



*Global Leader in Munitions Response*

# What's the Difference?

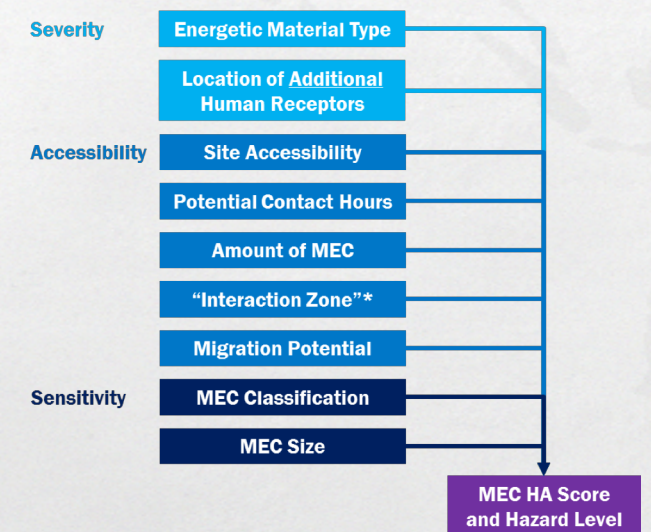
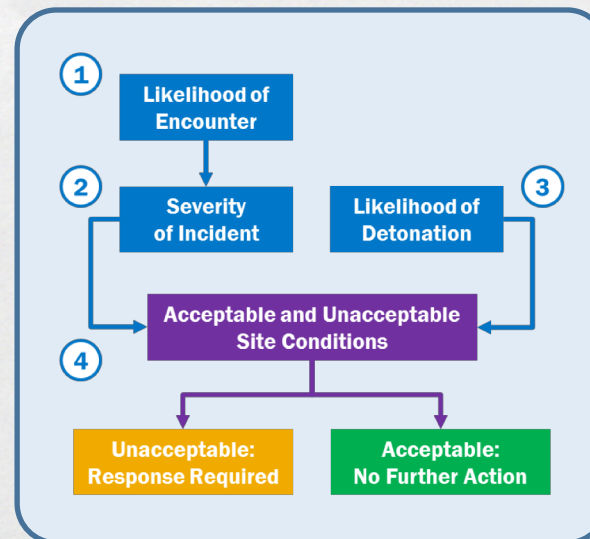
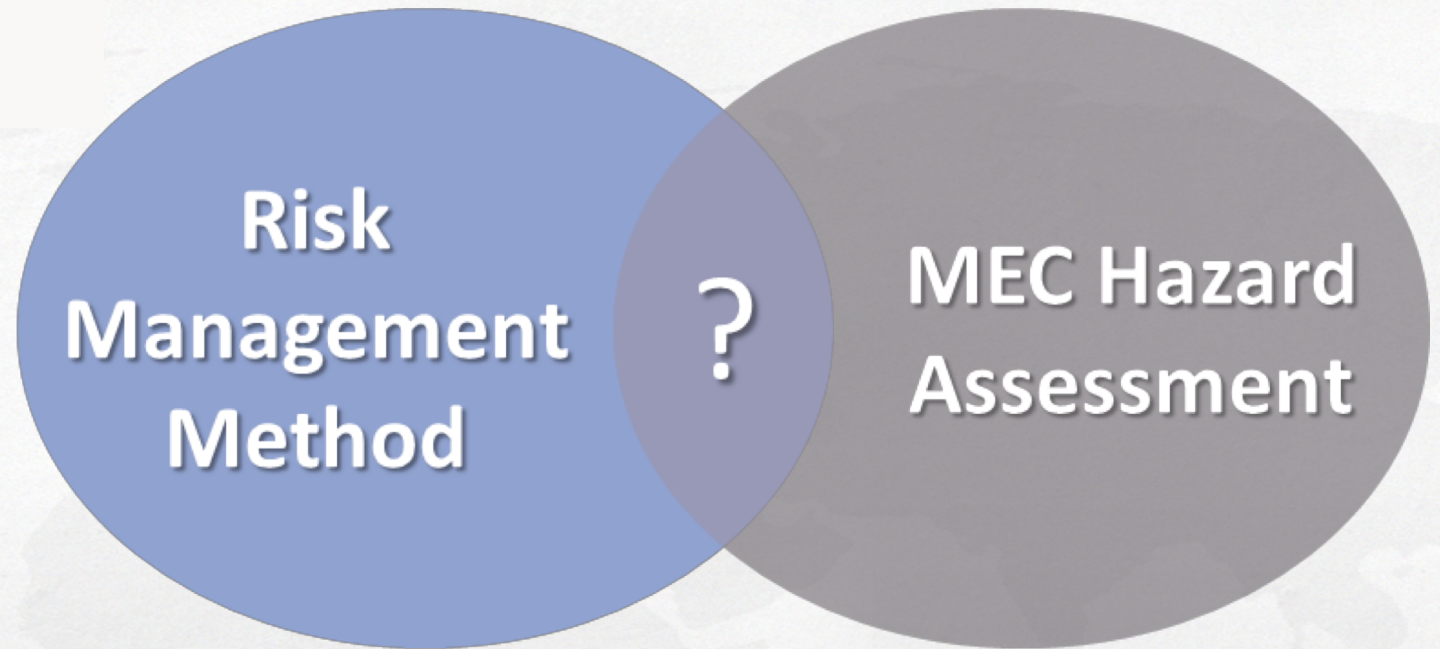
Comparison of the Army MEC Risk Management Method and the MEC HA Method

