

An Overview of MRBCA Representative Concentrations (RCs)

By:

Hashim Mukhtar

MRBCA Risk Management Decisions are Made either by:

A: Comparison of Maximum COC Concentrations :
(Section 6.5) to:

- Default Target Levels
- RBTLs (surficial soil for a resident child)

Or

B: Comparison of the Arithmetic Average (RCs) of
COC Concentration to RBTLs or SSTLs.

To Determine RCs we Need to Consider:

The Media of Concern:

- Surficial soil (0 – 3' bgs)
- Subsurface soil (3' – top of water)
- Sediment
- Soil vapor
- Soil to the depth of construction
- Groundwater
- Surface water

Consider the Exposure Domain:

- Current building
- Hypothetical building (30X30 feet)
- Building of a current development plan
- Point of exposure (POE)
- Area of construction (current and future)
- Utility corridor
- Point of discharge for surface water

Consider the Receptor

- Resident child
- Resident adult
- Age adjusted individual
- Non-resident worker-adult
- Construction worker-adult
- Utilities
- Ecological

Consider the Exposure Pathway:

- Inhalation of vapors from media
- Ingestion of media
- Dermal contact with media
- Combined pathway for soil to depth of construction (ingestion, inhalation of vapor emissions/particulate, dermal contact)

Consider the Following Concepts: (Sections 5.8.1 and 5.8.2)

- Point of release
- Area of release
- Outside area of release

Calculation of RCs

Information provided in MRBCA:

- Tables 6-2
- Section 6.5
- Section 7.4
- Appendix E

Calculation of RCs for Surficial Soil: (Appendix E.2.1)

- Protection of Groundwater:

Average of COC concentrations in surficial soil within the area of release

- Direct Contact for a Nonresident (ingestion, outdoor inhalation, dermal contact):

Based on the receptor's exposure domain:

- Average of samples within the known exposure domain of a current receptor
- Average of samples in unpaved area for a current receptor, if exposure domain unknown
- Average of entire samples for a future receptor (entire site is the exposure domain)
- **Maximum of COC for a resident child**

Calculation of RCs for Subsurface Soil: (Appendix E.2.2)

A- Protection of groundwater:

Average of soil samples within the area of release

B- Indoor Inhalation of Vapors:

- **Current:** Average of soil samples immediately below and within 10' of the footprint of the current building
- **Future:** Average of soil samples within 30X30 feet hypothetical building over area of maximum contamination (a 50X50 feet exposure domain)
- **Or:** Average of the exposure domain based on an approved development plan

Calculation of RCs of Soil for a Construction

Worker: (Appendix E.2.3)

- **Known zone of construction:** Average of soil samples from surface to the depth of construction
- **Unknown construction zone:** Average of soil samples from surface to depth of 10' in the area of the release
- Also must consider existing utility corridors – these might require calculation of separate RC (Section 5.4.3)

