Software Release Notice
Developed or Modified Software

1. Software Name and Project Number:: BDOSE Version: 2.0

14002.01.011

2. Software Function: Probabilistically evaluate receptor doses (mrem) based on radionuclide groundwater and soil concentrations.

3. Summary of Actions:
❑ New Software ■ Update to Existing Software ❑ Software Retirement

4. Software Development

4a. Software Requirements Description (SRD) Date Approved: 12/20/2006 (ver 1.0)
4b. Software Development Plan (SDP) Date Approved: 12/20/2006
4c. Software Change Report (SCR) Nos: 714, 715, 717, 718
4d. User's Guide Date Date Approved None
4e. Enclosed: ■ Copy of Program Title Block ❑ Sample Source Code Header Block

Developer:	Date:
James Mancillas	28 August 2008

Remarks: BDOSE V2.0 is computationally the same as BDOSE V1.0 (with the exception of limited bug fixes). The substantial difference between versions is the structural format of the input data. In V1.0, input data was distributed throughout the model, V2.0 has the input data localized into a centralized location. BDOSE_V2.0.gsm is the same as development model BDOSE_V2.0BetaD.gsm.

5. Software Installation

5a. Computer Platform(s): PC
5b. Operating System(s): Windows XP
5c. Programming Language(s): GoldSim (9.6.3)

5d. Installation Testing: ■ Passed Testing Performed on: 28 August 2008
Description of Testing Performed:
A copy of BDOSE v.2.0 was installed from CD onto Manta, including the file PeakOfMean.dll. BDOSE was then run using GoldSim. The model successfully executed, producing no run time errors and generating results which were consistent with user expectations for a default simulation.

5e. Archive Copy: ■ Enclosed ❑ Not Available, Why:

