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Summary

The test plan that was designed and conducted for the RAGS Viewer is described. This Viewer is a set of programs that enable the Framework for Analysis of Risk in Multimedia Environmental Systems to generate the tables required for a RAGS analysis. Summaries of the requirements on which testing was based are provided as well as descriptions of test cases and the results of their implementation.



Acronyms

- COPC contaminants of potential concern
- CT Central Tendency
- EPA U.S. Environmental Protection Agency
- FRAMES Framework for Analysis of Risk in Multimedia Environmental Systems
- RAGS Risk Assessment Guidelines for Superfund
- RAGS The D for RAGS is EPA's D-section of the entire RAGS procedure
- RME Reasonable Maximum Exposure

Contents

1.0 Introduction
2.0 Risk Assessment Guidance for Superfund (Rags) Part D Report Generator Viewers 2.1
2.1 Summary of Requirements 2.1
2.2.1 RAGS_01 (Dean's Creek Development Company)
2.2.1.1 Description and Rationale 2.2
2.2.1.2 Input Data 2.5
2.2.1.3 Expected Results
2.2.1.4 Procedure 2.5
2.2.1.5 Results
2.2.2 RAGS_02 (Case1_gw)
2.2.2.1 Description and Rationale
2.2.2.2 Input Data
2.2.2.3 Expected Results 2.10
2.2.2.4 Procedure
2.2.1.5 Results 2.17
Appendix A: Deans Creek Example
Input Data A.2
Contaminant Database Module A.3
Aquifer A.4

				. 7
Exposure Pathways	 	 	 <i>F</i>	A ./

Receptor Intake		 	 	••••	•••••	A	.8
Health Impacts		 ••••	 	••••	•••••	A	.9
Expected Results	••••	 • • • •	 		1	A.1	10

Testing Results A.11

Figures

21	ERAMES Model for Deans Creek Development Company Example Used
2.1.	by EPA to Demonstrate the Filling out of RAGS Tables
2.2.	Input Display for Entering Chemical Concentrations 2.6
2.3.	System Flow Chart for the FRAMES Model "Case1_gw"
2.4.	Parameter settings for the Source Term in Case1_gw test case for RAGS 2.12
2.5.	Parameter settings for the Vadosel in Casel_gw test case for RAGS 2.13
2.6.	Parameter Settings for the Vadose2 in Case1_gw test Case for RAGS 2.14
2.7.	Parameter settings for the Aquifer in Case1_gw test case for RAGS 2.15
A.1.	Multimedia Framework Screen
A.2.	Contaminant Selection Screen
A.3.	View screen to Aquifer_1_to_tap_water A.7
A.4a.	Viewer for Exposure Pathways
A.4b.	Viewer for Receptor Intake A.10
A.4c.	Viewer for Health Impacts A.11



Tables

2.1. Funda	damental Requirements for Testing the RAGS Viewers	2.1
2.2. Relat	tionship Between Test Cases and RAGS Table Viewer Fundamental	
Requ	uirements	2.3



1.0 Introduction

The "RAGS Viewer"^(a) is a set of programs that will enable the Framework for Analysis of Risk in Multimedia Environmental Systems (FRAMES) system to generate the Tables required for a RAGS analysis as prescribed by the U.S. Environmental Protection Agency (EPA) at: http://epa.gov/superfund/programs/risk/ragsd/tara.htm.

The objective is simply to generate the RAGS tables as worksheets in an EXCEL file that match the structure of a given model. It is not the objective to populate each column and row of each table with the required data for conforming to RAGS requirements as specified by the EPA.

This report describes the test plan designed and conducted for the RAGS Viewer. It includes summaries of the requirements on which testing was based and descriptions of test cases, and it lists the results of their implementation. One test case for the RAGS Viewer was generated for the simple, single medium, Deans Creek Development Company example that is used by the EPA (see above URL) to demonstrate how to fill out the RAGS tables. Another test case uses a more elaborate multiple media example. The "rags.xls" files are included with the test package. The "rags.xls" file generated through independent testing should match these files.

Required program files are:

RAGSgen.exe, 8/13/2001, 10:27 am, 232 KB RAGS_templates_XLS, 8/13/20001, 8:45 am, 132 KB RAGSgen.des, 6/5/2001, 12:16 am./2 KB XlsChart.exe, 8/13/2001, 11:23 am, 460 KB.

⁽a) RAGS = Risk Assessment Guidance for Superfund. The D for RAGS refers to EPA's D-section of the entire RAGS procedure.

2.0 Risk Assessment Guidance for Superfund (Rags) Part D Report Generator Viewers

The RAGS Viewers allow the FRAMES user to have FRAMES generate the RAGS Tables after the model is run from the Health Impacts module to the extent that the suggested entries to the Tables are those that are used in running a FRAMES application.

2.1 Summary of Requirements

Requirements for the RAGS Viewers are described in Addendum 2 of the document: Requirements for the FRAMES Specification File Viewer Modules. Table 2.1 lists these requirements. To ensure that the RAGS Viewers meet the requirements shown in table 2.1, two cases were developed to check performance. Table 2.2 shows the relationship between these requirements and the test cases described in Section 2.2.

Requiremen t Number	Requirement					
1	The RAGS Viewer shall be activated at the user's request after running a FRAMES- based model by right-clicking on the Health Impacts module icon to popup a context menu and then moving the cursor over "View/Print Module Output" to popup a sub-menu of applicable viewers and selecting "RAGS Table Generator for Chemicals."					
2	The RAGS Viewer shall save to disk in the EXCEL file a worksheet containing: Table 1 - Selection of Exposure Pathways.					
3	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 2.1 through 2.n—Occurrence, Distribution, and Selection of Chemicals of Potential Concern, one worksheet table for each environmental medium and exposure medium.					
4	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Tables 3.1 through 3.n—Medium-Specific Exposure Point Concentration Summary, one worksheet table for each environmental medium and exposure medium.					
5	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Tables 4.1 through 4.n—Values Used for Daily Intake Calculations, one worksheet table for each environmental medium and exposure medium.					

Table 2.1.	Fundamental	Requirement	nts før	r Testing	g the	RAG	S Viewers
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Table 2.1 (Contd)

6	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Table 5—Non-Cancer Toxicity Data: 5.1—Oral/Dermal, 5.2—Inhalation, 5.3—Special Case Chemicals.
7	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Table 6—Cancer Toxicity Data: 6.1—Oral/Dermal, 6.2—Inhalation, 6.3—Special Case Chemicals.
8	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 7.1 through 7.n for Reasonable Maximum Exposure (RME) and also for Central Tendency (CT) for Calculation of Non-Cancer Hazards, one worksheet table for each environmental medium and exposure medium.
9	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 8.1 through 8.n for RME and also for CT for Calculation of Cancer Risks, one worksheet table for each environmental medium and exposure medium.
10	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 9.1 RME and 9.1 CT for RME and also for CT, respectively, for Summary of Receptor Risks and Hazards for contaminants of potential concern (COPCs).
11	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 10.1 RME and 10.1 CT for RME and also for CT, respectively, for Risk Assessment Summary.

