrologic property set (file: "dkm-afc-EBS_Rev10"; see Attachment I) in cells B16 and B17, respectively.

The volume for each of the three zones of interest (3, 4, and 5) is imported to Worksheet: Solvent mass vs. surface area, Range B7:B9, from spreadsheet routine (File: "th+gas_model-l4c4-ui-04.xls" [Version 1.4] Worksheet: Zone volume). The required values are taken respectively from cells: D411, D415, and D420. The same values are repeated on Row 13 of Worksheet: Solvent mass vs. surface area.

The liquid mass in each zone (including Zone 6) is also imported to Worksheet: Solvent mass vs. surface area, Range C7:I10, from spreadsheet routine (File: "th+gas_model-l4c4-ui-04.xls" [Version 1.4] Worksheet: Zone volume). The required values are taken from Range AW13:AZ17.

CALCULATION OF SURFACE AREA

The average of the sand samples is calculated for each size range, in Range B13:F13. The sum of these average mass fractions is calculated as a check in cell H13 (should be close to 100%). The bulk density is calculated in cell B18 from

$$\rho_b = (1-\phi)\rho_g \qquad \text{(XVII-1)}$$

where ρ_b = bulk density (kg/m^3)
ρ_g = particle density (kg/m^3)
ϕ = porosity

The mass of one particle representing each size range, is calculated on Row 20, using the following expression

$$m_p = 4\pi\rho_g r^3 / 3 \qquad \text{(XVII-2)}$$

where m_p = particle mass (kg)
r = average of the two radii corresponding to the limits of the size range (m)

The radii for the limits of each size range are taken from half the diameters in Rows 5 and 6, converted to meters. A scaled density for each size range is calculated in Row 21, using the formula

$$\rho_{scaled} = \rho_b f \qquad \text{(XVII-3)}$$

where ρ_{scaled} = scaled density (kg/m^3)
f = proportion of total mass in each size range

The proportion of mass in each size range is taken from Row 13, converted from percentage. The surface area for each size fraction is calculated in Row 22 using the formula

$$A = (\rho_{scaled} / m_p)\, 4\pi r^2 \qquad \text{(XVII-4)}$$

The total surface area is calculated as the sum of the surface areas for all size fractions (cell G23).

CALCULATION OF SURFACE AREA IN ZONES OF THE MODEL

The following description applies to Worksheet: Solvent mass vs. surface area. The total surface area (m^2/m^3) from Worksheet: Sand surface area, Cell G22, is entered in Range C7:C9 and Row 14. The actual surface area of sand in each zone is calculated in Range D7:D9, and Row 15, using

$$A_{zone} = A\, V_{zone} \qquad \text{(XVII-5)}$$

where A_{zone} = sand surface area in each zone (m^2/m)
V_{zone} = the volume of the zone (m^3/m; Range B7:B9)

The surface area in each composite zone (i.e. Zone 3/4 and Zone 5/6) is calculated in Row 18, by summing the surface areas in Row 14.

The liquid mass in each composite zone is calculated in Rows 21 through 25 by summing the imported liquid mass values from Rows 7 through 10.

The surface area: liquid mass ratio is calculated in Rows 28 through 32, using the liquid mass data from Rows 21 through 25, and the specific surface area calculated in Row 18.

VALIDATION TEST CASE

Documentation of the accuracy of this routine is provided by comparing the results with hand calculation. For selected cells, the hand-calculated values are compared with the spreadsheet values in Table XVII-1. Minor differences in the least significant digit are attributed to round-off. The results are in agreement, from which it is established that the routine performs the operations accurately, and is valid for its intended use (in a bounding model for surface

area of sand backfill or other potentially reactive granular materials). The routine is therefore appropriate and valid for the range of parameters obtained from the data sources.

Table XVII-1. Comparison of Spreadsheet Values with Hand-Calculations for Selected Cells

Worksheet	Cell	Spreadsheet Value	Hand-Calc. Value
Sand surface area	B13	2.08	2.08
	B18	1593	1593
	B20	6.329E-10	6.329E-10
	B21	33.13	33.13
	B22	962.5	962.4
	G23	10.08	10.08
Solvent mass vs. surface area	D7	1.0076E+05	1.0073E+05
	D15	1.008E+05	1.007E+05
	D18	1.102E+05	1.102E+05
	D25	4.412E+02	4.413E+02
	D32	2.497E+02	2.497E+02

ATTACHMENT XVIII SOFTWARE ROUTINE DOCUMENTATION FOR CO_2 BALANCE CALCULATION SPREADSHEET

XVIII.1 ROUTINE IDENTIFICATION

This attachment describes initial issue of routine CO2balanceV1.2 Version 1.2. This is an Excel 97 spreadsheet. The source file is "CO2balance.xls" (Attachment I).