Installation Performed by:	Date:
James Mancillas	28 August 2008

Remarks: An archived copy of BDOSE v2.0 is on an attached CD

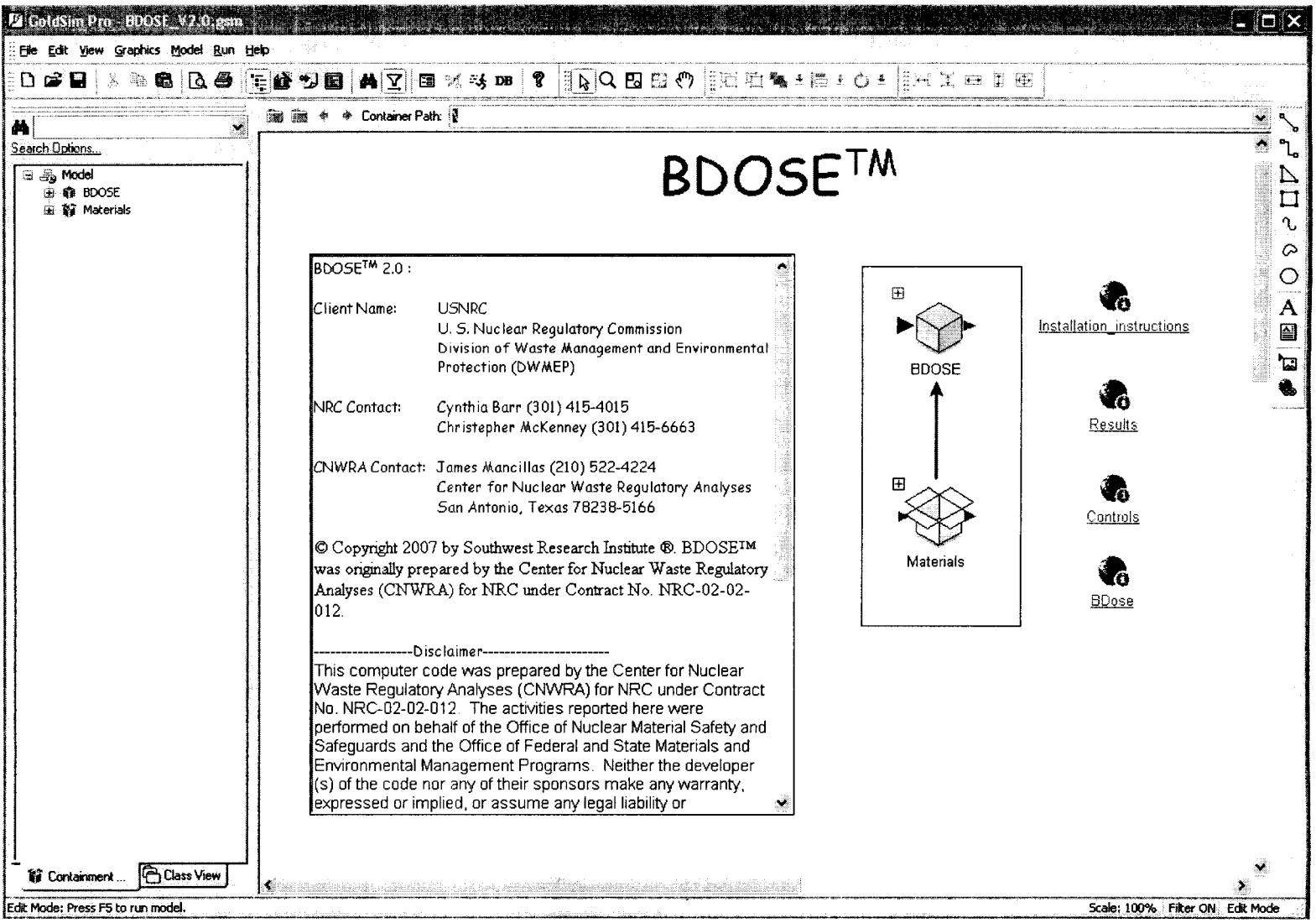
6. Software Assessment

6a. Acceptance Testing:
❑ Enclosed ❑ Documented in Scientific Notebook No. _____
■ Documented in SCRs (attached)

6b. Validation Status:
■ Full Validation ❑ Limited Validation Date of Validation: 8/28/2008
❑ Not Validated, Explain: Regression Testing using Version 1.0 validation tests. RBr 8/28/08

Software Developer:	Date:
James Mancillas	28 August 2008

Remarks: Testing completed during SCR testing was comprehensive and identical to original validation tests.	
7. Approval	
Manager: Mi Hopkins	Date 8/27/08
Remarks:	
7. QA Verification	
SRN Number: 451	
Software Custodian M Hunt	Date: 8/28/08
Remarks:	


GoldSim Pro - BDOSE_V2.0.gsm
File Edit View Graphics Model Run Help
Container Path:
Search Options...
Model
BDOSE
Materials
Containment ...
Class View
BDOSE™
BDOSE™ 2.0 :
Client Name: USNRC
U. S. Nuclear Regulatory Commission
Division of Waste Management and Environmental Protection (DWMEP)
NRC Contact: Cynthia Barr (301) 415-4015
Christepher McKenney (301) 415-6663
CNWRA Contact: James Mancillas (210) 522-4224
Center for Nuclear Waste Regulatory Analyses
San Antonio, Texas 78238-5166
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----------Disclaimer----------
This computer code was prepared by the Center for Nuclear Waste Regulatory Analyses (CNWRA) for NRC under Contract No. NRC-02-02-012. The activities reported here were performed on behalf of the Office of Nuclear Material Safety and Safeguards and the Office of Federal and State Materials and Environmental Management Programs. Neither the developer (s) of the code nor any of their sponsors make any warranty, expressed or implied, or assume any legal liability or
BDOSE
Materials
Installation_instructions
Results
Controls
BDose
Edit Mode: Press F5 to run model.
Scale: 100%
Filter ON
Edit Mode

SOFTWARE CHANGE REPORT (SCR)

1. SCR No. (*Software Developer Assigns*):	2. Software Title and Version:	3. Project No:
714	BDOSE Version 2.0BetaA1	14003.01.006.200

4. Affected Software Module(s), Description of Problem(s):
Input parameters are scattered through out the graphical interface in BDOSE. To enhance transparency, and improve QA capabilities these parameters have been consolidated into a single container, "BDOSE_Inputs".
Implemented a stochastic model for soil KDs, as requested by NRC staff.
Moved the fluid element "BDOSE_soil" to the physical soil submodel, to ease BDOSE installation into existing models.