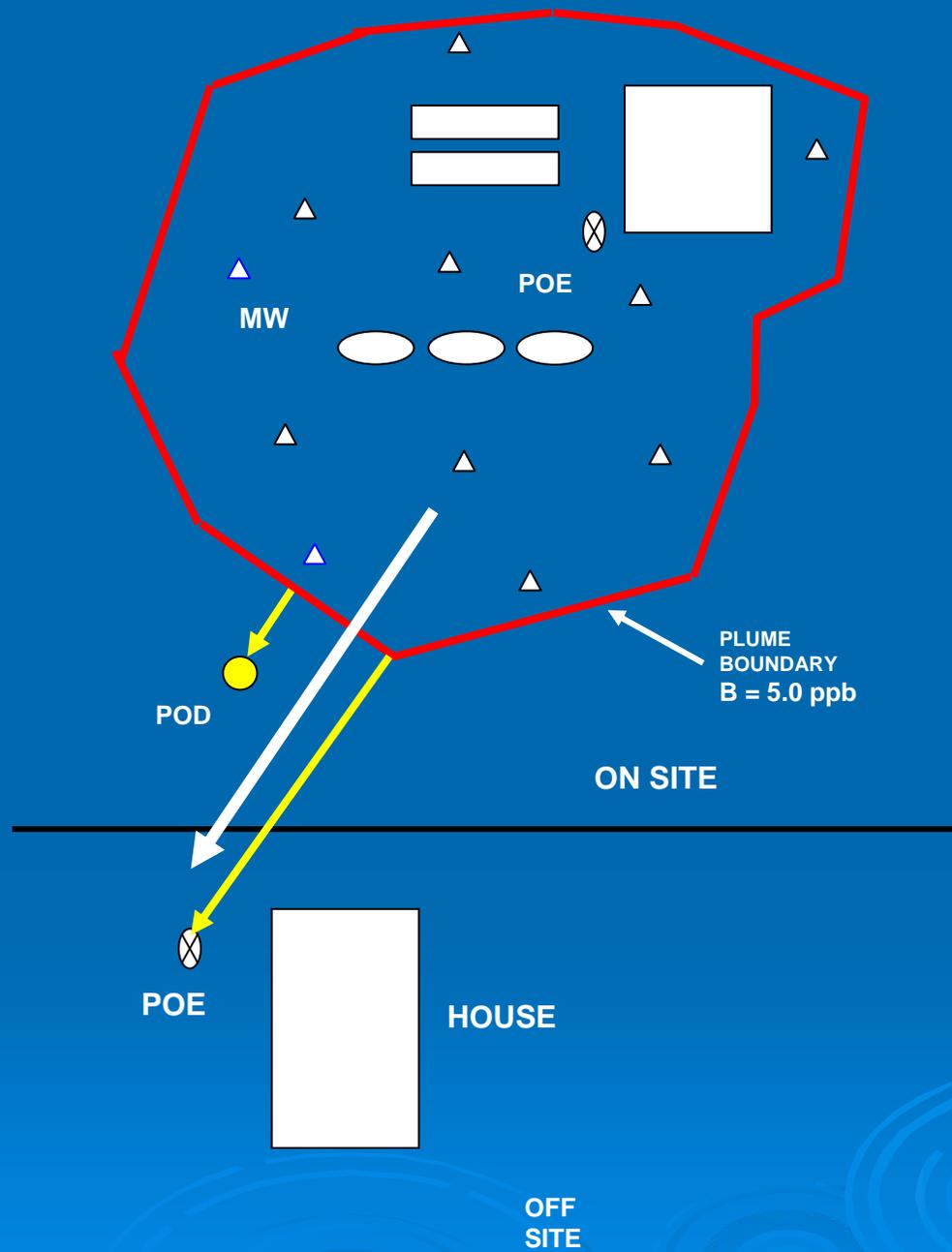
Non-detect values must not be used

