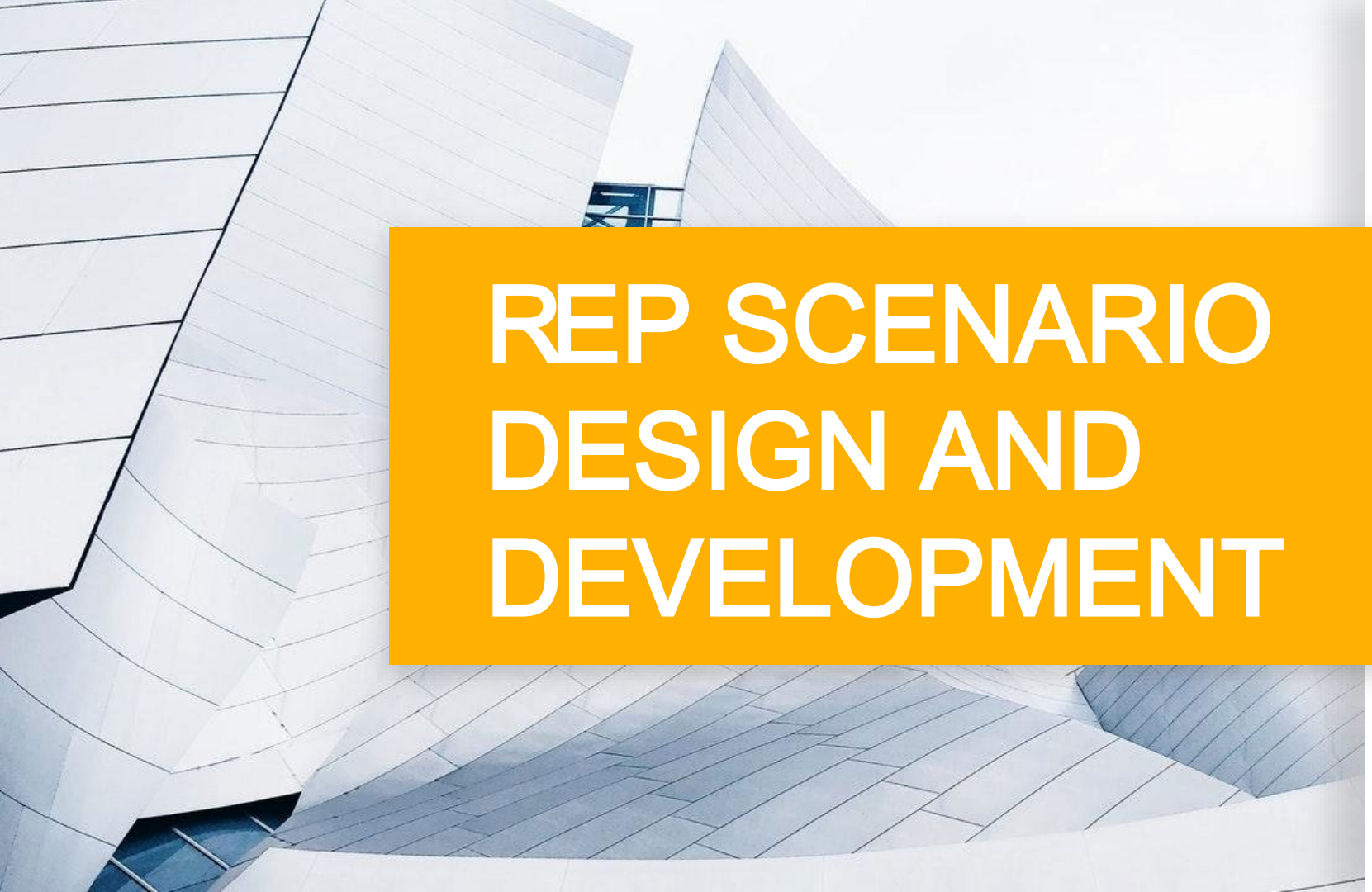


REP SCENARIO DESIGN AND DEVELOPMENT

HELLO!