April 3, 2019



## Agenda

- Overview of MEC HA
- Similarities and Differences
- Example Using Both Methods








# MEC Hazard Assessment (MEC HA)

- *Interim MEC Hazard Assessment Methodology*
  - Developed by USEPA, DoD, DOI, States, and Tribes
  - Recommended for a “two-year” trial period by the Dept of the Army in Jan 2009
  - Primarily for remedy selection decisions (FS or EE/CA)
- Just like RMM, it considers
  - Severity (of incident)
  - Accessibility (i.e., likelihood of encounter)
  - Sensitivity (i.e., likelihood of detonation)
- Generates a “MEC HA score” and “Hazard Level”
  - Has an automated Excel workbook

Publication Number:  
EPA: 505/B0001  
DoD: XXXXXXXXX

**MUNITIONS AND EXPLOSIVES OF CONCERN  
HAZARD ASSESSMENT METHODOLOGY**

INTERIM  
OCTOBER 2008

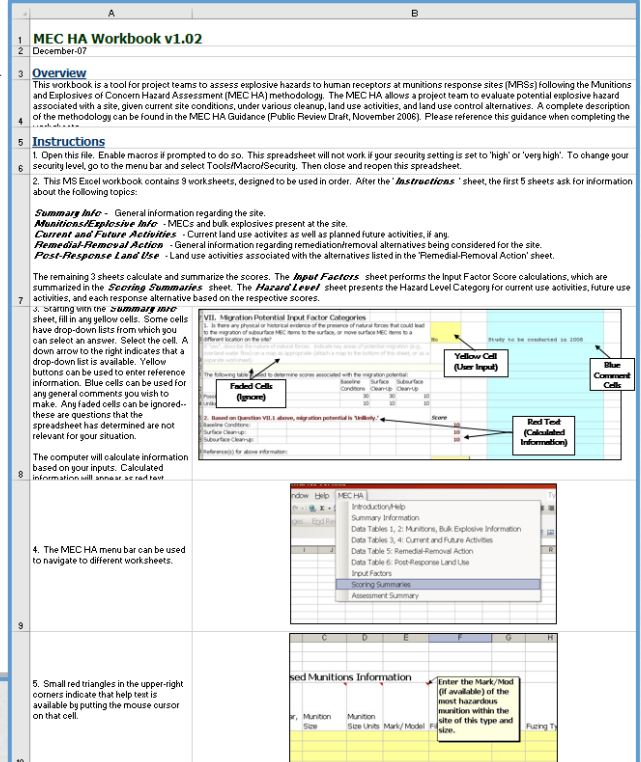
**MEC HA Workbook v1.02**  
December-07

**Overview**  
This workbook is a tool for project teams to assess explosive hazards to human receptors at munitions response sites (MRSs) following the Munitions and Explosives of Concern Hazard Assessment (MEC HA) methodology. The MEC HA allows a project team to evaluate potential explosive hazard associated with a site, given current site conditions, under various cleanup, land use activities, and land use control alternatives. A complete description of the methodology can be found in the MEC HA Guidance (Public Review Draft, November 2006). Please reference this guidance when completing the workbook.

