

# TRANSPORTATION ACCIDENT

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Part of the RASCAL Instructor-led Training

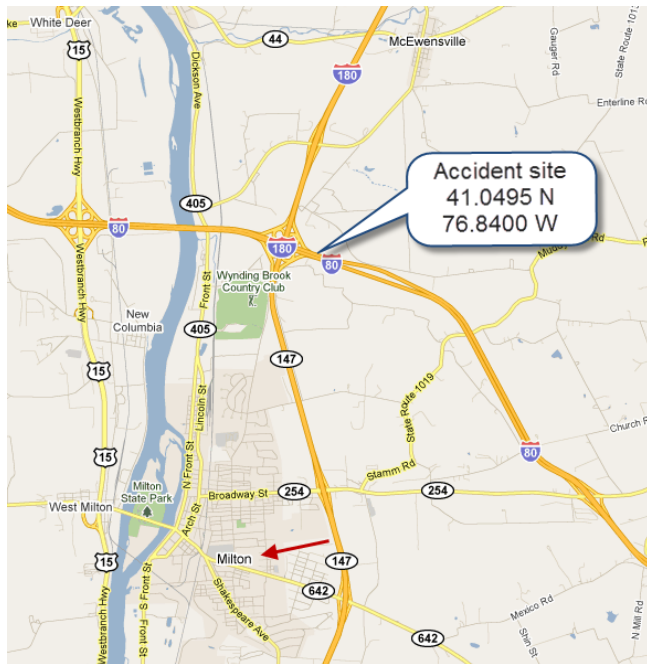
# WHAT DO YOU DO IF THE RELEASE IS AT A LOCATION THAT IS NOT PART OF THE RASCAL FACILITY DATABASE?



Use the option on Event Location to Describe a Site not in the Database.

As a minimum you will need the latitude and longitude of the accident location.

# TRANSPORTATION ACCIDENT - SCENARIO



At 02:00 a tractor trailer truck crashed in central Pennsylvania near the intersection of I-80 and I-180 when the driver lost control on the icy road.

## TRANSPORTATION ACCIDENT - SCENARIO

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The truck manifest says it was carrying 5,000 TBq of tritium gas and was bound for the Safety Light facility in Bloomsburg, PA. State highway patrol reports that the trailer slid at high speed into a bridge support and split open.

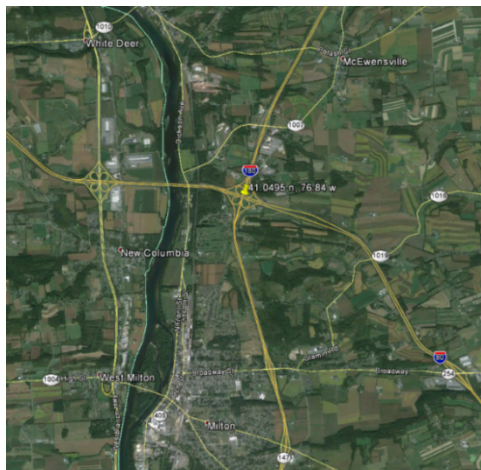
Reports from the scene are that the weather is cold, but the precipitation had stopped and the winds are very light.



# TRANSPORTATION ACCIDENT - SCENARIO

For this problem, assume that the following site information has been obtained:

Nearby population	Accident Location Information
City: Milton	Time Zone = Eastern
County: Northumberland	Latitude = $41.0495^{\circ}$ (positive latitude is north)
State: Pennsylvania	Longitude = $-76.8400^{\circ}$ (negative longitude is west)
Country: United States	Elevation = 153 meters



## TRANSPORTATION ACCIDENT - SCENARIO

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The licensee estimates that 10 percent of the containers may have ruptured and that most of their contents are likely to leak out within 10-20 minutes and would quickly volatilize and become airborne.

## TRANSPORTATION ACCIDENT - SCENARIO

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What are the doses (TED) to persons and the first responders in the immediate vicinity of the crash (0.16 and 0.32 km)?

What are the doses (TED) to nearby residents in the vicinity of the crash (0.8 and 1.6 km)?

Dose Type	Distance from Release (km)			
	0.16	0.32	0.8	1.6
TED (Sv)				

## ONE WAY TO WORK THE PROBLEM IS AS FOLLOWS:

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- Event type
  - Not a nuclear power plant, spent fuel, or fuel cycle accident
  - That leaves Other Radioactive Material Releases
- Event location
  - Select the option for Define a Site not in the Material Database
  - Enter a name, city, state, time zone, latitude, longitude and elevation.