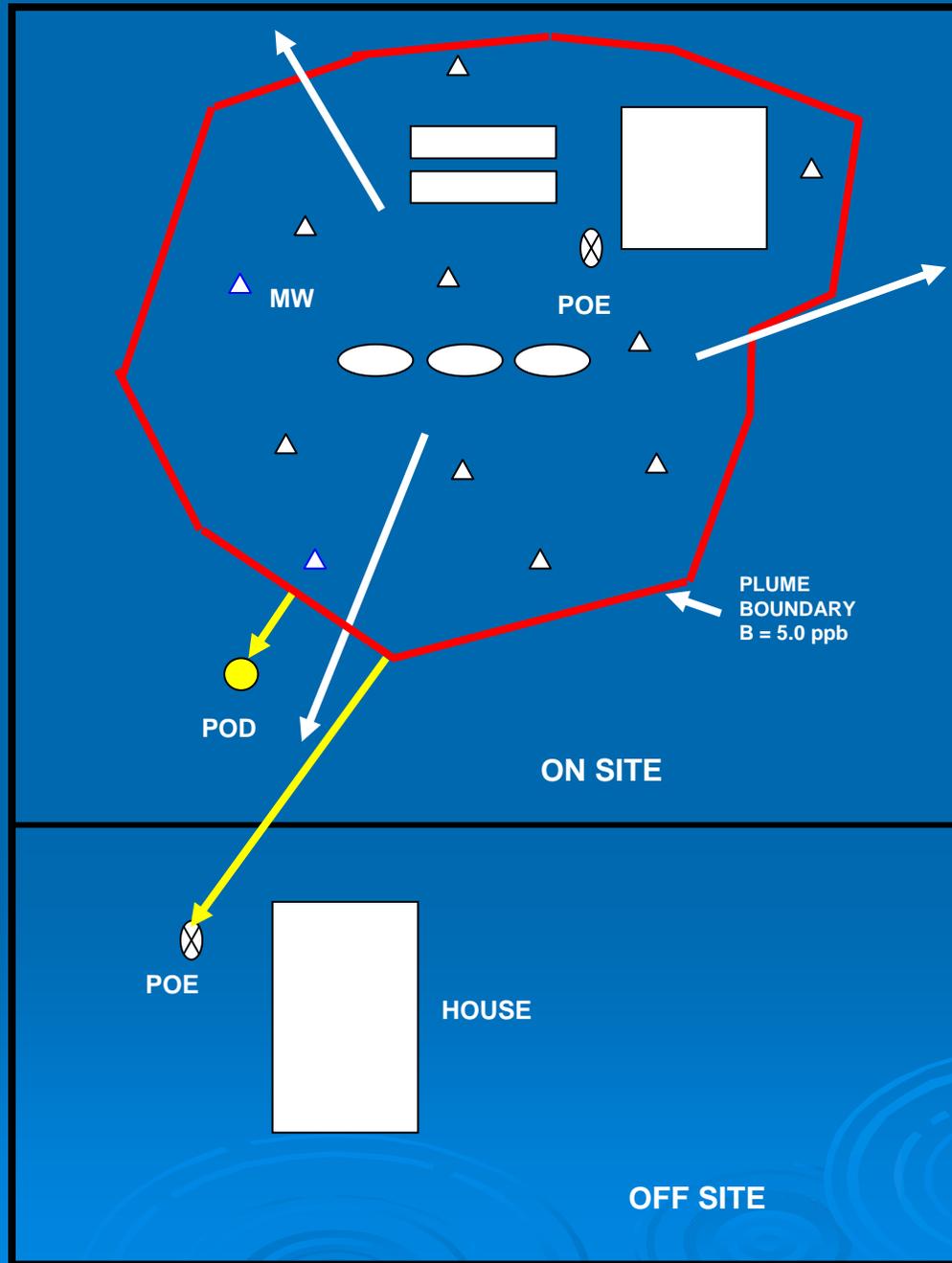
Calculation of RCs for Groundwater: (Appendix E.2.4)