CO2balanceV1.2 is classified as a routine per AP-SI.1Q, and is qualified by this Attachment. The routine executes the expected mathematical operations accurately, and is therefore appropriate. CO2balanceV1.2 was run on a Dell Poweredge 2200 PC (Pentium Pro, Windows 95 4.00.950 B).

XVIII.2 ROUTINE PURPOSE

The purpose of this routine is to sum the CO_2 produced and consumed in all zones representing the Engineered Barrier System (EBS) using output from the EQ3NR chemical equilibrium model, the normative mineral assemblage model, and the EQ6 mass transfer reaction model.

XVIII.3 ROUTINE DESCRIPTION

Input data are transferred manually into the CO2balanceV1.2 spreadsheet. The specific input files used for as sources for these data are as follows:

Hydrologic information on influx and outflux for each composite zone, from a thermal-hydrology and gas model summary spreadsheet routine file:

"th+gas_model-l4c4-ui-04.xls"

EQ3NR output files representing water composition in composite Zone 1/2, in Time Period 1 through Time Period 5.

Normative mineral assemblage spreadsheet files:

"normative_hiCO2_l4c4_ui-zone34-500V1.2.xls"

"normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls"

Output from the EQ6 mass transfer reaction model, reformatted in spreadsheet files:

"water34_3A_qtz.xls"
"water34_3B_qtz.xls"
"water34_4_qtz.xls"
"water34_5_qtz.xls"
"water56_4A_qtz.xls"
"water56_4B_qtz.xls", and
"water56_5_qtz.xls"

All of these files are included in the electronic submittal described in Attachment I.

The CO2balanceV1.2 spreadsheet is organized by columns, and is described by specifying the columns in a list:

Columns A and B: These contain the time period number, and the nominal time in yr corresponding to each time period.

XVIII.3.1 CO_2 Production from Taking J-13 Water to Zone 0 Composition

Column C: Molal concentration CO_2 as carbonate species comprising bicarbonate, carbonate, and aqueous $CaCO_3$ and accounting for 99% of total dissolved CO_2, for Zone 0, and each time period. These data area taken from the "Current Basis" tables in the EQ3NR output files for composite Zone 0, and Time Period 1 through Time Period 5.

Column D: Molal concentration Ca, accounting for 99% of total dissolved Cs, for Zone 0, and each time period. These data area taken from the "Current Basis" tables in the EQ3NR output files for composite Zone 0, and Time Period 1 through Time Period 5.

XVIII.3.2 CO_2 Production by Taking Zone 0 Waters to Zone 1/2 Composition

Column E: Liquid inflow rate for Zone 1/2, from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column P. The inflow rate to Zone 1/2 is equal to the through-flow rate for Zone 0. These data are identical to Column F.

Column F: Molal concentration CO_2 as carbonate species comprising bicarbonate, carbonate, and aqueous $CaCO_3$ and accounting for 99% of total dissolved CO_2, for Zone 1/2, and each time period. These data area taken from the "Current Basis" tables in the EQ3NR output files for composite Zone 1/2, and Time Period 1 through Time Period 5.

Column G: Molal concentration Ca, accounting for 99% of total dissolved Cs, for Zone 0, and each time period. These data area taken from the "Current Basis" tables in the EQ3NR output files for composite Zone 0, and Time Period 1 through Time Period 5.

Column H: Liquid outflow rate for Zone 1/2, from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column S.

Column I: Compute the aqueous CO_2 budget for Zone 1/2. Multiply the influent CO_2 molal concentration by the inflow rate, and multiply the effluent CO_2 molal concentration by the outflow rate.

Column J: Compute the calcite precipitation CO_2 budget for Zone 1/2. Multiply the influent Ca molal concentration by the inflow rate, and multiply the effluent CO_2 molal concentration by the outflow rate.

Column K: Total CO_2 budget for Zone 1/2. Add Columns I and J.

XVIII.3.3 Evaporation, Redissolution, and Through-Flow of Waters in Zone 3/4

Column L: CO_2 concentration in waters that can potentially enter Zone 3/4 and evaporate during Time Period 1 and Time Period 2. Identical to Column F, the Zone 1/2 concentration, during these time periods.