**Instructions**  
1. Open this file. Enable macros if prompted to do so. This spreadsheet will not work if your security setting is set to 'high' or 'very high'. To change your security level, go to the menu bar and select Tools/Macro/Security. Then close and reopen this spreadsheet.  
2. This MS Excel workbook contains 9 worksheets, designed to be used in order. After the 'Instructions' sheet, the first 5 sheets ask for information about the following topics:  
**Summary Info** - General information regarding the site.  
**Munitions/Explosive Info** - MECs and bulk explosives present at the site.  
**Current and Future Activities** - Current land use activities as well as planned future activities, if any.  
**Remedial/Removal Action** - General information regarding remediation/removal alternatives being considered for the site.  
**Post-Response Land Use** - Land use activities associated with the alternatives listed in the 'Remedial-Removal Action' sheet.  
The remaining 3 sheets calculate and summarize the scores. The **Input Factors** sheet performs the Input Factor Score calculations, which are summarized in the **Scoring Summaries** sheet. The **Hazard Level** sheet presents the Hazard Level Category for current use activities, future use activities, and each response alternative based on the respective scores.  
3. Starting with the **Summary Info** sheet, fill in any yellow cells. Some cells have drop-down lists from which you can select an answer. Select the cell. A down arrow to the right indicates that a drop-down list is available. Yellow buttons can be used to enter reference information. Blue cells can be used for any general comments you wish to make. Any faded cells can be ignored—these are questions that the spreadsheet has determined are not relevant for your situation.  
The computer will calculate information based on your inputs. Calculated information will appear in red text.

4. The MEC HA menu bar can be used to navigate to different worksheets.

5. Small red triangles in the upper-right corners indicate that help text is available by putting the mouse cursor on that cell.

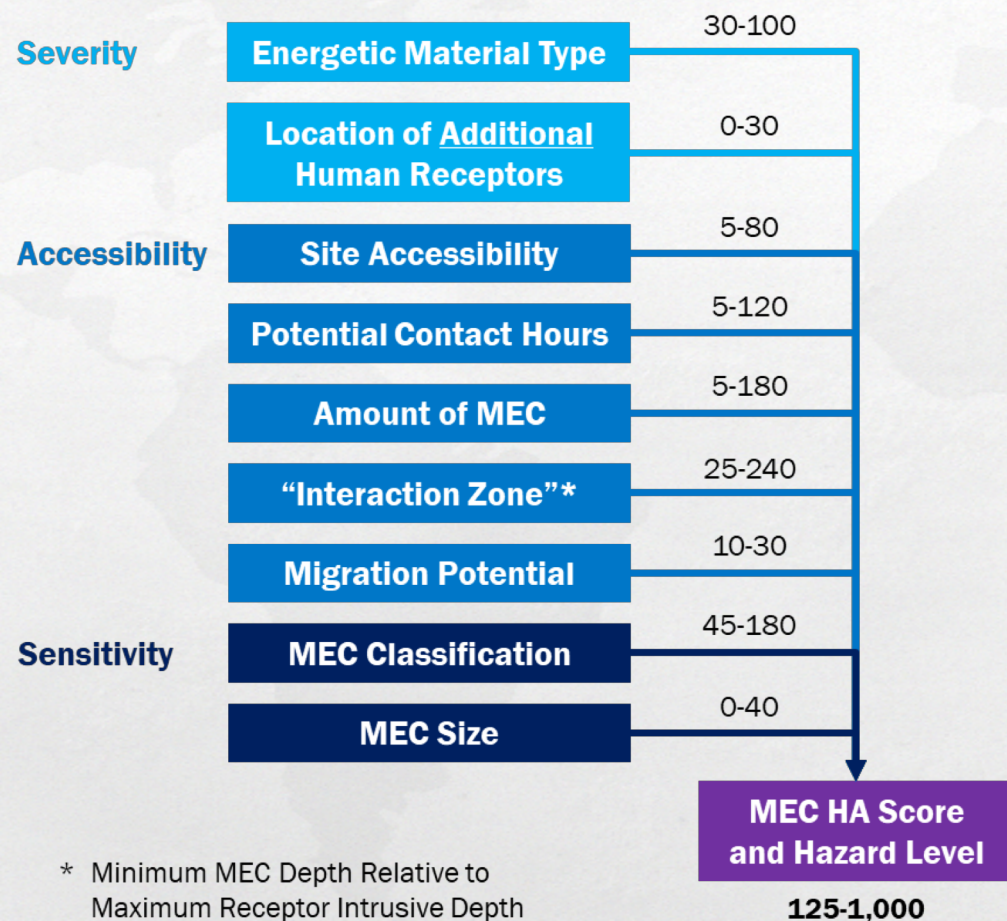


The screenshot shows the Excel interface with the following elements:

- Worksheet Tabs:** Introduction/Help, Summary Information, Data Tables 1, 2: Munitions, Bulk Explosive Information, Data Tables 3, 4: Current and Future Activities, Data Table 5: Remedial-Removal Action, Data Table 6: Post-Response Land Use, Scoring Summaries, Assessment Summary.
- Menu Bar:** File, Edit, Format, Tools, Window, Help.
- Yellow Cell (User Input):** A cell with a drop-down arrow, labeled 'Yellow Cell (User Input)'.
- Blue Comment Cells:** Cells with a small blue square icon, labeled 'Blue Comment Cells'.
- Red Text (Calculated Information):** Cells with red text, labeled 'Red Text (Calculated Information)'.
- Faded Cells (Ignore):** Cells with a light gray background, labeled 'Faded Cells (Ignore)'.
- Help Text:** A small red triangle in the upper-right corner of a cell, labeled 'Help Text'.