2.2 Test Cases

2.2.1 RAGS-D_01 (Dean's Creek Development Company)

2.2.1.1 Description and Rationale

This test case addresses the capability of the RAGS Viewer to allow the user to generate the RAGS Tables after running a FRAMES version of the Deans Creek Development Company example that is used by the EPA as seen when selecting Example Tables (.PDF) at: http://epa.gov/superfund/programs/risk/ragsd/tables.htm. Because this example is used by the EPA, it is instructive to apply a FRAMES model to it for comparison of FRAMES RAGS tables output against the

instructive to apply a FRAMES model to it for comparison of FRAMES RAGS tables output against the Example Tables (.PDF) at the above URL. This simple example does not use a source term, but has the user insert the chemical concentrations directly, thereby bypassing the source-term specification.

A graph of the FRAMES model for the Deans Creek Development Company example is shown in Figure 2.1.

		Т	Test Case Name (RAGS-D_xx)						
		01	02						
	1	Х	Х						
n t s	2	X	X						
e m e	3	X	Х						
uir	4	X	Х						
R e q	5	X	X	1					
	6	X	x			1			
	7	X	X						
	8	\mathbf{x}	X						
	9	\mathbf{x}	X			L			
	10	X	X						
	11	X	X						

 Table 2.2.
 Relationship Between Test Cases and RAGS Table Viewer Fundamental Requirements



Figure 2.1. FRAMES Model for Deans Creek Development Company Example Used by EPA to Demonstrate the Filling out of RAGS Tables

The requirements addressed are listed below.

1	The RAGS Viewer shall be activated at the user's request after running a FRAMES- based model by right-clicking on the Health Impacts module icon to popup a context menu, then moving the cursor over "View/Print Module Output" to popup a sub-menu of applicable viewers, and selecting "RAGS Table Generator for Chemicals."
2	The RAG8 Viewer shall save to disk in the EXCEL file a worksheet containing: Table 1—Selection of Exposure Pathways.
3	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 2.1 through 2.n—Occurrence, Distribution, and Selection of Chemicals of Potential Concern, one worksheet table for each environmental medium and exposure medium.

4 The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 3.1 through 3.n—Medium-Specific Exposure Point Concentration Summary, one worksheet table for each environmental medium and exposure medium.

5	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 4.1 through 4.n—Values Used for Daily Intake Calculations, one worksheet table for each environmental medium and exposure medium.
6	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Table 5—Non-Cancer Toxicity Data: 5.1—Oral/Dermal, 5.2—Inhalation, 5.3—Special Case Chemicals.
7	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Table 6—Cancer Toxicity Data: 6.1—Oral/Dermal, 6.2—Inhalation, 6.3—Special Case Chemicals.
8	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 7.1 through 7.n for RME and also for CT for Calculation of Non-Cancer Hazards, one worksheet table for each environmental medium and exposure medium.
9	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 8.1 through 8.n for RME and also for CT for Calculation of Cancer Risks, one worksheet table for each environmental medium and exposure medium.

- 10 The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 9.1 RME and 9.1 CT for RME and also for CT, respectively, for Summary of Receptor Risks and Hazards for COPCs.
- 11 The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 10.1 RME and 10.1 CT for RME and also for CT, respectively, for Risk Assessment Summary.

2.2.1.2 Input Data

This test case requires that you use the .GID file "Deans.gid" and the RAGS files: "RAGSgen.exe," "RAGS_templates.XLS," "RAGSgen.des," and "XIsChart.exe." All of these files should be located on the computer. All other input will be described in the procedure section below.

2.2.1.3 Expected Results

It is expected that the RAGS Viewer will execute without error and will meet all of the requirements listed in Section 2.2.1.1.

2.2.1.4 Procedure

Place the RAGS Viewer files, RAGSgen.exe, RAGS_templates.XLS, RAGSgen.des, and XlsChart.exe in your FRAMES folder if they are not already there. Then, either place the model file "Deans.gid" in this folder, or create the model by selecting icons from the left side of the screen, as shown in Figure 2.1 and linking or connecting them as shown in the Figure.

If you are not using the Deans.gid file, then, from the Example Tables (.PDF) at: <u>http://epa.gov/superfund/programs/risk/ragsd/tables.htm</u>, use their Table 2.1 to right-click on the Contaminants icon and enter the chemical names (second column from the left in their Table 2.1) for:

aluminum	3.20E+00	mg/L
arsenic	4.20E-08	mg/L
barium	1.73E-01	mg/L
beryllium	2.10E-09	mg/L
calcium ion	3.07E-05	mg/L
1,1-dichloroethylene	7.60E-02	mg/L
1,1,1,2- tetrachloroethene	5.60E-01	mg/L
vinyl chloride	5.00E-03	mg/L

Save and exit.

Input and enter cor

Next, right-click on the aquifer model icon, select "User Input," and enter concentrations (column labeled as "Concentration Used for Screening" in EPA Table 2.1). Note that EPA's Table 2.1 gives concentration units as ": g/L," and FRAMES requests units as "ng/L" so that the former (EPA's) will need to be divided by 1000 (as shown above) to enter concentration values for the latter into FRAMES.

Enter "time" as shown in Figure 2.2. Save and exit.

Usage Locat	on <<>>>	
Exposure		
Parent		
Aluminum	▼ Her: 0	
Time	Concentratio 🔺	
yr O	▼ mg/l ▼ 3200000	
70	3200000	
-		
-		

Figure 2.2. Input Display for Entering Chemical Concentrations

Now, right-click on the Exposure icon, "User Input," and on the Ground Water tab display, enter 24 yr for the Exposure Duration, and click on the boxes to the left of the labels "Other Ingestion - Shower water," "Dermal - Shower," "Inhalation - Air - Volatiles from water - Shower - Air." On the Exposure Controls tab display, set "Maximum time for reporting" as 70 yr, and "Number of time points for evaluation" as 24. Save and exit.

Next, right-click on the Receptor icon, "User Input,"specify body weight as 70 kg, Exposure Duration as 24 yr, Water dermal absorption model as "EPA Model," Ground Water ingestion rate as 2 L/d, Age of Receptor at start as 0.0, and Age of Receptor at end as 70 yr. Save and exit.

Then, right-click on the Human Health Impact icon, "User Input," and make sure that all of the boxes show an X in them and "Method for inhalation impact analysis has "Daily Intake" in it's drop down box. Save and exit.

At this point, all icons shown in Figure 2.1 should display a yellow light. On the command bar at the top of the screen, click on "GO." After execution of the model, all icons should show green lights.

To produce the RAGS Tables as the "Deans.rags.xls" file, right-click on the Human Health Impacts icon to pop-up a context menu. Then, move the cursor over "View/Print Module Output" to pop-up a sub-menu of applicable viewers, and select "RAGS Table Generator for Chemicals." Table displays will flash quickly in sequence on the screen as the RAGS Viewer software builds the output EXCEL file. When finished, it will have your display positioned inside of this output file, "Deans.rags.xls," having already saved a file copy to your working folder.

2.2.1.5 Results

- 1 The RAGS Viewer was activated at the user's request after running a FRAMES-based model by right-clicking on the Health Impacts module icon to popup a context menu, then moving the cursor over "View/Print Module Output" to popup a sub-menu of applicable viewers, and selecting "RAGS Table Generator for Chemicals."
- 2 The RAGS Viewer saved to disk in the EXCEL file worksheets for 18 Tables as listed in the following/Table, and including a worksheet containing Table 1—Selection of Exposure Pathways.
- 3 The **RAGS** Viewer saved to disk in the EXCEL file worksheets containing Tables 2.1 through 2.n—Occurrence, Distribution, and Selection of Chemicals of Potential Concern, one worksheet table for each environmental medium and exposure medium.
- 4 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 3.1 through 3.n—Medium-Specific Exposure Point Concentration Summary, one worksheet table for each environmental medium and exposure medium.
- 5 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 4.1 through 4.n—Values Used for Daily Intake Calculations, one worksheet table for each environmental medium and exposure medium.