Column M: Liquid inflow rate for Zone 3/4, from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column Y.

Column N: Liquid outflow rate for Zone 3/4, from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column AB.

Column O: Moles of CO_2 precipitated in Zone 3/4 from the normative mineral assemblage model. Cell O9 has a value of zero because there is no liquid inflow during Time Period 1. The value in Cell O10 is calculated from values in spreadsheet routine file: "normative_hiCO2_l4c4_ui-zone34-500V1.2.xls" Worksheet: 300-700 yr, Cells K42 and K48. The precipitated moles of calcite and thermonatrite are converted to moles of CO_2 and entered in Cell O10.

Column P: Net CO_2 budget values calculated by the EQ6 reaction model for Zone 3/4, and taken directly from the "Masses of gases produced" tables in spreadsheet files "water34_3A_qtz.xls", "water34_3B_qtz.xls", "water34_4_qtz.xls", "water34_5_qtz.xls".

Column Q: Compute CO_2 budget for Zone 3/4. For Time Periods 1 and 2, multiply the influent CO_2 molal concentration by the inflow rate, and multiply the CO_2 precipitation rate (converted to mass CO_2) by the inflow rate. Subtract the precipitation term from the inflow term. For Time Periods 3,4, and 5 the net CO_2 budget is calculated differently. The budget values calculated in Column P are multiplied by the liquid inflow rate.

XVIII.3.4 Evaporation, Redissolution, and Through-Flow of Waters in Zone 5/6

Column R: Influent CO_2 concentration to Zone 5/6, for Time Periods 3A and 3B, for which there is liquid water inflow to Zone 5/6 from Zone 3/4, but evaporation is complete and mass balance is not computed by the EQ6 model.

Column S: Liquid inflow rate for Zone 5/6, from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column AG.

Column T: Liquid outflow rate for Zone 5/6, from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column AJ.

Column U: Moles of CO_2 precipitated in Zone 5/6 from the normative mineral assemblage model. Cells U9 and U10 have are zero because there is no liquid inflow during Time Periods 1 and 2. The value in Cell U11 is calculated from values in spreadsheet routine file: "normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls" Worksheet: 700-1500 yr, Cells K42 and K48. The precipitated moles of calcite and thermonatrite are converted to moles of CO_2 and entered in Cell U11. The value in Cell U12 is calculated from values in spreadsheet routine file: "normative_hiCO2_l4c4_ui-zone56-1000V1.2.xls" Worksheet: 700-1500 yr, Cells K104 and K110. The precipitated moles of calcite and thermonatrite are converted to moles of CO_2 and entered in Cell U12.

Column V: Net CO_2 budget values calculated by the EQ6 reaction model for Zone 5/6, and taken directly from the "Masses of gases produced" tables in spreadsheet files "water56_4A_qtz.xls", "water56_4B_qtz.xls", and "water56_5_qtz.xls".

Column W: Compute CO_2 budget for Zone 5/6. For Time Periods 1 and 2 there is no liquid inflow or outflow, so the CO_2 budget is zero. For Time Periods 3A and 3B multiply the influent CO_2 molal concentration by the inflow rate, and multiply the CO_2 precipitation rate

(converted to mass CO_2) by the inflow rate. Subtract the precipitation term from the inflow term. For Time Periods 4 and 5 the net CO_2 budget is calculated differently. The budget values calculated in Column V are multiplied by the liquid inflow rate.

XVIII.3.5 CO_2 Production by Cooling of Zone 1/2 Through-Flow to Zone 0 Conditions

Column X: Liquid through-flow from Zone 1/2 back to the host rock (Zone 0), from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column W.

Column Y: CO_2 budget for a 1-kg parcel of Zone 1/2 water, cooled to Zone 0 temperature in the presence of equilibrium solids, as used for modeling Zone 0. Calculated for all time periods using EQ3NR, as summarized in file: "CO2_budget_a1.xls" (Attachment I). Represents the net CO_2 production from waters diverted around the drifts.

Column Z: Compute CO_2 budget for Zone 1/2 through-flow to Zone 0 conditions. For all time periods, multiply the through-flow rate (Column X) by the net CO_2 production (Column Y).

XVIII.3.6 CO_2 Production by Cooling of Zone 5/6 Through-Flow to Zone 0 Conditions

Column AA: Liquid through-flow from Zone 5/6 back to the host rock (Zone 0), from file: "th+gas_model-l4c4-ui-04.xls" Worksheet: "CHEMprobl4c4upper" Column AN.