Jill Leatherman

Health Physicist

ICF Scenario Reviewer/Regional Coordinator

Tar Heel Fan

Is it worth it?

Take the FEMA Path!

Can’t Always Predict…

- Simulator problems
- Operator actions
- Controller issues

Factors That Make a Good Scenario

An opportunity for the players to demonstrate objectives without unnecessary pitfalls

Scenario Data

- Narrative Summary
- Master Scenario Events List
- Controller Injects for ORO’s

Emergency Classification Levels

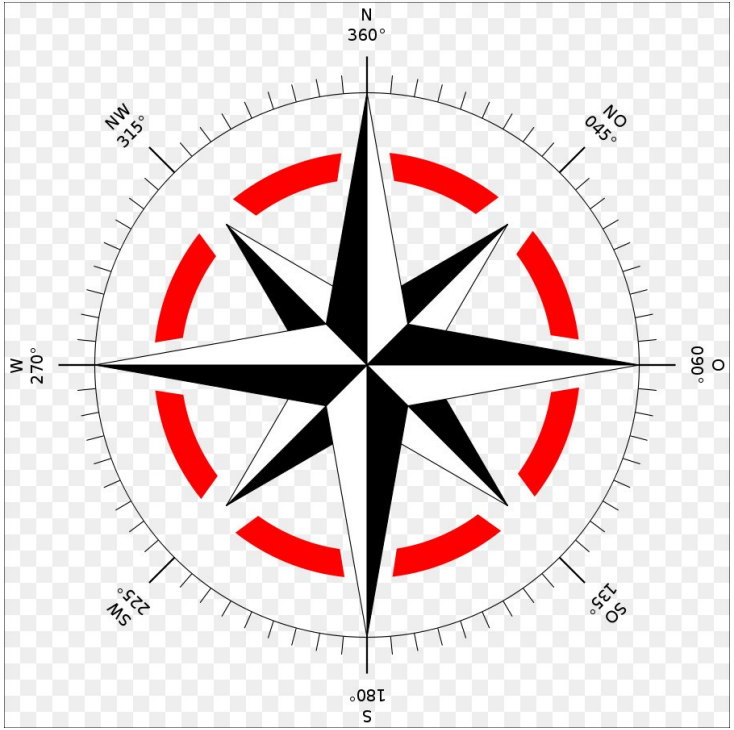
Declaration times spaced appropriately.

It's lunchtime- a General Emergency must be coming…

Meteorological Data

- Wind Direction
- Wind Speed
- Stability Class

Wind Direction



Direction the wind is coming **from**

Stability Class

Stability Classification	Pasquill Categories
Extremely Unstable	A
Moderately Unstable	B
Slightly Unstable	C
Neutral	D
Slightly Stable	E
Moderately Stable	F
Extremely Stable	G

Wind Shifts

RASCAL

Radiological Assessment System for Consequence Analysis

Protective Action Recommendations (PARs)

Based upon:

- Plant conditions
- Dose projections
- Field monitoring team measurements of plume gamma exposure rate and radioiodine concentration
- Protective Action Guides (PAGs)

Common Inputs

Effluent Releases - by Mixtures

Reactor shutdown: Yes 2014/06/22 21:00
No

Sample taken: 2014/06/22 23:00

Release rate units: Ci/s

Release rates:

Noble gases 1.90E+01 (Ci/s) <--

Iodines

Total 9.00E-01 (Ci/s) <--

I-131 equiv.

Particulates 1.00E-01 (Ci/s) <--

If you have a concentration and flow rate, it can be used to set a release rate.