- 6 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Table 5—Non-Cancer Toxicity Data: 5.1—Oral/Dermal, 5.2—Inhalation, 5.3—Special Case Chemicals.
- 7 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Table 6—Cancer Toxicity Data: 6.1—Oral/Dermal, 6.2—Inhalation, 6.3—Special Case Chemicals.
- 8 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 7.1 through 7.n for RME and also for CT for Calculation of Non-Cancer Hazards, one worksheet table for each environmental medium and exposure medium.
- 9 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 8.1 through 8.n for RME and also for CT for Calculation of Cancer Risks, one worksheet table for each environmental medium and exposure medium.
- 10 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 9.1 RME and 9.1 CT for RME and also for CT respectively, for Summary of Receptor Risks

_

		RAGS - D Tables' Produced for Deans.gid
BOLD indica	tes Table c	ontains data; Not Bold indicates Table contains no data
TABLE	1	SELECTION OF EXPOSURE PATHWAYS
TABLE	2.1	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Aquifer-Shower
TABLE	3.1	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Aquifer-Shower
TABLE	4.1	VALUES USED FOR DAILY INTAKE CALCULATIONS Aquifer-Shower
TABLE	5.1	NON-CANCER TOXICITY DATA ORAL/DERMAL
TABLE	5.2	NON-CANCER TOXICITY DATA INHALATION
TABLE	5.3	NON-CANCER TOXICITY DATA SPECIAL DASE CHEMICALS
TABLE	6.1	CANCER TOXICITY DATA ORAL/DERMAL
TABLE	6.2	CANCER TOXICITY DATA INHALATION
TABLE	6.3	CANCER TOXICITY DATA - SPECIAL CASE CHEMICALS
TABLE	7.1 RME	CALCULATION OF NON-CANCER HAZARDS Aquifer-Shower
TABLE	7.1 CT	CALCULATION OF NON-CANCER HAZARDS Aquifer-Shower
TABLE	8.1 RME	CALCULATION OF CANCER RISKS Aquifer-Shower
TABLE	8.1 CT	CALCULATION OF CANCER RISKS Aquifer-Shower
TABLE	9.1 RME	SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS
TABLE	9.1 CT	SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
TABLE	10.1 RME	RISK ASSESSMENT SUMMARY
TABLE	10.1 CT	RISK ASSESSMENT SUMMARY

and Hazards for COPCs.

11 The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 10.1 RME and 10.1 CT for RME and also for CT respectively, for Risk Assessment Summary.

2.2.2 RAGS-D_02 (Case1_gw)

2.2.2.1 Description and Rationale

This test case uses a FRAMES model that incorporates the definition of a source term, two vadose zones, the air, an aquifer, surface water, and groundwater as environmental media through which human receptors are exposed. This is a more complex set of exposure pathways than the previous simple model. The graphic model for this case is shown in Figure 2.3.



Figure 2.3. System Flow Chart for the FRAMES Model "Case1_gw"

The requirements addressed are listed below.

1	The RAGS Viewer shall be activated at the user's request after running a FRAMES- based model by right-clicking on the Health Impacts module icon to popup a context menu, then moving the cursor over "View/Print Module Output" to popup a sub-menu of applicable viewers, and selecting "RAGS Table Generator for Chemicals."
2	The RAGS Viewer shall save to disk in the EXCEL file a worksheet containing: Table 1—Selection of Exposure Pathways.
3	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 2.1 through 2.n—Occurrence, Distribution, and Selection of Chemicals of Potential Concern, one worksheet table for each environmental medium and exposure medium.
4	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Tables 3.1 through 3.n —Medium-Specific Exposure Point Concentration Summary, one worksheet table for each environmental medium and exposure medium.
5	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing: Tables 4.1 through 4.n—Values Used for Daily Intake Calculations, one worksheet table for each environmental medium and exposure medium.
6	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Table 5—Non-Cancer Toxicity Data: 5.1—Oral/Dermal, 5.2—Inhalation, 5.3—Special Case Chemicals.
7	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Table 6—Cancer Toxicity Data: 6.1—Oral/Dermal, 6.2—Inhalation, 6.3—Special Case Chemicals.
8	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Tables 7.1 through 7.n for RME and also for CT for Calculation of Non-Cancer Hazards, one worksheet table for each environmental medium and exposure medium.
9	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Tables 8.1 through 8 n for RME and also for CT for Calculation of Cancer Risks, one worksheet table for each environmental medium and exposure medium.
10	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Tables 9.1 RME and 9.1 CT for RME and also for CT, respectively, for Summary of Receptor Risks and Hazards for COPCs.
11	The RAGS Viewer shall save to disk in the EXCEL file worksheets containing Tables 10.1 RME and 10.1 CT for RME and also for CT, respectively, for Risk Assessment Summary.

2.2.2.2 Input Data

This test case requires that you use the .GID file "Case1_gw.gid" and the RAGS files: "RAGSgen.exe," "RAGS_templates.XLS," "RAGSgen.des," and "XlsChart.exe." All of these files should be located on the computer. All other input will be described in the procedure section below.

2.2.2.3 Expected Results

It is expected that the RAGS Viewer will execute without error and will meet all of the requirements listed in Section 2.2.2.1.

2.2.2.4 Procedure

Place the RAGS Viewer files, RAGSgen.exe, RAGS_templates XLS, RAGSgen.des, and XlsChart.exe in your FRAMES folder if they are not already there. Then, either place the model file "Case1_gw.gid" in this folder or create the model by selecting icons from the left side of the screen, as shown in Figure 2.3, and linking or connecting them as shown in the Figure.

Right-click on the Contaminants icon, then "User Input," and enter the chemical names for: Antimony, Strontium-90, and Trichforoethylene. Save and Exit. Right-click on the Source term icon, then "User Input," and enter the parameter values as shown in Figure 2.4.

Save and Exit.

Next, right-click on the Air icon, then "User Input," and enter for the Climatology tab, a Morning mixing height of 400. m, afternoon mixing height of 1400. m, Annual precipitation of 6.3 in, Precipitation days as 68, and Thunderstorms per year as 10. For Joint Frequency Distribution, enter 15.2 m for Anemometer height, and 45.5 cm Average roughness length. Wind joint frequency calms can be set or left as 0.0000. Wind speed midpoints for Group 1 through 6 should be set at 0.671, 2.46, 4.48, 6.94, 9.62, and 12.53 respectively. Under the Topographical Data tab, all regional surface roughness lengths can be set as 10.0. Save and Exit.

Right-click on the Vadose 1/icon, then "User Input," and enter the values shown in Figure 2.5.