5. Change Requested by: Ali Simpkins **Date:** 2/15/2008

6. Change Authorized by (*Software Developer*): James Mancillas **Date:** 2/15/2008

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

Input parameters have been localized into a single input container, which contains substructures which are used to maintain parameter organization. This required the calculational parameter to be renamed "xxx_c".

8. Implemented by: James Mancillas **Date:** 2/20/08

9. Code Review Needed (see TOP-018, 5.4.7) **Yes** ■ **No** □
(Determined by Software Developer. Code reviews should be performed for modifications with significant risks of code errors. Indicate selection with ☒*).*
Review the connectivity of the rearranged parameters.

Describe any errors detected and their resolution *(If no errors are found, indicate with "**None**".)*:

A few parameters were found to be incorrectly mapped and these were fixed prior to testing.

Code review accomplished by: Ali Simpkins **Date:** 5/2/08

10. Description of Acceptance Tests:

See attached for tests and results.

11. Tested by: Ali Simpkins **Date:** 5/2/08

Form TOP-5 (10/2006)

Attachment: Acceptance Tests

Test 1

First perform visual inspection of all parameters ('**_c') to ensure correct mapping. Compare BDOSE Version 1.1 results with BDOSE Version 2.0BetaA1 for the following receptors: Resident, recreationalist acute driller, and chronic driller. Compare pathway doses if available. Use all default values and run both versions by modifying the Monte Carlo tab of Simulation Settings menu to select Deterministic and then select 'Element Mean Values'. This will allow for a comparison using the same set of input parameters.

Test passes if the ratio of the results from the two different versions is 1.00 for each radionuclide and pathway (if available).

Test 1 Results

All parameters were visually inspected to ensure '**_c' were mapped to the correct parameters.

Both version of BDOSE were executed using the input specifications above and the results are shown on the attached CD. The CD contains the BDOSE Version 1.1 and BDOSE Version 2.0BetaA1 which includes the results within the model. A spreadsheet 'BDOSE SCR714 results.xls' is also included on the CD which shows the comparison between the versions. There are several worksheets within the spreadsheet which are labeled by receptor name. The results of the ratios between the different versions are shown in yellow. All ratios are equal to 1.00.

Tests passed.

Test 2

Visually inspect to ensure Kd's have been changed to stochastic. Execute BDOSE in stochastic mode with selection of Kds changed to stochastic to test code operation.

Test 2 Results

Kd indentifiers (Kd1, Kd2, etc) were all inspected to ensure proper mapping in Kd vector. BDOSE executed in stochastic mode and the results were saved as 'BDOSE_V2.0BetaA1testKd.gsm.' Results were inspected to ensure all elements of code were operating. Test 1 which compares Version 1.1 with Version 2.0 Beta also ensures that no inadvertent changes were made.

Test passed.

Test 3

Inspect soil model to ensure the fluid element "BDOSE_soil" was moved to the physical soil submodel

Test 2 Results

Physical soil submodel inspected to ensure change was made. Test 1 which compares Version 1.1 with Version 2.0 Beta also ensures that no inadvertent changes were made.

Test passed.

SOFTWARE CHANGE REPORT (SCR)

1. SCR No. (*Software Developer Assigns*):	2. Software Title and Version:	3. Project No:
715	BDOSE Version 2.0BetaB1	14003.01.006.200

4. Affected Software Module(s), Description of Problem(s):
Corrected conditions which allow non-physical concentrations of RN in the intruder source calculations.
Result summary for receptors were edited to include the pathway exclusion (give zeros when pathway not selected).
Created and implemented a dll which calculates peak of the mean values for the receptors, and creates a file for the all realization values at the time step of the peak of the mean.

5. Change Requested by: Ali Simpkins Ali Simpkins **Date:** 2/15/08

6. Change Authorized by (*Software Developer*): James Mancillas **Date:** 2/15/08

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

8. Implemented by: James Mancillas **Date:** 2/28/08

9. Code Review Needed (see TOP-018, 5.4.7) **Yes** ■ **No** □
(Determined by Software Developer. Code reviews should be performed for modifications with significant risks of code errors. Indicate selection with ☒).