## MEC Hazard Assessment (MEC HA), cont'd.



\* Minimum MEC Depth Relative to Maximum Receptor Intrusive Depth

- MEC HA scores
  - Pre-cleanup (i.e., “baseline”) and Post-cleanup
- Comparison of pre- and post-cleanup scores supports FS evaluation
  - Remedial alternatives modify scores
- Despite having scores, method is qualitative
  - Selection of inputs dependent on team decisions
  - Does not allow quantitative comparison between sites
  - “MEC HA does not answer the question of ‘how clean is clean?’”
    - Low MEC HA score (e.g., Hazard Level 4) does not necessarily indicate “acceptable” risk
- Hard to model effect of non-structural LUCs



# Similarities and Differences: General Comparison

## MEC Hazard Assessment (MEC HA)

- Qualitative method
  - Provides framework for discussion/concurrence
  - Generates a score (can be helpful during FS)
- “Amount of MEC” input factor based on historic use only
- Most input factors are clearly defined
  - Minimal advance consideration needed
  - No need to include input factors in DQOs
- Does not link directly to RAOs
- Does not establish threshold for action
  - Does not assess “how clean is clean”
  - Baseline score only useful in FS

## Risk Management Method (RMM)

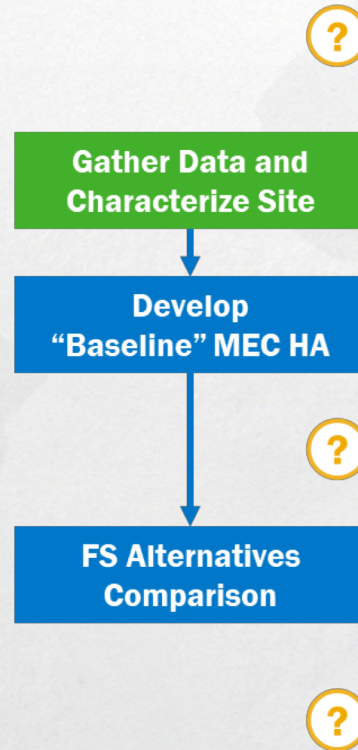
- Qualitative method
  - Provides framework for discussion/concurrence
  - Does not generate a score
- “Amount of MEC” input factor based on historic information and investigation results
- Input factors are less clearly defined
  - Advance consideration preferred
  - Best to include Amount of MEC input factor in DQOs
  - Links directly to RAOs
- Establishes threshold for action
  - Supports decisions on “acceptable” vs. “unacceptable” risk
  - Conclusions potentially useful from SI through Remedial Action



# Similarities and Differences: Process Flow

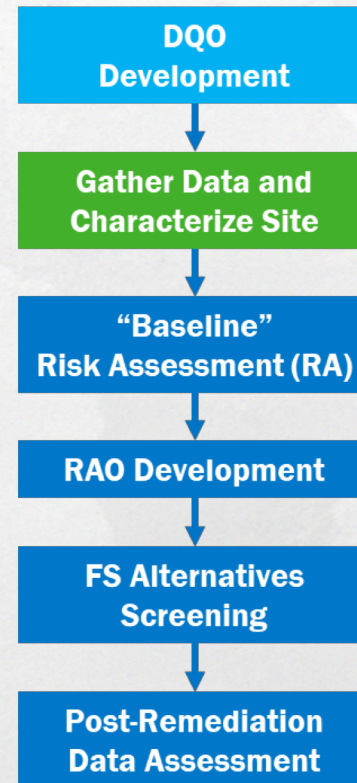
## MEC Hazard Assessment (MEC HA)

- Primarily for RI/FS
  - Baseline MEC HA
  - Alternatives evaluation
    - Comparison
    - Which are more effective?