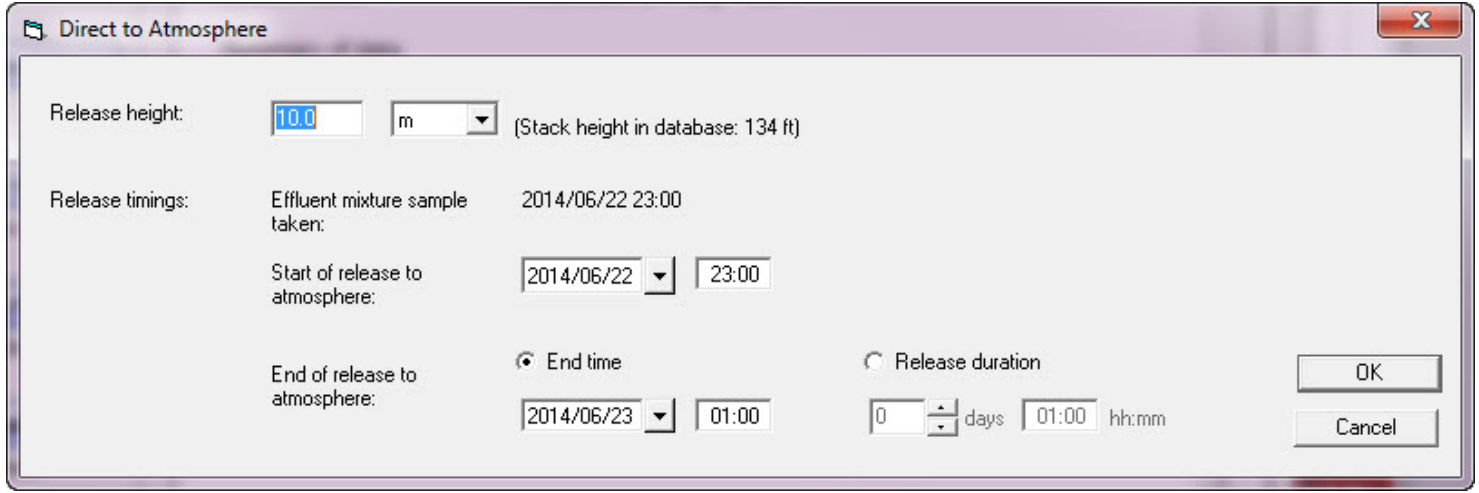
Use <-- buttons to activate the release rate calculator.

OK

Cancel

Help

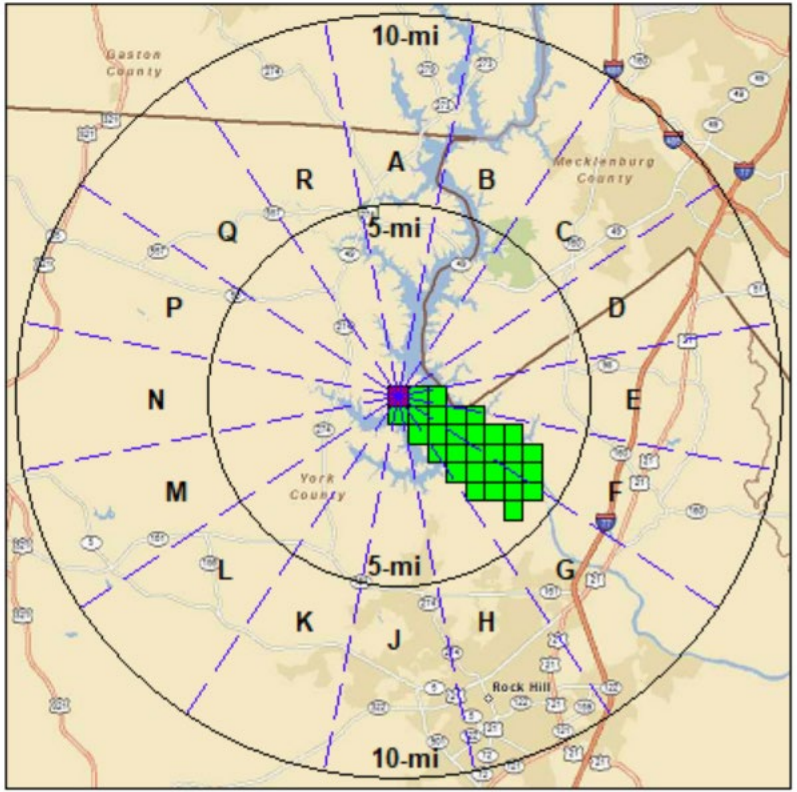
Common Inputs



RASCAL Outputs

- Total Effective Dose
- Thyroid Committed Effective Dose

Downwind Plume



- Release pathway?
- Release monitored?
- Site boundary distance?
- Adult or child thyroid?