Review peak of the mean calculations.

Describe any errors detected and their resolution *(If no errors are found, indicate with "**None**".)*:

Code review accomplished by: Ali Simpkins Ali Simpkins **Date:** 5/16/08

10. Description of Acceptance Tests:

See Attachment

11. Tested by: Ali Simpkins Ali Simpkins **Date:** 5/16/08

Form TOP-5 (10/2006)

Attachment: Tests

Test 1

Warning flag for excavation volume check was visually inspected to ensure logic was correct.

Test 1 Results

Excavation volume check is correctly testing to not allow the source volume to exceed the total excavation volume.

Test Passed.

Test 2

Visual inspection of all results was performed to ensure that they were multiplied by the appropriate vector. Pathway vectors were changed in order to test if pathways would not show results when zeroed. Within the following location: \BDOSE\BDOSE_Input\Controls\Receptor_definitions the resident farmer pathway vectors were changed to zero for all crops, air shine, soil ingestion, and water submersion. Inspection of pathway-specific results should reveal no results for these pathways.

Test 2 Results

Visual inspection revealed no errors. Within the following location: \BDOSE\Results\Resident_Pathway_doses results were reviewed for the above mentioned pathways to ensure no doses were reported. As expected, no doses were reported for these pathways. This is also shown in the resident summary table in the same location where each of these columns has zero values.

Test Passed.

Test 3

For each of the outputs (resident, recreationist, intruders), visually inspect the output to ensure peak of the means is reported along with the appropriate time.

Test 3 Results

Receptor	Visual Inspection	Visual Inspection	DLL Result	DLL Result
	Total Dose (mrem)	Time (yr)	Total Dose (mrem)	Time (yr)
Resident	188.77	0	188.77	0
Recreationist	106.55	0	106.55	0
Chronic Intruder	205.93	100	205.93	100
Acute Intruder	1.27e-6	Entire range	1.27e-6	10000**

** Since the dll is testing for maximum values starting with the first time step and then comparing to subsequent time steps, it is acceptable for the dll to report the last time step even when all are equal.

Test Passed.

SOFTWARE CHANGE REPORT (SCR)

1. SCR No. (*Software Developer Assigns*):	2. Software Title and Version:	3. Project No:
717	BDOSE Version 2.0BetaC1	14003.01.006.200

4. Affected Software Module(s), Description of Problem(s):
BDOSE 2.0betaC contains cosmetic changes to the graphical environment.
Soil Kd values were updated from table 4.1 of the users manual.
Default input values were changed for the following parameters with the new values shown:
Drinking water consumption: Normal Distribution: Mean 337 L/yr, Standard Deviation 100 L/yr, Min 170 L/yr, Max 730 L/yr
Transfer Factor for Leafy Vegetables for Uranium: changed to 8.3e-03

5. Change Requested by: Ali Simpkins Ali Simpkins **Date:** 2/15/08

6. Change Authorized by (*Software Developer*): James Mancillas **Date:** 2/15/08

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

Spelling, letter transpositions, and mislabeling errors have been corrected.
Intruder groundwater model has been modified to account for the separate biospheres for the resident and the intruder.
A separate Fish type, 'fish_INT', has been added to allow complete separation of the resident and intruder biosphere.

Minor changes were made to the default input file which will require visual inspection:

PROPRIETORY INFORMATION

The BDOSE calculations module has been locked to prevent user modifications.
The password is ALISSSNALL9

PROPRIETORY INFORMATION

8. Implemented by: James Mancillas **Date:** 5/16/08

9. Code Review Needed (see TOP-018, 5.4.7) **Yes** ■ **No** □
(Determined by Software Developer. Code reviews should be performed for modifications with significant risks of code errors. Indicate selection with ☒*).*

Check to ensure Intruder biosphere is isolated from the resident biosphere

Describe any errors detected and their resolution *(If no errors are found, indicate with "**None**".)*:

Code review accomplished by: Ali Simpkins Ali Simpkins **Date**: 5/29/08

10. Description of Acceptance Tests:

See attached

11. Tested by: Ali Simpkins Ali Simpkins	**Date**: 6/26/08

Form TOP-5 (10/2006)

Acceptance Tests:

Test 1:

To ensure no inadvertent changes were made a test was performed to compare the results for the resident scenario from BDOSE 1.1 to BDOSE 2.0BetaC1 using default parameters. Use all default values and run both versions by modifying the Monte Carlo tab of Simulation Settings menu to select Deterministic and then select 'Element Mean Values'. This will allow for a comparison using the same set of input parameters.