Figure 2.4. Parameter settings for the Source Term in Case1_gw test case for RAGS

HEPAS Vadose Zone Hodule	- vad3			x	KEPAS Vadose Zone Hodule - wad3	
Elle detterne Options Holp			-		Ele Universe Options Help	
SolCorposition Characteristics	Constituent Parameters				Sol Composition Distance Constituent Per	anatara
						202
	Texture	2Sand 2	Silt %Clay	2	pH of the pare visiter - WP-PH	Tro eH Ret 0
Soll class - WP-DLASS	Sand	92	5 3 3	-	Total accessite - WP-TDTPOR	280 Bet 0
Percentage of sand - WP-SAND *	9	20 2	Ref 0		Field capacity . WP.FELDC	DO Bet 0
Percentage of sit - WPSET	E	0 1	Ret 0		(and party in the cost	190 Iperced with the o
Parcentage of clay - WP-ELAY*	1	0 2	Ref. 0		Saturated hydraulic conductivity - WP-CONDUC	570.24 on/dev - Ret 0
Percentage of organic matter - WF	RUMC IN	0 %	Ret 0		Thickness of this layer - WP-THICK	70 H Ret 0
Percentage of itom and alumnum	WFURDN '	0 3	Het 0		Longitudinal deperavely - WP-LDISP	007 0 × Ret 0
Sol top coefficient - WP-SDLCD	EF 17	05	Flet 0		Daybulk denoty - WP-BULKD	154 a(m ⁻¹) w But 0
and the second second second	- P	No.				Town Dates Th
*The percent of cand, all, clay, or	ganic matter, and iron m	ust add up to 100	<u>64</u>			
				1		
MEPAS Vadose Zone Module	- vad3				MEPAS Vadose Zone Hodule - vad3	
Elle Belarence Options Halp		10 C			File Reference Options Help	- 1
Sol Composition Characteristics	Constituent Parameters				Soil Composition] Characteristics Construent Par	oneters
					E	
Constituent - FS-CNAME	22 33 Cond	tituent Parameter S	Selection		Constituent - FG-CHAME 22 33	Constituent Parameter Selection
Artimory	- 4	ubarplian Coefficie	ent - WA-SUBKD }		STRONTIUM SO	Advorption Coefficient - WA-SUBKD -
Estimate de La Unit	Estante 1	ni/g	· Ret 0	1.11	Estimate 64	24.3 nl/g * Ret 0
- COMMERCE - COM	[mild				243 ml/g
			8) 		1	
					Progery - FS-DNAME (C 3)	Progeny Perameter Selection
					TTRUM-90	Adaaption Coefficient - WA-SUBKD 💌
					Estimate Al Use Estructe 1	10 mL/p 💌 Ret 0
						229 mil/g
				î n		
				<u> </u>	Va	lue must be creater than or equal to 0
		MERAC	Total Total			
		File Relate	rice Options H	sin		
		SolCorpo	ation Deserted	tics Constituent Pa	aranetes]	
			and a subsection			
		a second	20122/025	a second	Cardana Dana da Balaria	
		ConoMin	ent · FS-CHAME	22. 33	Concuent Parateter Selection	
		Trichk	ovoethylene	1	Adsorption Coefficient - WA/SUBKD 💌	
	1 1	Esta	nala Al	Une Extender	0.107 ni/g Met 0	
					0.106296 ml/g	
	l í					
		-				

Figure 2.5. Parameter settings for the Vadose1 in Case1_gw test case for RAGS

Save and Exit.

Right-click on the Vadose 2 icon, then "User Input," and enter the settings shown in Figure 2.6.

HEPAS Vadose Zone Module - vad8	MEPAS Vadose Zone Module - vad8	
Ele Concerne Optione Help	Ele Concerco Options Help	
Sol Composition Characteristics Constituent Parameters	Sol Composition Overacteristics Constituent Parameters	
Texture XSand XSilt XClay Set class - WP-DLASS Find 92 5 3 * Percentage of set 0-WP-SAND * 91.2 % Field 9 5 3 * Percentage of sit - WP-SILT * 6.3 % Ref. 0 *	pH of the pois water - WP-PH [25 pH Total porceity - WP-TOTPDR [38,0 perceit Reld capacity - WP-FIELDC [30 perceit Saturated hydroulic conductivity - WP-CDNDUC [570.24 perceit	Ret0 ent ¥ Ret0 ent ¥ Ret0
Percentage of organic matter - WP.OMC * 0.0 % Ref: 0	Thickness of Prislayer - WP-THICK 15.2 cm	Ref: 0
Percentage of iron and aluminum - WP4RDN * 0.0 3 Ref. 0	Longitudinal dependently - WP-LDISP 0.0 cm	Ret:0
Soil type coefficient - WP-SOILCOEF 40 Ref: 0	Dy buk densty - WP 800KD 164 a/or	Ci F Ret 0
* The percent of sand, sit, clay, organic matter, and iron must add up to 100%		_
The percent of sand, sit, clay, organic matter and iron must add up to 100%]	
MEPAS Vadase Zone Module - vad8	MEPAS Vadose Zone Module - vad8	
Ele Beference Options Help	Ele Beference Options Help	
Sol Composition Cheracteristics Constituent Parameters	Sol Composition Characteristics Constituent Parameters	
Constituent - FS-CNAME <<<>>> Constituent Parameter Selection Ardinary Image: Advantation of the selection Advantation of the selection Estimate AI Use Estimate Image: Mage: Advantation of the selection 2 mMg	Constituent - FS-ENAME <u><< >></u> STRUNTIUM-90 Estimate AI Use Estimate 24.3 mV/2	Selection w/l - W/A-SUBKD X Ref: 0 o
	Progeny - FS-CNAME <u>KC 335</u> Progeny Parameter Sel VTTRUM-90 Parameter Sel Estimate Al Use Estimate 10 m/g 220 m/d	ection ent - WA-SUBKD T Ref: 0 g
Select a constituent		
HEPAS Vadase Zone Module - vad8 Ele Beterne Options Help Sol Composition Characteristics Constituent	Parameters	
Constituent - FS CNAME (()) Trichlande Figlene () Estimate All Use Estimate	Constituent Parameter Selection Adsorption Coefficient - WA-SUBKD I 0.1 0.1004976 mJ/g Ref. 0 0.1004976 mJ/g	

Figure 2.6. Parameter Settings for the Vadose2 in Case1_gw test Case for RAGS Save and Exit.

Right-click on the Aquifer icon, then "User Input," and enter the settings shown in Figure 2.7.

HEPAS Vadose Zone Module - vad8	MEPAS Vadose Zene Module - vad8	
Ele dimense Options Help	File deterring Options Help	
Sol Composition Characteristics Constituent Parameters	Sol Composition Obstacteristics Constituent Para	neters
Texture 2Send 2Silt 2Clay Soldes-WPELASS Sond 92 5 3 •	pH of the pole water - WP-FH	R5 pH Ret 0
Payrantana ol yand JWP/SAMD X	Total perceity - WP-TOTPOR	38.0 percent 💌 Ret 0
Development of the Development o	Field capacity - WP-FIELDC	9.0 parcant 💌 Rel: 0
Percentage of all (WPSIL) 6,3 A Not. 0	Categoria di successi da successi da CONDUC	
Percentage of cap - who can a met of 25 a	The lase of the lase is 10 TUDE	5/0.24 cm/day There
Percentage of organic manary were unc."	Therease of the layer - WF-THICS.	15.2 cm Y Hat 0
Percentage of iron and automotive WP-IRON * 00 % Ret 0	Long Monal depensivity - WP-LDISP	00 cn 💌 Het 0
Softype coefficient - WP-SOILCEEF 40 Ref: 0	Dy buk densty - WP-80000	1.64 g/cm^3 • Het:0
*The pescent of sand, sit, day, organic matter, and iron must add up to 100%		
The percent of sand, sit, day, organic matter and iron must add up to 100%		
MEPAS Vadase Zone Module - vad8	HEPAS Vadose Zone Module - vad8	
Fie Betweene Uptions Help	File Helenence Upbane Help	
Sol Composition Characteristics Constituent Parameters	Sol Composition Characteristics Constituent Para	nekers
Constituent - P5-CNAME <<>>> Constituent Parameter Solection Advanption Coefficient - WA-SUBKD	Constituent - FS-CNAME 🔍 🖂	Constituent Parameter Solection
Estimate Al Use Estimate 0 mV/g 💌 Rel: 0	Estimate AI Use Estimate	24 mVg ▼ Rel:0 24.3 mVg
	Progeny - FS-CNAME KE 30	Progeny Parameter Selection
	YTTRUM-90	Adsorption Coefficient - WA-SUBKD 💌
	Edinate Al Use Estimate	10 ml/g 💌 Ref: 0
		220 ml/g
J		
Select a constituent		
HEPAS Vadose Zone Module - vad8		
Ele Beference Options Help		
Soil Composition Characteristics Constituent Pa	raneleis	
Continent -ES CNAME (())	Constituent Parameter Selection	
Tachizoetalene	Adversion Coefficient - WA-SUBKD	
	01 mVo v Rel.0	
Esserence Ore contrate	0.1004976 mk/g	
	the second s	