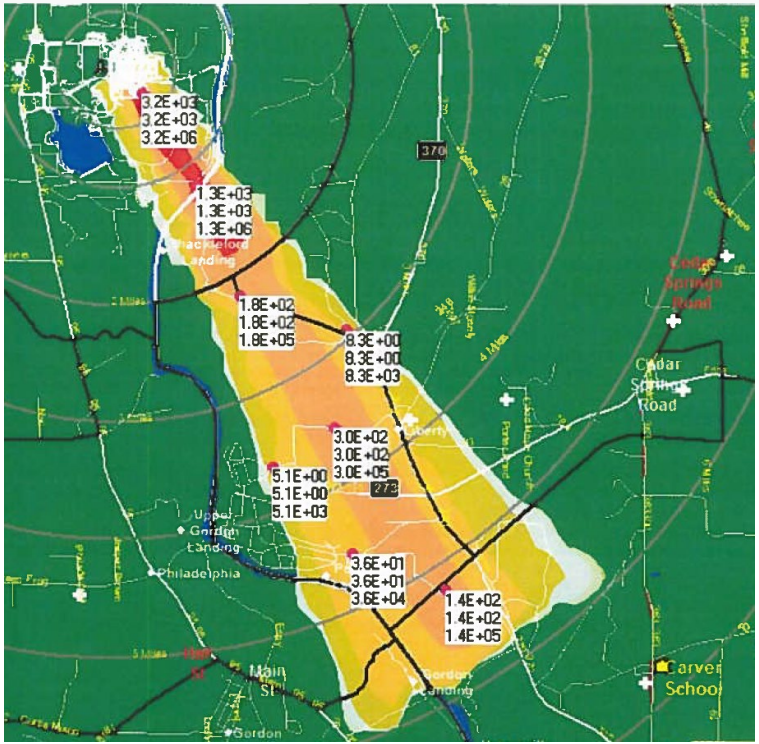
Licensee Termination

- Simulation cell for dose assessment
- Additional staffing if needed

Field Team Data

- Compared with RASCAL
- Less than a factor of 10
- Same PARs

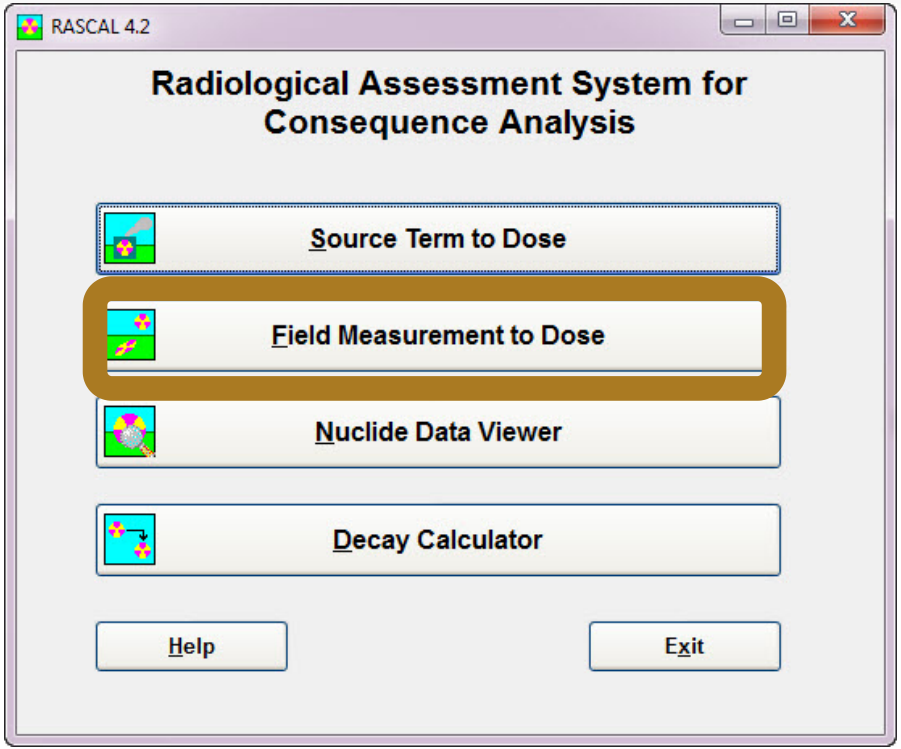
Can You Read Me?