Test 1 Results

Both versions of BDOSE were executed using the input specifications above and the results are shown on the attached CD. The CD contains the BDOSE Version 1.1 and BDOSE Version 2.0BetaA1 which includes the results within the model. A spreadsheet 'BDOSE SCR717 results.xls' is also included on the CD which shows the comparison between the versions. The results of the ratios between the different versions are shown in yellow. All ratios are equal to 1.00.

Tests passed.

Test 2:

To ensure that the intruder model is operating as expected, parameters were adjusted to ensure it is isolated from the remaining modules. In the controls model the intruder water selector is set to uncontaminated water and the intruder source switch is set to external source. If the model is isolated, the resulting doses should be zero.

Test 2 Results

The resulting doses were zero.

Test passed.

Visual inspection was used to ensure changes to parameters were made.

SOFTWARE CHANGE REPORT (SCR)

1. SCR No. (*Software Developer Assigns*):	2. Software Title and Version:	3. Project No:
718	BDOSE Version 2.0BetaD	14003.01.006.200

4. Affected Software Module(s), Description of Problem(s):
BDOSE 2.0betaD contains cosmetic changes to the graphical environment.

BDOSE 2.0betaD contains corrections to soil model 5, BDOSE_soil and a correction to the intruder soil calculation for the acute intruder.

5. Change Requested by: Ali Simpkins Ali Simpkins **Date:** 8/08/08

6. Change Authorized by (*Software Developer*): James Mancillas **Date:** 8/11/08

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

Descriptive text for the Intruder_source_switch, the GW_source_switch and Soil_KD_selector were altered to improve clarity. Additional text was added to relate soil Kds to RNs in the usr_defined_KDs container.

The logic for the INT_Soil_Concentration_Acute was change to correct a logic error.
The partition coefficients for the model element BDOSE_soil was changed to Soil_RN_KD*Soil_density_c. Previously, the partition value was incorrectly set to a default value of zero.

8. Implemented by: James Mancillas **Date:** 8/11/08

9. Code Review Needed (see TOP-018, 5.4.7) **Yes** ■ **No** □
(Determined by Software Developer. Code reviews should be performed for modifications with significant risks of code errors. Indicate selection with ☒).
Describe any errors detected and their resolution *(If no errors are found, indicate with "**None**".):*

Spelling errors were noted in the text of the model and these were corrected. This will not affect the functionality of the code.

Visual inspection of the INT_Soil_Concentration_Acute was performed to ensure the logic was correct.

Code review accomplished by: Ali Simpkins Ali Simpkins **Date:** 8/27/08

10. Description of Acceptance Tests:

See Attached

11. Tested by: Ali Simpkins Ali Simpkins **Date:** 8/27/08

Acceptance Tests

TEST 1

To ensure no inadvertent changes were made a test was performed to compare the results for the resident scenario from BDOSE 1.1 to BDOSE 2.0BetaD using default parameters with the exception of changing the resident water consumption value in BDOSE 2.0 Beta D to a discrete value of 730.5 L/yr to agree with BDOSE 1.1. Use all default values and run both versions by modifying the Monte Carlo tab of Simulation Settings menu to select Deterministic and then select 'Element Mean Values'. This will allow for a comparison using the same set of input parameters.

Test 1 Results

Both versions of BDOSE were executed using the input specifications above and the results are shown on the attached CD. The CD contains the BDOSE Version 1.1 and BDOSE Version 2.0BetaD which includes the results within the model. A spreadsheet 'BDOSE SCR718 results.xls' is also included on the CD which shows the comparison between the versions. The results of the ratios between the different versions are shown in yellow. All ratios are equal to 1.00.

Tests passed.