## Risk Management Method (RMM)

- Usable for SI, RI/FS, and Remedial Action
  - Baseline risk assessment
  - RAOs
  - Alternatives screening
    - Preliminary step
    - Do they achieve RAOs?
  - Post-remedy evaluation

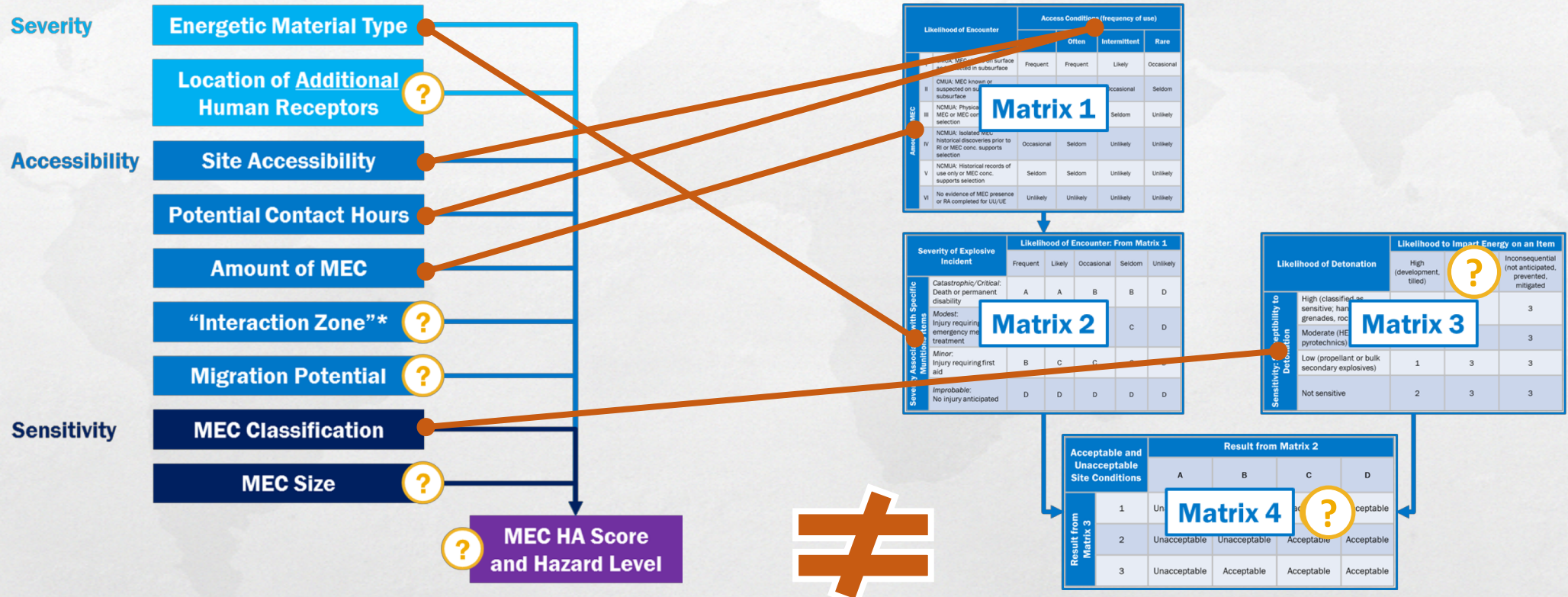




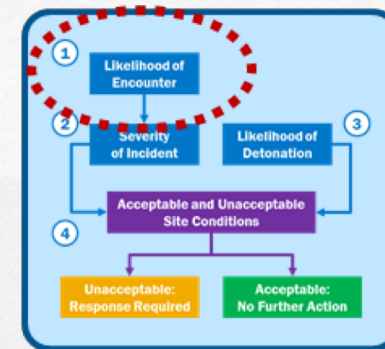
# Similarities and Differences: Data Inputs

## MEC Hazard Assessment (MEC HA)

## Risk Management Method (RMM)







# Similarities and Differences: Likelihood of Encounter

## MEC Hazard Assessment (MEC HA)

## Risk Management Method (RMM)

- Site Accessibility
- Potential Contact Hours
- Amount of MEC
- “Interaction Zone”\*
- Migration Potential

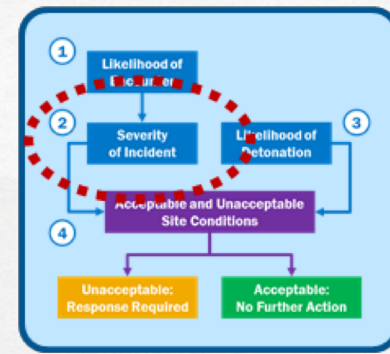
		Access Conditions (frequency of use)				
		Regular	Often	Intermittent	Rare	
Amount of MEC	I	CMUA: MEC visible on surface and detected in subsurface	Frequent	Frequent	Likely	Occasional
	II	CMUA: MEC known or suspected on surface and in subsurface	Frequent	Likely	Occasional	Seldom
	III	NCMUA: Physical evidence of MEC or MEC conc. supports selection	Likely	Occasional	Seldom	Unlikely
	IV	NCMUA: Isolated MEC historical discoveries prior to RI or MEC conc. supports selection	Occasional	Seldom	Unlikely	Unlikely
	V	NCMUA: Historical records of use only or MEC conc. supports selection	Seldom	Seldom	Unlikely	Unlikely
	VI	No evidence of MEC presence or RA completed for UU/UE	Unlikely	Unlikely	Unlikely	Unlikely