Yes, I Can!

	FIELD DATA (5.0 MILE)							
Time of Field Reading	Meter Readings				Air Sample Data			
					Bkgnd =	40 CPM	Sample vol.	= 10ft³
	Waist Level (mR/hr)		Ground level (mR/hr)		Part Reading	Part Activity	Iodine Read.	Iodine Act.
	Closed	Open	Closed	Open	CPM	uCi/cc	CPM	uCi/cc
10:37	0.0	0.0	0.0	0.0	BKG	<3e-10	BKG	<6E-8
10:42	2.6	5.4	2.6	5.4	47,797	4.29E-07	6,793	1.07E-05
10:47	2.7	5.6	2.7	5.6	49,722	4.46E-07	7,066	1.12E-05
10:52	2.8	5.7	2.8	5.7	50,108	4.50E-07	7,120	1.12E-05
10:57	2.8	5.7	2.8	5.7	50,185	4.50E-07	7,131	1.13E-05
11:02	2.8	5.8	2.8	5.8	51,648	4.63E-07	7,338	1.16E-05
11:07	2.8	5.8	2.8	5.8	51,648	4.63E-07	7,338	1.16E-05
11:12	2.8	5.7	2.8	5.7	50,878	4.56E-07	7,229	1.14E-05
11:17	2.8	5.7	2.8	5.7	50,878	4.56E-07	7,229	1.14E-05
11:22	2.8	5.7	2.8	5.7	36,366	3.26E-07	5,177	8.15E-06
11:27	2.8	5.7	2.8	5.7	36,643	3.29E-07	5,216	8.22E-06
11:32	2.8	5.7	2.8	5.7	36,366	3.26E-07	5,177	8.15E-06
11:37	2.8	5.7	2.8	5.7	36,089	3.24E-07	5,138	8.09E-06
11:42	2.8	5.7	2.8	5.7	36,643	3.29E-07	5,216	8.22E-06
11:47	2.8	5.7	2.8	5.7	36,643	3.29E-07	5,216	8.22E-06
11:52	2.8	5.7	2.8	5.7	36,366	3.26E-07	5,177	8.15E-06
11:57	2.8	5.7	2.8	5.7	34,167	3.06E-07	4,866	7.66E-06
12:02	2.8	5.7	2.8	5.7	34,219	3.07E-07	4,873	7.67E-06
12:07	2.8	5.7	2.8	5.7	34,115	3.06E-07	4,859	7.65E-06
12:12	2.8	5.7	2.8	5.7	34,011	3.05E-07	4,844	7.63E-06
12:17	2.8	5.7	2.8	5.7	34,219	3.07E-07	4,873	7.67E-06
12:22	2.8	5.7	2.8	5.7	34,115	3.06E-07	4,859	7.65E-06
12:27	2.8	5.7	2.8	5.7	34,167	3.06E-07	4,866	7.66E-06

RASCAL Field Measurement to Dose Tool



Detailed Results Function

Source Term to Dose - [Unit 5 Problem B.STD]

File Settings Nuclide Data Viewer Site / Facility Data Viewer Help

Follow the steps below to define and run a problem

Use the Tabs below to review information.