Figure 2.7. Parameter settings for the Aquifer in Case1_gw test case for RAGS

Save and Exit.

Right-click on the Surface Water (River module) icon, then "User Input," and enter Flow velocity at 10.0 mi/yr, Depth... at 10.0 ft, and Width at 100.0 ft. Then specify Distance from source... as 100.0 ft, and Average annual discharge... as 10022.4 cm³/s. Save and Exit.

Right-click on the Chronic Exposure icon (Groundwater_Well), then "User Input." Under the Ground Water tab, enter an Exposure Duration of 20 yr, and click an X in the boxes to the left of Plant Production Ingestion—Leafy vegetables and Other vegetables; do the same for Other Ingestion—Drinking water, and Shower water. Also, click the box to show an X for Dermal—Shower, and a darkened center for the small circle to the left of Indoor—Air.

Under the Surface Water tab, again specify 20.0 yr for Exposure duration. Click an X in the boxes to the left of: Plant Production Ingestion—Leafy vegetables, and Other vegetables; do the same for Other Ingestion—Drinking water, Shower water, and Swimming water. Also, click the boxes to show an X for Dermal—Swimming, and External—Shoreline, and a darkened center for the small circle to the left of Indoor—Air.

Under the Atmospheric tab, again specify 20.0 yr as the Exposure duration. Click an X in the boxes to the left of: Plant Production Ingestion—Leafy vegetables, and Other vegetables; do the same for Other Pathways—Soil—Ingestion, Soil—Inhalation, Soil—Dermal, Soil—External, Air—External, and Air Inhalation.

Under the Exposure Controls tab, enter 0.0 yr for Time to start..., 1000.0 yr for Maximum time..., and 20 for Number of time points....

Under the Leach Rate tab, enter 1.0 for 1/yr for each of the chemicals by stepping down through with the down arrow to the right of the chemical name. Save and Exit.

Right-click on the Receptor Intake icon, and then "User Input," and enter Body weight as 70.0 kg, Exposure duration as 30.0 yr, Ground water ingestion... as 2.0 L/d, Surface water ingestion... as 2.0 L/d, Age...at start as 0.0 yr, and Age...at end as 70.0 yr. Save and Exit.

Right-click on the Health Impacts icon and then "User Input," and be sure that all boxes are checked with an X under the Chemical tab, and also under the Radionuclide tab. Thickness of contaminated soil can be set at 0.04 m, and Density... set at 1.5 g/cm³. Save and Exit.

At this point, all icons shown in Figure 2.3 should display a yellow light. On the command bar at the top of the screen, click on "GO." After execution of the model, all icons should show green lights.

To produce the RAGS Tables as the "CASE1_GW.rags.xls" file, right-click on the Human Health Impacts icon to pop-up a context menu. Then, move the cursor over "View/Print Module Output" to popup a sub-menu of applicable viewers and select "RAGS Table Generator for Chemicals." Table displays will flash quickly in sequence on the screen as the RAGS Viewer software builds the output EXCEL file. When finished, it will have your display positioned inside of this output file, "CASE1_GW.rags.xls," having already saved a file copy to your working folder.

2.2.1.5 Results

1	The RAGS Viewer was activated at the user's request after running a FRAMES-based model by right-clicking on the Health Impacts module icon to popup a context menu, then moving the cursor over "View/Print Module Output" to popup a sub-menu of applicable viewers, and selecting "RAGS Table Generator for Chemicals."
2	The RAGS-D Viewer saved to disk in the EXCEL file worksheets for 151 Tables as listed in the following Table, and including Table 1—Selection of Exposure Pathways.
3	The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 2.1 through 2.n—Occurrence, Distribution, and Selection of Chemicals of Potential Concern, one worksheet table for each environmental medium and exposure medium.
4	The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 3.1 through 3.n—Medium-Specific Exposure Point Concentration Summary, one worksheet table for each environmental medium and exposure medium.
5	The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 4.1 through 4.n—Values Used for Daily Intake Calculations, one worksheet table for each environmental medium and exposure medium.
6	The RAGS Viewer saved to/disk in the EXCEL file worksheets containing Table 5— Non-Cancer Toxicity Data, 5.1—Oral/Dermal, 5.2—Inhalation, 5.3—Special Case Chemicals.
7	The RAGS Viewer saved to disk in the EXCEL file worksheets containing Table 6—Cancer Toxicity Data: 6.1—Oral/Dermal, 6.2—Inhalation, 6.3—Special Case Chemicals.
8	The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 7.1 through 7 n for RME and also for CT for Calculation of Non-Cancer Hazards, one worksheet table for each environmental medium and exposure medium.
9	The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 8.1 through 8.n for RME and also for CT for Calculation of Cancer Risks, one worksheet table for each environmental medium and exposure medium.
10	The RAGS Viewer saved to disk in the EXCEL file worksheets containing Tables 9.1 RME and 9.1 CT for RME and also for CT, respectively, for Summary of Receptor Risks and Hazards for COPCs.
11	The RAGS Viewer saved to disk in the EXCEL file worksheets containing: Tables 10.1 RME and 10.1 CT for RME and also for CT, respectively, for Risk Assessment Summary.