- “Access Conditions (frequency of use)”
  - Combines two separate MEC HA inputs
- No clear equivalent to “Interaction Zone\*” and “Migration Potential”

- “Amount of MEC”
  - MEC HA – based on past use
  - RMM– based on estimated quantities

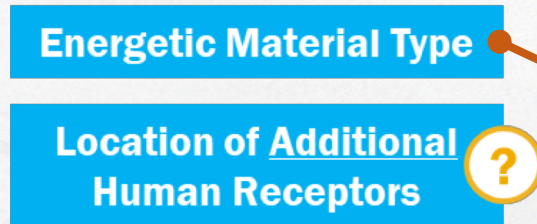
\* Minimum MEC Depth Relative to Maximum Receptor Intrusive Depth





# Similarities and Differences: Severity of Incident

## MEC Hazard Assessment (MEC HA)



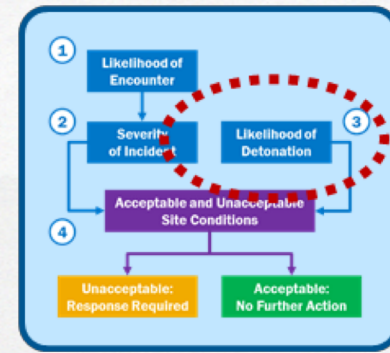
- “Severity Assoc. w/ Specific Munitions Items”
  - Based on energetic material type, but not totally equivalent
  - Not prescribed
- No clear equivalent to “Location of Additional Human Receptors”

## Risk Management Method (RMM)

Severity of Explosive Incident		Likelihood of Encounter: From Matrix 1				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity Associated with Specific Munitions Items	<i>Catastrophic/Critical:</i> Death or permanent disability	A	A	B	B	D
	<i>Modest:</i> Injury requiring emergency medical treatment	B	B	B	C	D
	<i>Minor:</i> Injury requiring first aid	B	C	C	C	D
	<i>Improbable:</i> No injury anticipated	D	D	D	D	D

- Stakeholders can determine severity during planning based on expected munitions
  - Supported by UXO professionals’ input





# Similarities and Differences: Likelihood of Detonation

## MEC Hazard Assessment (MEC HA)



## Risk Management Method (RMM)

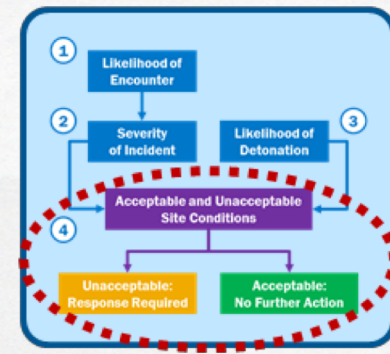
Likelihood of Detonation		Likelihood to Impart Energy on an Item		
		High (development, tilled)	Unanticipated, (unmarked, refuged, marks) ?	Inconsequential (not anticipated, prevented, mitigated)
Sensitivity: Susceptibility to Detonation	High (classified as sensitive; hand grenades, rockets, etc.)	1	1	3
	Moderate (HE or pyrotechnics)	1	2	3
	Low (propellant or bulk secondary explosives)	1	3	3
	Not sensitive	2	3	3

- Sensitivity: Susceptibility to Detonation
  - Correlates to “MEC Classification”
  - Supported by UXO professionals’ input
- No clear equivalent to “MEC Size”

- No clear equivalent to “Likelihood to Impart Energy”



# Similarities and Differences: Score/Site Conditions



## MEC Hazard Assessment (MEC HA)

**MEC HA Score  
and Hazard Level**



## Risk Management Method (RMM)

Acceptable and Unacceptable Site Conditions		Result from Matrix 2			
		A	B	C	D
Result from Matrix 3	1	Unacceptable	Unacceptable	Unacceptable	Acceptable
	2	Unacceptable	Unacceptable	Acceptable	Acceptable
	3	Unacceptable	Acceptable	Acceptable	Acceptable

- Single biggest difference between methods
  - RMM establishes threshold for action
  - MEC HA score  $\neq$  threshold for action

- Remedial Action Objectives
  - RMM provides means to determine an adequate RAO
    - “Implement remedial actions to achieve acceptable site conditions”
  - MEC HA shows a reduced score, but this is only useful for alternatives comparison
    - Cannot based an RAO on reducing the MEC HA score