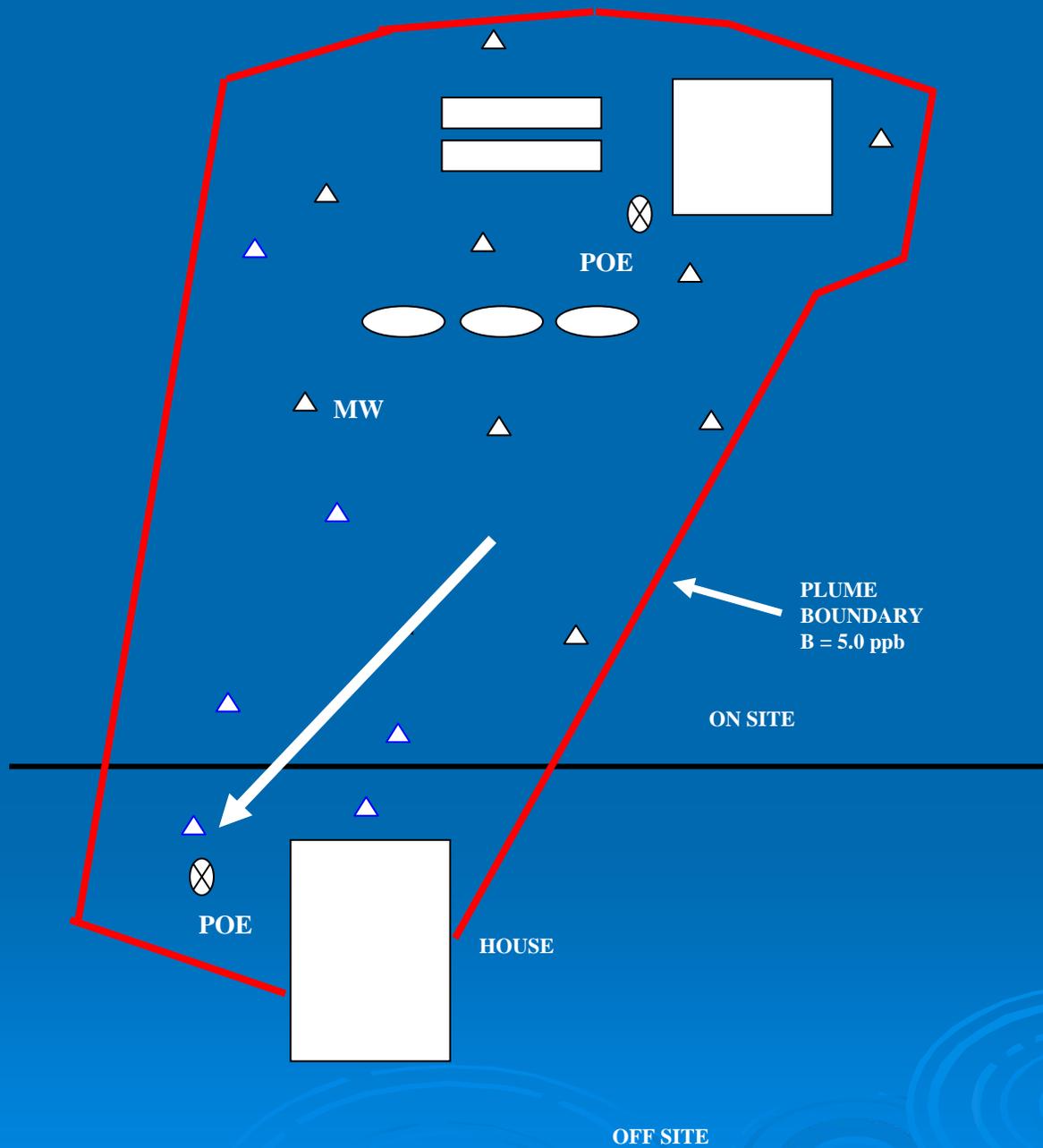
A- Protection of Groundwater Ingestion:

- Actual point of exposure (existing well):
RCs do not apply, Domestic Use target levels must be met
- RC for POD or POE:
 - Plume stable: Most recent 2 years data
 - Plume shrinking: Most recent 1.5 years data
 - Plume not stable: Most recent 1.5 years data
Another RC must be calculated after the plume has stabilized

Groundwater data collected on at least quarterly basis to account for seasonal variations







RCs for Groundwater Continued:

B- Indoor Inhalation of vapors:

- **Current:** Average of wells within 10' of the footprint of a current building, and
- **Future no plan:** Average of wells within the footprint of a 30X30 feet hypothetical future building, and
- **With plan:** Average of wells within the footprint of a building according to a construction plan.

Plan must be approved by local planning/zoning authorities

C- Dermal Contact with GW:

Average of wells at which a receptor would come in contact with groundwater (POE, contact with surface water, seeps, etc.)

RCs for LNAPL: dissolved and vapor phase Section 6.8.3, Table 5-2, Appendix B

- Use default dissolved and vapor values (Raoult's Law), or
- Sample soil vapor, or
- Sample LNAPL (with conditions)

General Observed Problems with Determination of RCs:

- Insufficient data (spatial distribution, temporal variability)
- Samples not analyzed for all appropriate COCs (PAHs, Oxygenates, Lead, EDB, and EDC)
- Old data (more than 4 years for soil, 2 for gw)
- Samples not analyzed according to MRBCA methods (GRO and OA2), **OA1 for BTEX is acceptable.**
- Soil results not on dry weight basis (use 40%mc)
- Use of samples outside the exposure domain (mostly for off site receptors)

Observed Problems Continued:

- Inappropriate future exposure domain
- Use of Setbacks
- LNAPL RCs not included
- Groundwater and/or soil vapor data not adequately representative of temporal variability (seasonal variations)
- Improper averaging within a boring or between wells
- Use of $\frac{1}{2}$ DL, when DL higher than MRBCA RRL.
- Outlier data points (questionable)
- High DL for tracer compounds (<100.00 microgram/L)

QUESTIONS or COMMENTS?

hashim.mukhtar@dnr.mo.gov

573-526-8919