Event Type
NPP Reactor

Event Location
Perry - Unit 1

Source Term
Effluent Releases - by Mixtures

Release Path
Direct to atmosphere

Meteorology
Actual Observations

Calculate Doses

Detailed Results

Save Case

Maximum Dose Values (rem) - To 10 mi

Dist from release miles (kilometers)	3 (4.8)	4 (6.4)	5 (8.0)	7 (11.3)	10 (16.1)
Total EDE	7.0E-02	5.3E-02	4.3E-02	2.6E-02	1.3E-02
Thyroid CDE	1.3E+00	1.0E+00	8.3E-01	5.4E-01	3.0E-01
Inhalation CEDE	4.0E-02	3.1E-02	2.6E-02	1.7E-02	9.4E-03
Cloudshine	9.3E-03	7.5E-03	6.4E-03	4.2E-03	2.3E-03
4-day Groundshine	2.1E-02	1.4E-02	1.0E-02	4.5E-03	1.5E-03
Inter Phase 1st Yr	4.2E-02	2.8E-02	2.0E-02	8.6E-03	2.8E-03
Inter Phase 2nd Yr	4.6E-03	2.3E-03	1.2E-03	***	***

Notes:
- Doses exceeding PAGs are underlined.
- Early-Phase PAGs: TEDE - 1 rem, Thyroid (iodine) CDE - 5 rem
- Intermediate-Phase PAGs: 1st year - 2 rem, 2nd year - 0.5 rem
- Inhalation dose factors used: FGR 11 (ICRP 26)
- *** indicates values less than 1 mrem

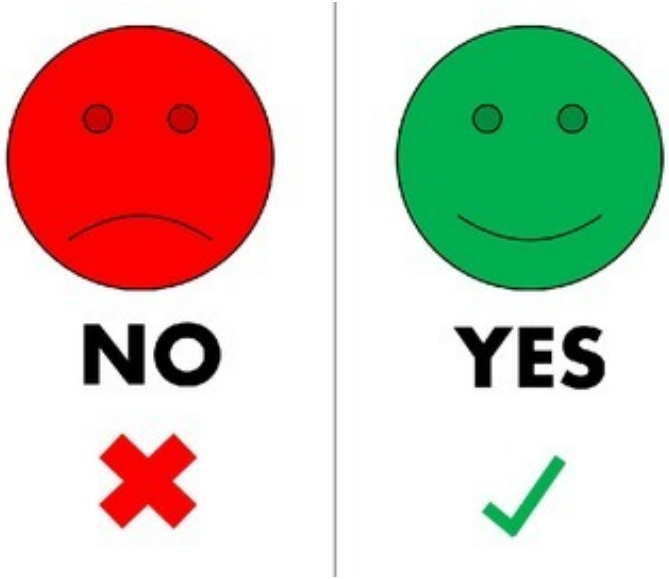
Value displayed: Close-in dose / Doses to 10 miles / Criticality shine dose

Display units: English / Metric

Definitions Print

Case Summary | Source Term | **Maximum Dose Values**

Field to Dose Comparisons



Does it have to be perfect?

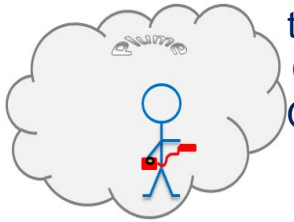
Does it have to make sense?