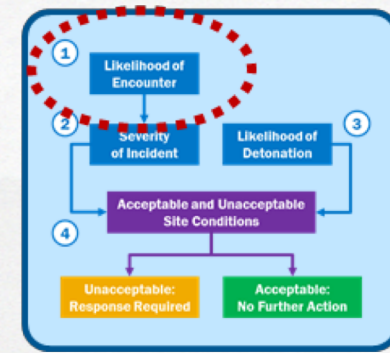
## Example: Hypothetical Site – Background

- Evaluate a site where there is evidence of past use, but there might be an acceptable risk
  - Uses a hypothetical site
  - MEC HA vs. RMM: inputs and conclusions
- Background
  - Former maneuver/training area
  - Intermittent use
  - Current park land; accessible to public
  - Potential MEC items include flares and training munitions with small spotting charges
  - Small amounts of MD found during RI, but a couple of unexpended flares found historically





# Example: Likelihood of Encounter



## MEC Hazard Assessment (MEC HA)

Site Accessibility	Full Accessibility (80/80)
Potential Contact Hours	Few Hours (40/120)
Amount of MEC	Maneuver Area (115/180)
“Interaction Zone”*	Surface/Subsurface (240/240)
Migration Potential	Possible (30/30)

- Open park land, no access restrictions
- Park expects 1,000 users/week
- Area used for military exercises
- MD found on surface and in subsurface
- Soil erosion/frost heave possible

\* Minimum MEC Depth Relative to Maximum Receptor Intrusive Depth

## Risk Management Method (RMM)

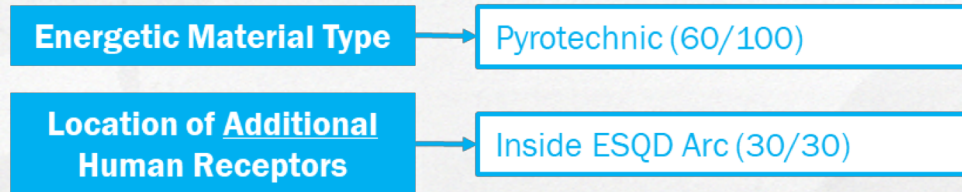
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		Regular	Often	Intermittent	Rare
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	V NCMUA: Historical records of use only or MEC conc. supports selection	Seldom	Seldom	Unlikely	Unlikely
	VI No evidence of MEC presence or RA completed for UU/UE	Unlikely	Unlikely	Unlikely	Unlikely

- Current land use is open park land
  - Periodic use, some access - Often
- NCMUA: MEC presence is based only on isolated historical discoveries supports Category IV



# Example: Severity of Incident

## MEC Hazard Assessment (MEC HA)

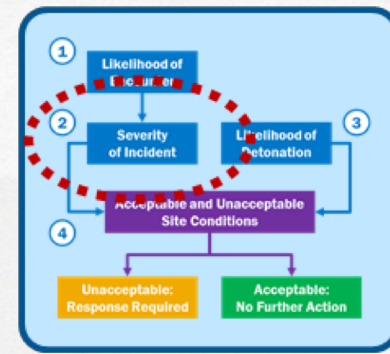


- Potential MEC items include flares and training munitions
- Picnic areas and pavilions located within park are in ESQD arc

## Risk Management Method (RMM)

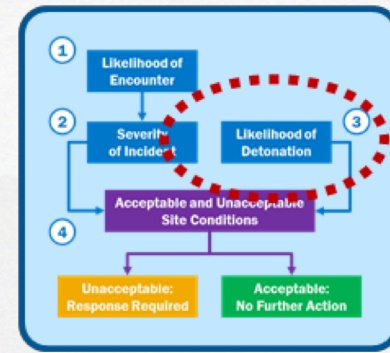
Severity of Explosive Incident		Likelihood of Encounter: From Matrix 1				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity Associated with Specific Munitions Items	<i>Catastrophic/Critical:</i> Death or permanent disability	A	A	B	B	D
	<i>Modest:</i> Injury requiring emergency medical treatment	B	B	B	<b>C</b>	D
	<i>Minor:</i> Injury requiring first aid	B	C	C	C	D
	<i>Improbable:</i> No injury anticipated	D	D	D	D	D

- Pyrotechnics (flares) and practice munitions
  - Modest – May result in 1 or more injuries resulting in emergency medical treatment, without hospitalization