## NEXT, FIGURE OUT HOW TO DEFINE THE SOURCE TERM AND RELEASE PATHWAY.

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- Recall the data you have been given about the release
  - Inventory = 5,000 TBq
  - 10% released in 10 minutes
- You have an amount and a time so we could define a rate.

## SELECT AND FILL-IN THE OPTION FOR EFFLUENT RELEASE RATES — BY NUCLIDE

[illegible]

## DETAILS ON FILLING IN THE SOURCE TERM SCREEN

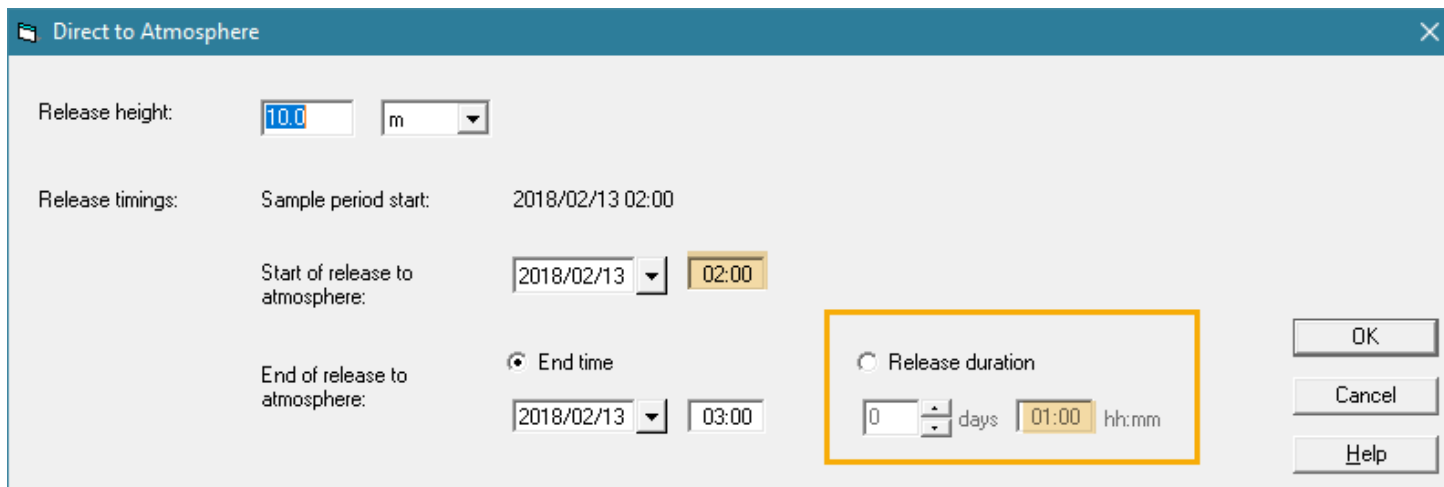
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- The default release rate units are in  $\mu\text{Ci/s}$ . Change it to  $\text{TBq/min}$ .
- Set the release start time to the time of the accident: 02:00
- Set the stop time to 02:10. That defines the release period duration to be 10 minutes.
- Finally, enter H-3 as the nuclide and set a  $\text{TBq/min}$  release rate value of 50. (That gets 10% of the 5000 out over the 10 minutes)

## STILL NEED TO PROVIDE RELEASE PATHWAY INFORMATION

Leave release height at the default of 10 meters.  
The start of release defaults to the source term start.

Set the release duration to match the 10 minutes of the single source term defined.