RAGS - D Tables Produced for Case1_gw.gid

BOLD indicates Table contains data; Not Bold indicates Table contains no data

TABLE	1	SELECTION OF EXPOSURE PATHWAYS
TABLE	21	OCCURRENCE DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Aquifer-Water
TABLE	22	OCCURRENCE DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Aquifer-Shower (dermal)
TABLE	2.3	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Aquifer-Shower (ingestion)
TABLE	2.0	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Aquifer Leafy (Agetables
TABLE	2.5	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Aquifer-Other Vegetables
TABLE	2.6	OCCURRENCE DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air- Leafy Vegetables
TABLE	2.7	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air- Other Vegetables
TABLE	2.8	OCCURRENCE DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air - Soil (ingestion)
TABLE	2.9	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air - Soil (dermal)
TABLE	2.10	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air - Air (inhalation)
TABLE	2.11	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air - Soil (inhalation)
TABLE	2.12	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air - Soil (external)
TABLE	2.13	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Air - Air (external)
TABLE	2.14	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Surface water - Water
TABLE	2.15	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Surface water - Shower
TABLE	2.16	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Surface water - Leafy Vegetables
TABLE	2.17	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Surface water - Other Vegetables
TABLE	2.18	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Surface water - Swimming (ingestion)
TABLE	2.19	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMIQALS OF POTENTIAL CONCERN Surface water - Swimming (dermal)
TABLE	2.20	OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN Surface water - Shoreline
TABLE	3.1	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Aquifer-Water
TABLE	3.2	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY A Aquifer-Shower (dermal)
TABLE	3.3	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Aguiter Shower (indextion)
TABLE	3.4	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Aquifer-Leary Vegetables
TABLE	3.5	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Aquifer-Other Vegetables
TABLE	3.6	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
TABLE	3.7	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Air- Other Vegetables
TABLE	3.8	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Air - Soil (ingestion)
TABLE	3.9	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Air - Soil (dermal)
TABLE	3.10	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Air - Air (inhalation)
TABLE	3.11	MEDIUM-SPĘCIFIC EXPOSURE POINT CONCENTRATION SUMMARY Air - Soil (inhalation)
TABLE	3.12	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Air - Soil (external)
TABLE	3.13	MEDIUM-SPECIFIC EXPOSURE POINT/CONCENTRATION SUMMARY Air - Air (external)
TABLE	3.14	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Surface water - Water
TABLE	3.15	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Surface water - Shower
TABLE	3.16	MEDIUM-SPEGIFIC EXPOSURE POINT CONCENTRATION SUMMARY Surface water - Leafy Vegetables
TABLE	3.17	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Surface water - Other Vegetables
TABLE	3.18	MEDIUM-SPECIFIC EXPOSURE POIN CONCENTIA ION SUMMARY Surface water - Swimming (ingestion)
TABLE	3.19	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Surface water - Swimming (dermal)
TABLE	3.20	MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY Surface water - Shoreline
TABLE	4.1	VALUES USED FOR PALLY INTAKE CALCULATIONS Aquifer-Water
TABLE	4.2	VALUES USED FOR DAILY INTAKE CALCULATIONS Aquifer-Shower (dermal)
TABLE	4.3	VALUES USED FOR DAILY INTAKE CALCULATIONS Aquifer-Shower (ingestion)
TABLE	4.4	VALUES USED/FOR/DALY INTAKE CALCULATIONS Aquifer-Leafy Vegetables
TABLE	4.5	VALUES USED FOR DAILY INTAKE CALCULATIONS Aquifer-Other Vegetables
TABLE	4.6	VALUES USED FOR DAILY INTAKE CALCULATIONS Air- Leafy Vegetables
TABLE	4.7	VALUES USED FOR DAILY INTAKE CALCULATIONS Air- Other Vegetables
TABLE	4.8	VALUES USED FOR DAILY INTAKE CALCULATIONS Air - Soil (ingestion)
TABLE	4.9	VALUES USED FOR DAILY INTAKE CALCULATIONS Air - Soil (dermal)
TABLE	4.10	VALUES USED FOR DAILY INTAKE CALCULATIONS AIR - Air (inhalation)
TABLE	4.11	VALUES USED FOR DAILY INTAKE CALCULATIONS AIR - Soil (inhalation)
TABLE	4.12	VALUES USED FOR DAILY INTAKE CALCULATIONS AIR - Soil (external)
TABLE	4.13	VALUES USED FOR DAILY INTAKE CALCULATIONS AIF AIT (external)
TABLE	4.14	VALUES USED FOR DAILT INTARE CALCULATIONS SUITACE WATER - WATER
TADLE	4.10	VALUES USED FOR DAIL I INTARE CALCULATIONS Suitable water - Shower
TADLE	4.10	VALUES USED FOR DAIL I INTARE CALCULATIONS Surface water - Leary Vegetables
TABLE	4.17	VALUES USED FOR DAIL I INTARE CALCULATIONS Surface water - Utiler vegetables
TABLE	4.10	VALUES USED FOR DAILY INTAKE GALOGEATIONS Surface water - Swimming (ingestion)
TABLE	4.20	VALUES USED FOR DAILY INTAKE CALCULATIONS Surface water - Shoreline
	51	NON-CANCER TOXICITY DATA ORAL/DERMAL
TABLE	5 2	
TABLE	5.3	NON-CANCER TOXICITY DATA SPECIAL CASE CHEMICALS
	2.0	