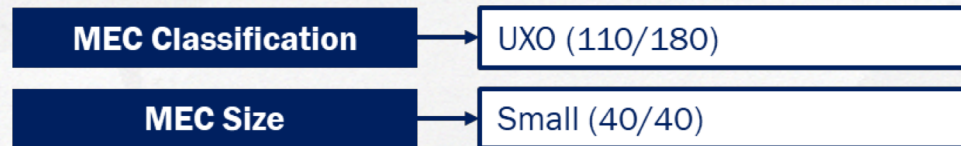




# Example: Likelihood of Detonation



## MEC Hazard Assessment (MEC HA)



- Pyrotechnics (flares) considered UXO
- Small size increases portability and hazard

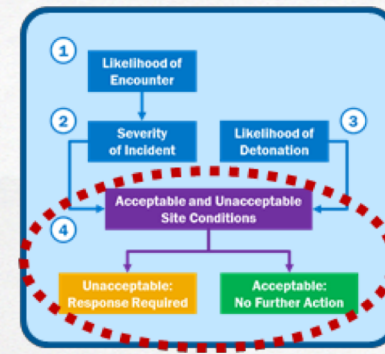
## Risk Management Method (RMM)

		Likelihood to Impart Energy on an Item		
		High (development, tilled)	Modest (undeveloped, refuge, parks)	Inconsequential (not anticipated, prevented, mitigated)
Sensitivity: Susceptibility to Detonation	High (classified as sensitive; hand grenades, rockets, etc.)	1	1	3
	Moderate (HE or pyrotechnics)	1	<b>2</b>	3
	Low (propellant or bulk secondary explosives)	1	3	3
	Not sensitive	2	3	3

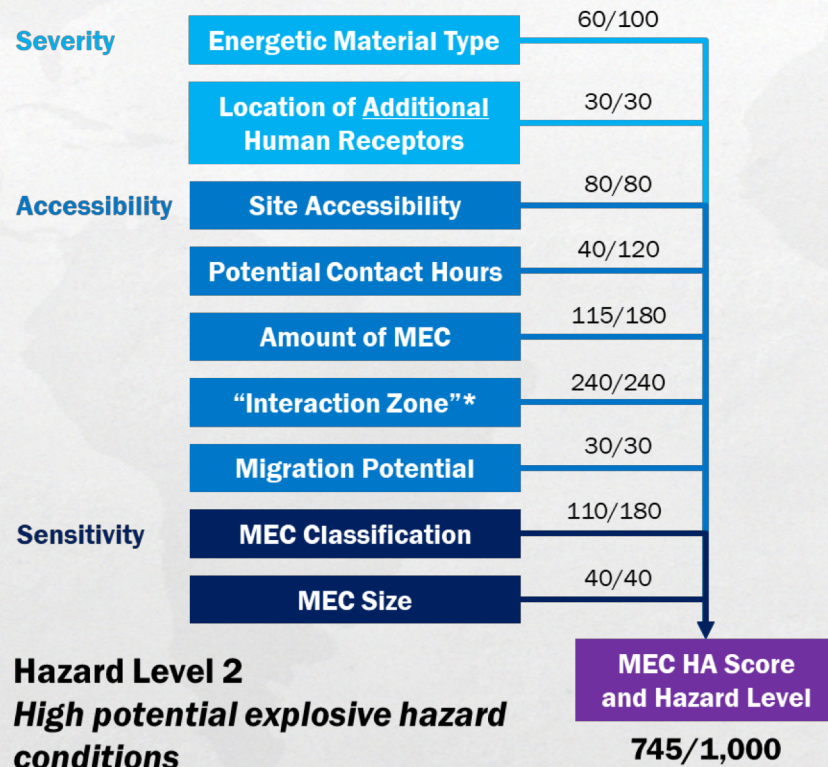
- Land use is modest, because of use as a park
- Pyrotechnics are moderate sensitivity



# Example: Score/Site Conditions



## MEC Hazard Assessment (MEC HA)



## Risk Management Method (RMM)

Acceptable and Unacceptable Site Conditions		Result from Matrix 2			
		A	B	C	D
Result from Matrix 3	1	Unacceptable	Unacceptable	Unacceptable	Acceptable
	2	Unacceptable	Unacceptable	<b>Acceptable</b>	Acceptable
	3	Unacceptable	Acceptable	Acceptable	Acceptable

- RMM output indicates possible acceptable risk
- But MEC HA indicates high Hazard Level; why?
  - Amount of MEC overestimated?
  - Other input factors inflexible?
  - NOTE: MEC HA doesn't establish threshold for action



## Summary and Lessons Learned

- RMM and MEC HA
  - Both provide framework for discussion
- RMM
  - Threshold for action is biggest difference
  - Good for sites where NFA is option
  - Reflects impact of LUCs more effectively
  - Cannot compare FS alternatives
    - Though can use for initial screening
- MEC HA
  - Better for FS alternatives comparison







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# Questions or Comments?

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