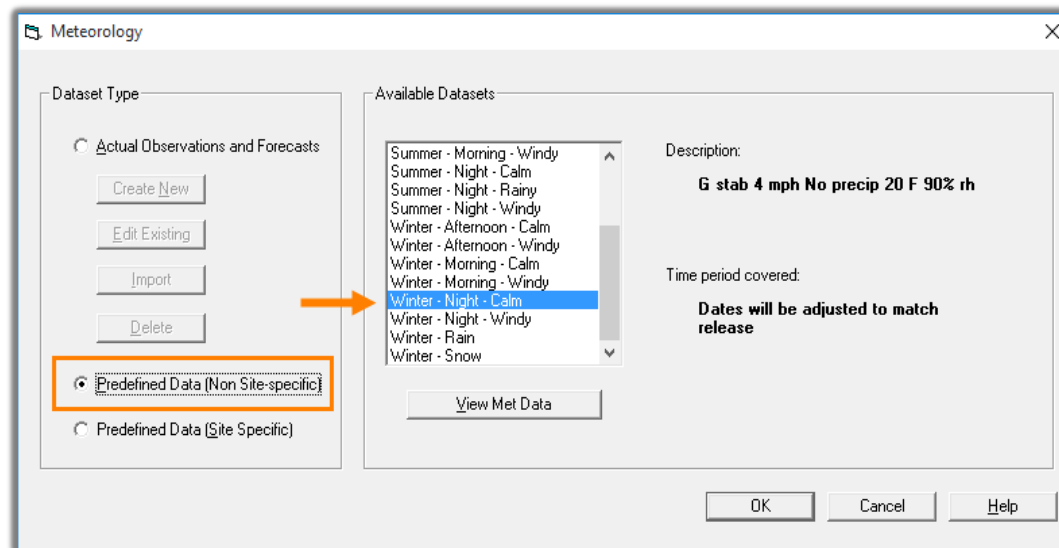
The screenshot shows a software dialog box titled "Direct to Atmosphere". It contains the following fields and controls:

- Release height:** A text box with "10.0" and a dropdown menu set to "m".
- Release timings:**
  - Sample period start:** A date and time field showing "2018/02/13 02:00".
  - Start of release to atmosphere:** A date dropdown showing "2018/02/13" and a time field showing "02:00".
  - End of release to atmosphere:** A radio button labeled "End time" is selected, followed by a date dropdown showing "2018/02/13" and a time field showing "03:00".
- Release duration:** A radio button is selected, enclosed in a yellow box. Below it is a duration field showing "0" days and "01:00" hh:mm, also enclosed in the yellow box.
- Buttons:** "OK", "Cancel", and "Help" buttons are located on the right side.

# METEOROLOGICAL DATA

No wind speed or direction have been provided. For a quick assessment we can make use of the predefined meteorological datasets.

Winter – Night – Calm would be a logical choice



## SET THE FINAL PARAMETERS AND START THE CALCULATIONS

Distance to 16 km is fine;  
we do not expect doses at  
long ranges.

The default 8h calculation  
duration is more than  
enough for this 10 minute  
release with 4 mph winds

The screenshot shows a software dialog box titled "Start the Calculations". It contains several sections for configuring calculation parameters:

- Specify options and title for this set of calculations, then OK to begin calculations.**
  - Distance of calculation:** A group box containing five radio buttons: "Close-in + out to 10 miles (16 km)" (selected), "Close-in + out to 25 miles (40 km)", "Close-in + out to 50 miles (80 km)", "Close-in + out to 100 miles (160 km)", and "Close-in only". Below these is a label "Using close-in distances in miles:" followed by a list of values: 0.1, 0.2, 0.3, 0.5, 0.7, 1.0, 1.5, 2.0.
  - Defaults:** A radio button that is selected, with a "Set Close Distances" button next to it.
  - User defined:** A radio button that is not selected.
- Start of release to atmosphere:** A text field showing "2015-11-05 02:00" with a note "(from release pathway definition)".
- End calculations at:** A group box containing two radio buttons: "Start of release to atmosphere plus:" (selected) and "User specified time:". The "Start of release to atmosphere plus:" option has a numeric input field set to "8" and a unit dropdown set to "hours". The "User specified time:" option has a date dropdown set to "2015/11/05" and a time input field set to "10:00".
- Inhalation dose coefficients to use in calculations:** A group box containing two radio buttons: "ICRP 26/30" (selected) and "ICRP 60/72".
- Case information:** A section on the right containing:
  - Title:** A text field with the value "Transportation accident" and a red note "(required - max 45 characters)".
  - Case description:** A large text area with a red note "(optional - max 600 characters)".
  - Analyst:** A section with a radio button labeled "Dose analyst" and an empty text field.

At the bottom of the dialog are three buttons: "Help", "Cancel", and "OK".

## PROBLEM CONCLUSION

From the source term summary screen, we can confirm that  $5.0\text{E}+14$  Bq (or 500 TBq) of tritium were released.

Then on the maximum dose values screen we see the following doses:

Dose Type	Distance from Release (km)			
	0.16	0.32	0.8	1.6
TED (Sv)	4.5E-04	2.2E-04	9.5E-05	5.5E-05

## PROBLEM CONCLUSION

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RASCAL has the flexibility to model these type accidents.

You just need to take what you know, make some assumptions, and find the best fit to define the release.