TABLE	6.1	CANCER TOXICITY DATA ORAL/DERMA	L
TABLE	6.2	CANCER TOXICITY DATA INHALATION	
TABLE	6.3	CANCER TOXICITY DATA SPECIAL CASE	CHEMICALS
TABLE	7.1 RME	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Water
TABLE	7.2 RME	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Shower (dermal)
TABLE	7.3 RME	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Shower (ingestion)
TABLE	7.4 RME	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Leafy Vegetables
TABLE	7.5 RME	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Other Vegetables
TABLE	7.6 RME	CALCULATION OF NON-CANCER HAZARD	S Air- Leafy Vegetables
TABLE	7.7 RME	CALCULATION OF NON-CANCER HAZARD	S Air- Other Vegetables
TABLE	7.8 RME	CALCULATION OF NON-CANCER HAZARD	S Air - Soil (ingestion)
TABLE	7.9 RME	CALCULATION OF NON-CANCER HAZARD	S Air - Soil (dermal)
	710 RMF	CALCULATION OF NON-CANCER HAZARD	S Air - Air (inhalation)
	711 RME	CALCULATION OF NON-CANCER HAZARD	S Air - Soil (inhalation)
	712 RMF	CALCULATION OF NON-CANCER HAZARD	S Air - Soil (external)
	713 RME	CALCULATION OF NON-CANCER HAZARD	S Air - Air (external)
	7.13 RME		S Surface water - Water
	7.14 RME	CALCULATION OF NON-CANCER HAZARD	S Surface water - Shower
	7.15 RME		S Surface water Lasfy Vagetables
TABLE	7.10 RIVIE	CALCULATION OF NON-CANCER HAZARD	S Surface water - Leary Vegetables
	7.17 KWE	CALCULATION OF NON-CANCER HAZARD	S Surface water - Other vegetables
TABLE	7.10 RIVIE	CALCULATION OF NON-CANCER HAZARD	S Surface water - Swimming (ingestion)
TABLE	7.19 RME 7.20 RME	CALCULATION OF NON-CANCER HAZARD	S Surface water - Swimming (dermai) S Surface water - Shoreline
TABLE	7 1 CT	CALCULATION OF NON-CANCER HAZARD	8 Aquifer-Water
	7 2 CT	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Shower (dermal)
	7 3 CT	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Shower (ingestion)
	7 4 CT	CALCULATION OF NON-CANCER HAZARD	S Aquifer-Leafy Vegetables
	7.5 CT	CALCULATION OF NON-CANGER HAZARD	S Aquifer-Other Vegetables
	7.6 CT	CALCULATION OF NON-CANCER HAZARD	S Air- Leafy Vegetables
	7 7 CT	CALCULATION OF NON-CANCER HAZARD	S Air- Other Vegetables
	7 8 CT	CALCULATION OF NON-CANCER HAZARD	S Air - Soil (ingestion)
	7 9 CT	CALCULATION OF NON-CANCER HAZARD	S Air - Soil (dermal)
TABLE	7.1 CT	CALCULATION OF NON-CANCER HAZARD	S Air - Air (inhalation)
TABLE	7.11 CT	CALCULATION OF NON-CANCER HAZARD	S Air - Soil (inhalation)
TABLE	7.12 CT	CALCULATION OF NON-CANCER HAZARD	8 Air - Soil (external)
TABLE	7.13 CT	CALCULATION OF NON-CANCER HAZARD	S Air - Air (external)
TABLE	7.14 CT	CALCULATION OF NON-CANCER HAZARD	S Surface water - Water
TABLE	7.15 CT	CALCULATION OF NON-CANCER HAZARD	Surface water - Shower
TABLE	7.16 CT	CALCULATION OF NON-CANCER HAZARD	Surface water - Leafy Vegetables
TABLE	7.17 CT	CALCULATION OF NON-CANCER HAZARD	S Surface water - Other Vegetables
TABLE	7.18 CT	CALCULATION OF NON-CANCER HAZARD	S Surface water - Swimming (ingestion)
TABLE	7.19 CT	CALCULATION OF NON-CANCER HAZARD	S Surface water - Swimming (dermal)
TABLE	7.20 CT	CALCULATION OF NON-CANCER HAZARD	S Surface water - Shoreline
TABLE	8.1 RME	CALCULATION OF CANCER RISKS	Aquifer-Water
TABLE	8.2 RME	CALCULATION OF CANCER RISKS	Aquifer-Shower (dermal)
TABLE	8.3 RME	CALCULATION OF CANCER RISKS	Aquifer-Shower (ingestion)
TABLE	8.4 RME	CALCULATION OF CANCER RISKS	Aquifer-Leafy Vegetables
TABLE	8.5 RME	CALCULATION OF CANCER RISKS	Aquifer-Other Vegetables
TABLE	8.6 RME	CALCULATION OF CANCER RISKS	Air- Leafy Vegetables
TABLE	8.7 RME	CALCULATION OF CANCER RISKS	Air- Other Vegetables
TABLE	8.8 RME	CALCULATION OF CANCER RISKS	Air - Soil (ingestion)
TABLE	8.9 RME	CALCULATION OF CANCER RISKS	Air - Soil (dermal)
TABLE	8.10 RME	CALCULATION OF CANCER RISKS	Air - Air (inhalation)
TABLE	8.11 RME	CALCULATION OF CANCER RISKS	Air - Soil (inhalation)
TABLE	8.12 RME	CALCULATION OF CANCER RISKS	Air - Soil (external)
TABLE	8.13 RME	CALCULATION OF CANCER RISKS	Air - Air (external)
TABLE	8.14 RME	CALCULATION OF CANCER RISKS	Surface water - Water
TABLE	8.15 RME	CALCULATION OF CANCER RISKS	Surface water - Shower
TABLE	8.16 RME	CALCULATION OF CANCER RISKS	Surface water - Leafy Vegetables
TABLE	8.17 RME	CALCULATION OF CANCER RISKS	Surface water - Other Vegetables
TABLE	8.18 RME	CALCULATION OF CANCER RISKS	Surface water - Swimming (ingestion)
TABLE	8.19 RME	CALCULATION OF CANCER RISKS	Surface water - Swimming (dermal)
TABLE	8.20 RME	CALCULATION OF CANCER RISKS	Surface water - Shoreline

CALCULATION OF CANCER RISKS CALCULATION OF CANCER RISKS	Aquifer-Water Aquifer-Shower (dermal) Aquifer-Shower (ingestion) Aquifer-Leafy Vegetables Air-Leafy Vegetables Air- Leafy Vegetables Air- Other Vegetables Air - Soil (ingestion) Air - Soil (dermal) Air - Soil (dermal) Air - Air (inhalation) Air - Soil (external) Air - Air (external) Air - Air (external) Surface water - Water Surface water - Shower Surface water - Shower Surface water - Swimming (ingestion) Surface water - Swimming (dermal) Surface water - Shoreline
SUMMARY OF RECEPTOR RISKS AND HASUMMARY OF RECEPTOR RISKS AND HARRING RISK ASSESSMENT SUMMARY RISK ASSESSMENT SUMMARY	AZARDS FOR COPCS
	CALCULATION OF CANCER RISKS CALCULATION OF CANCER RISKS



Input Data

Open the Multimedia Framework (fui.exe). Select New from the File menu. Enter a file name and select Open. Enter a site name and select Ok.

Double click on the Contaminant icon. Left click and hold the mouse button to drag the icon on the main screen to the desired location. Repeat this operation to place the following icons into the workspace:

"Contaminants"
 "Aquifers"
 "Exposure Pathways"
 "Receptor Intakes"
 "Human Health Impacts"

Connect the Contaminant icon and Aquifer icon together by holding down SHIFT, clicking on the Contaminant Icon, dragging the cursor to the Aquifer icon, and releasing the mouse button (Note: To remove this line, repeat the steps used to connect it. To remove an icon from the screen, right click and select "Delete," and the icon will be removed).

In the same fashion, connect the following pairs of icons:

Contaminants û Aquifer (already done) Û Exposure Pathways *Contaminants* û û û Receptor Intake *Contaminants* Human Health Impacts *Contaminants* Exposure Pathways Aquifer Receptor Intake Exposure Pathways Ŵ û Receptor Intake Human Health Impacts

FRAMES should now be arranged on the screen like Figure 1.



Contaminant Database Module

Right click the Contaminant icon and choose General Info. When the General Info screen opens, enter "Contaminants" in the Label text box and select "FRAMES Default Chemical Database Selection" in the "Select from applicable models" text box. Click OK at the bottom of the screen to return to the work area. The signal light attached to the contaminant icon will change from black into red. Right click on the contaminant icon in the main screen and select User Input. The Contaminant Selection screen will open. Select "All Contaminants" from the "Possible Contaminants" dropdown box. The contaminants used in this case are: "1,1 dicloroethylene," "1,1,1,2-Tetrachloroethane," "Aluminum," "Arsenic," "Barium," "Beryllium," "Calcium Ion," and "Vinyl chloride." Scroll to select the contaminants from the contaminant list or use the Find option to search for them (see figure 2). Click "OK" to return to the work screen. Then click File, "Exit-Save Changes" and the Contaminant's icon status light will change from red to green.

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Figure A.2. Contaminant Selection Screen

Following is a listing of all data input required by the remaining modules used in this case. *Names of module icons* are in bold Italics. *Menu items* (displayed by right clicking on the icon) are shown below and indented to the right the icon names. *Explanations* of data required by each menu item are indented further to the right.

Aquifer

General Info

A window titled "Object General Information" will appear. In the Label text box put in "Aquifer_1_to _tap_water." In "Select from Applicable Models," choose "FRAMES known Aquifer Module" and click "Ok." The traffic light next to the Source Term icon should turn red.

User Input

A window titled "FRAMES Known Aquifer Concentration/Flux Module" will appear. Below "*Parent*" ensure that all the contaminants entered from before are present: "1,1 dicloroethylene, "1,1,1,2-Tetrachloroethane," "Aluminum," "Arsenic," "Barium," "Beryllium," "Calcium Ion," and "Vinyl chloride."

Time	Concentration
yr	mg/l
0	7.60E-02
70	7.60E-02

Scroll down and click on "1,1 dicloroethylene" and enter the following data from the spreadsheet into the table at the bottom of the window.