Field to Dose Comparisons

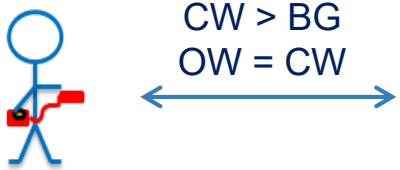
Make predictions

Verify predictions with data from field monitoring teams

Field Surveys



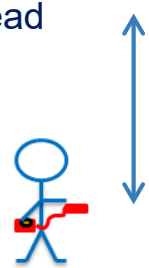
Immersed in the Plume
CW > BG
OW > CW



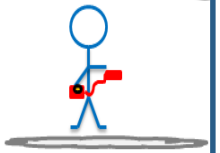
Lateral to the Plume
CW > BG
OW = CW

CW = Closed Window Reading
OW = Open Window Reading
BG = Background Reading

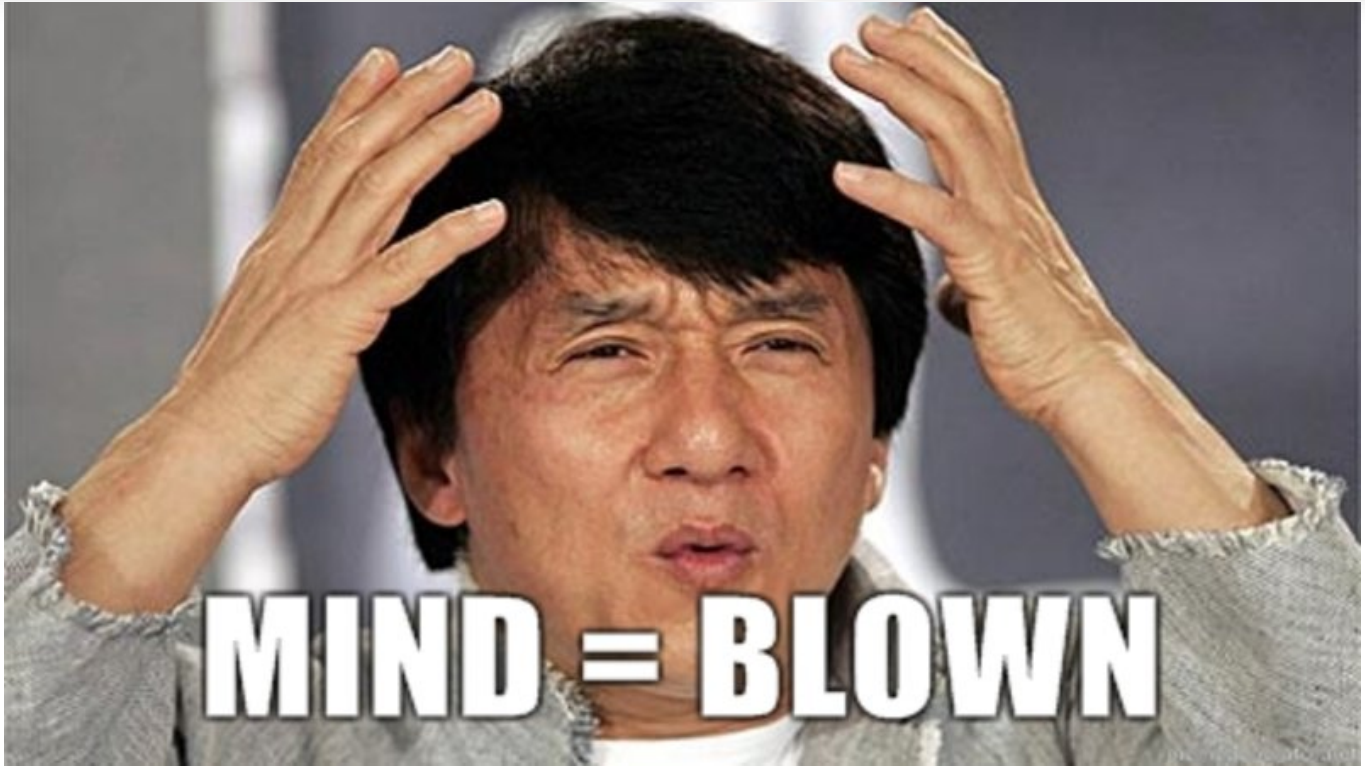
Plume Overhead
CW > BG
OW = CW



Groundshine Only
CW > BG
OW ≥ CW
But Near Ground Level
OW > CW



Did I Miss Something?



Air Sampling: Once the Plume is Located

Glass particulate filter Typically 99% effective

Silver Zeolite (AgZ) cartridge

Counting the Sample

GM probes have typical counting efficiencies of 10% for glass filters and 0.25% for AgZ cartridges

Sodium Iodide detectors may have slightly higher counting efficiencies

Plume Edge

- Which way is the wind carrying the plume?
- Have we evacuated far enough?
- Have we evacuated in the right direction?

Centerline

- Verifies the actual source term, which is much more valuable than a dose projection
- Calculating the centerline plume data from the edge plume data adds a layer of uncertainty
- Is it better to have a few, well-placed centerline data points or many plume edge datapoints?

The Magic Factor of 10

- Dose projections
- Field surveys
- Field air samples

Other Sample Media

Questions?