Column AB: CO_2 budget for a 1-kg parcel of Zone 5/6 water, cooled to Zone 0 temperature in the presence of equilibrium solids, as used for modeling Zone 0. Calculated for all time periods using EQ3NR, as summarized in file: "CO2_budget_b1.xls" (Attachment I). Represents the net CO_2 production from waters drained from the drifts.

Column AC: Compute CO_2 budget for Zone 5/6 through-flow to Zone 0 conditions. For all time periods, multiply the through-flow rate (Column AA) by the net CO_2 production (Column AB).

XVIII.3.7 Summary of CO2 Budgets for In-Drift, and Host-Rock Processes

Column AD: Compute CO_2 budget for in-drift processes only. Add the Zone 3/4 and Zone 5/6 contributions from Columns Q and W, respectively, and multiply by 2 to convert to full-drift basis (from the half-drift basis used in the NUFT symmetry models). Convert from moles to kg CO_2.

Column AE: Compute CO_2 budget for in-drift processes plus the host rock waters compared to Zone 0 conditions. To the result from Column AD, add the Zone 1/2 CO_2 budget from Column K, and the Zone 1/2 through-flow budget from Column Z. For Time Periods 4A, 4B, and 5, also add the Zone 5/6 through-flow budget from Column AC. Multiply the additional (Zone 0 basis) terms by 2 to convert to full-drift basis (from the half-drift basis used in the NUFT symmetry models).

XVIII.3.8 Potential Effect of Rockbolt Cement Grout on the In-Drift CO_2 Budget

Column AG: Enter leachate flow per rockbolt, from the Cementitious Materials Model, Section 6.3 of the EBS Physical and Chemical Environment AMR. This value is computed from the ratio of the rockbolt cross-sectional area to the drift diameter, multiplied by the inflow rate from Zone 1/2 to Zone 3/4.

Column AH: Enter number of rockbolts per meter of drift.

Column AI: Total leachate flow for all rockbolts in 1 m of drift, calculated by multiplying Columns AG and AH, and converting to kg/m-sec.

Column AJ: Influent CO_2 concentration in fluids that interact with rockbolt grout. This is the total CO_2 concentration corresponding to the bicarbonate concentration reported for J-13 water.

Column AK: Total CO_2 concentration in grout leachate after equilibration to CO_2 and quartz in the backfill. Taken from the Cementitious Materials Model (Section 6.3).

Column AL: Mass of calcite precipitated by grout leachate on equilibration to CO_2 and quartz in the backfill. Taken from the Cementitious Materials Model (Section 6.3).

Column AM: Total CO_2 consumed by grout leaching, and the equilibration of grout leachate with CO_2 and quartz in the backfill. Computed by taking the difference between Columns AK and AJ, multiplied by the flow rate in Column AI. The calcite precipitation from Column AL is multiplied by the flow rate in Column AI, converted from mass calcite to mass CO_2, and added. The mass-basis of the result is converted to kg CO_2.

Column AN: CO_2 budget for in-drift processes only, with consumption by leaching of rockbolt grout. Add the production calculated in Columns AD and AM.

Column AO: The percent difference in the CO_2 budget for in-drift processes, with addition of CO_2 consumption by rockbolt grout.

XVIII.4 VALIDATION TEST CASE

This routine is qualified by inspection and comparison of the formulae to the above description, and checking by hand calculation. Selected cells are calculated by hand, the values compared with the spreadsheet results in Table XVIII-1. Matching values are obtained, with small differences that are attributed to round-off. This documents the accuracy of this routine for calculating CO_2 mass balance from defined inputs. The routine is therefore determined to be approproate for performing mass balance calculations, given the range of chemical model inputs for the chemical reaction cell system described.

Table XVIII-1 Comparison of Hand-Calculated Values with Spreadsheet Results

Cell	Spreadsheet Value	Hand-Calculated Value
I11	-6.138E-11	-6.182E-11
J11	1.068E-08	-1.069E-08
K11	1.062E-08	1.075E-08
Q11	2.343E-07	2.343E-07
W11	-3.210E-07	-3.210E-07
Z11	-2.720E-09	-2.720E-09
AD11	-7.630E-09	-7.630E-09
AE11	-6.935E-09	-6.935E-09
AI11	4.196E-08	4.196E-08
AM11	-7.946E-12	-7.946E-12
AN11	-7.638E-09	-7.638E-09
AO11	0.10	0.104