Click on "1,1,1,2-Tetrachloroethane," and repeat the process using this set of data: \square

Time	Concentration		
yr	mg/l		
0	5.60E-01		
70	5.60E-01		

Click on "Aluminum," and repeat the process using this set of data:

	Time	Concentra	tion
\frown	yr yr	mg/l	
	0	3.20E+0	00
\bigcap	70	3.20E+0	00

Click on "Arsenic," and	repeat the process using	this set of data:
	Time	Concentration
	yr	mg/l
	0	4.20E-08
	70	4.20E-08

Time	Concentration
yr	mg/l
0	1.73E-01
70	1.73E-01

Click on "Barium," and repeat the process using this set of data:

Click on "Beryllium," and repeat the process using this set of data:

Time	Concentration
yr	mg/l
0	2.10E-09
70	2.10E-09

Click on "Calcium Ion," and repeat the process using this set of data

-					
	Time		Con	centra	tion
	yr			mg/l	
	0		3	.07E-0	5
\cap	70		3	.07E-0	5
		5			

Click on "Vinyl chloride." and repeat the process using this set of data:

Time	Concentration
yr	mg/l
0	5.00E-03
70	5.00E-03

Click "File $\hat{\mathbf{U}}$ Save and Exit." The traffic light next to the Aquifer icon should turn yellow.

Run Model

A DOS batch file will execute in a command prompt window, completing the operation. The traffic light next to the Aquifer icon should turn green.

View/Print Module Output

A second menu will appear, select the "WCF Text View." The view should output a screen like Figure A.3.

😹 Viewing File (C:\FFIAMES\Deans2 wcf) Section (aqu2)	_ 🗖 🗙
Punt	
FIR: CAERAMER-Duran 2 m C	
Fle Contents Module Description	
	_
" File LLNFRAMESNDEB1%2.AC" * Section Gau2	
* Date: 10/17/01 3:17:55 PM	
1	
agu2 has known Aguiler concentration values "	
exp5", 'Aquiler",0	
1,1 dchcroethylene1,75354111/11/g/m112,0	
7.00E+01,7.60E+08	
11,1,1,2-TetracHorpethane", '630206''' 'y''' g/m",2,0	
0.00L+00,5.00L-07 7.00E+01.5.60E-07	
"Alumnum";"7429905";"yr","g/m",2,0	
0.00E+00.3.20E-06 7.00E≠01.3.20E-06	
'Arsenic', "7440002", 'yr', 'g/ml',2,0	
0.00E+00,4.20E-08	
"Bati m","7440393"," yt", "g/ml",2,0	
0.00E+00,1.73E-07	
1 Bervlium", "7440417", 'vr', 'a/ml' 2.0	
U.UUE +UU, 2.1UE-U9	
Calcium Ion', "7440702","vr ' ''p/ml' 2.0	

Figure A.3. View screen for Aquifer_1_to_tap_water

Exposure Pathways

General Info

A window titled "Object General Information" will appear. In the Label text box put in "Exposure." In "Select from Applicable Models," choose "MEPAS 4.1 Chronic Exposure Module" and click "Ok." The traffic light next to the Exposure icon should turn red.

User Input

A window titled "MEPAS Chronic Exposure Module" will appear. Click the "Exposure Controls" and ensure that the following are true:

- Time to start exposure computation -EC-TEXPOS = 0 yr
- Maximum time for reporting EC MAXTIM = 70 yr
- Number of time points for evaluation EC NTIMES = 1

Click "Ground Water" and ensure that the following are true:

• Exposure duration - EG - DGWED = 24yr

Under Exposure duration click "Pathways" and ensure that the following are true:

- Under the heading "Other Ingestion" make sure "Shower water" is selected.
- Under the heading "Dermal" make sure "Shower" is selected.
- Under the heading "Inhalation" make sure "Air Volatiles water" and "Shower Air" is selected.

Click "File $\hat{\mathbf{U}}$ Save and Exit." The traffic light next to the Exposure icon should turn yellow.

Run Model

A DOS batch file will execute in a command prompt window, completing the operation. The traffic light next to the Exposure icon should turn green.

View/Print Module Output

A second menu will appear, select the "EPF Text View." The view should output a screen like Figure A.4a.

Receptor Intake

General Info.

A window titled "Object General Information" will appear. In the Label text box put in "Receptors." In "Select from Applicable Models," choose "MEPAS 4.1 Intake Module" and click "Ok." The traffic light next to the Receptor Intake icon should turn red.

User Input

А

W	indow	titled "MEPAS Intake Module" will appear, ensure that the following are	true:
	•	Body weight of individual / IC-BODYWT	= 70 kg
	•	Exposure duration – IC-EXPDUR = 24 y	r
	•	Water dermal absorption model – IC-DERM, = "EPA Model" in drop	2
		down box	
	•	Ground water ingestion rate – IG-UDWGW	= 2 L/d
	•	Age of receptor at start of exposure – IC-TAGE1	= 0 yr
	•	Age of receptor at end of exposure – IC -TAGE2	= 70 yr
	•	Method for inhalation impact analysis – HE-INHAL, = "Daily Intake"	' in
		drop down box	
	/		

Click "File $\hat{\mathbf{U}}$ Save and Exit." The traffic light next to the Receptor Intake icon should turn yellow.

Run Model

A DOS batch file will execute in a command prompt window, completing the operation. The traffic light next to the Receptor Intake icon should turn green.

View/Print Module Output

A second menu will appear, select the "RIF Text View." The view should output a screen like Figure A.4b.

Health Impacts

General Info

A window titled "Object General Information" will appear. In the Label text box put in "Human_Health_Impacts." In "Select from Applicable Models," choose "MEPAS 4.1 Human Health Impact Module" and click "Ok." The traffic light next to the Health Impacts icon should turn red.

User Input

A window titled "MEPAS Human Health Impact Module" should appear. Click the "Chemical" tab and ensure that the following conditions are true:

- "Calculate lifetime cancer incidence CHEMRISK" is checked
- "Calculate hazard index CHEMHI" is checked
- "Hazard quotient threshold limit \mathbf{RFDLIM} " = 0
- "Method for inhalation impact analysis HE INHAL" = "Daily Intake" in a drop down box

Click the "Radionuclide" tab and ensure that the following conditions are true:

- "Calculate lifetime cancer incidence _HE-INC" is checked.
- Conversion factor HE-CONINC = 0.06 risk/Sv "Calculate cancer fatalities – HE-FAT" is checked.
- Conversion factor HE-CONFAT = 0.05 risk/Sv
- "Calculate lifetime cancer and severe hereditary effects HE-FSH" is checked.
 - Conversion factor –HE-CONFSH = 0.073 risk/Sv
- "Calculate radiation dose commitment (CEDE) –HE-CEDE" is checked.
- "Thickness of contaminated soil/sediment layer TSOIL = 0.04 m
 - "Density of contaminated soil/sediment layer DSOIL = 1.5 g/cm^3

Click "File û \$ave and Exit." The traffic light next to the Health Impacts icon should turn yellow.

Run Model

A DOS batch file will execute in a command prompt window, completing the operation. The traffic light next to the Health Impacts icon should turn green.

View/Print Module Output

A second menu will appear, select the "HIF Text View." The view should output a screen like Figure A.4c.

Expected Results

Viewer outputs should look like the three viewers of Figure 4.



Figure A.4a. Viewer for Exposure Pathways

Figure A.4b. Viewer for Receptor Intake

