Framework Issue Paper # 2:
Comparison of Munitions Response Site Prioritization Protocol (MRSPP) and Initial MEC Hazard Assessment (HA) Consensus Input Factors

1.0 INTRODUCTION

This paper initiates an examination of how well the MRSPP Explosive Hazards Evaluation (EHE) module, as designed for its specific purpose, would also meet the purposes of the MEC HA process. The central question assessed is whether the unmodified EHE module could also serve as the MEC HA. This paper begins this examination by providing a comparison of the MRSPP and MEC HA purposes, structure, and input factors. *This is not an assessment of how well the MRSPP meets its intended purpose, but rather how well it meets the MEC HA objectives.*

2.0 PURPOSES OF MRSPP AND MEC HA

Differences in the current MRSPP proposal and the MEC HA proposal stem from their different purposes, as well as from different assumptions about the amount of information that will be available when the assessment is performed.

2.1 MRSPP

The purpose of the MRSPP is to prioritize potential munitions response locations for national level funding and responses. Such prioritization is designed to be applied after the CERCLA preliminary assessment phase, but before completion of the CERCLA site inspection phase[1]. Both the input factors and the structure through which they are applied reflect the application of the MRSPP:

- To an **installation or other munitions response area** (MRA), as well as munitions response sites (MRS). MRSs are often identified subsequent to initial field investigations.
- At a time early in the investigation process after a records review, before completion of any field investigation.

2.2 MEC HA

The MEC HA is designed to achieve multiple objectives in relation to individual munitions response sites identified over the course of a munitions response at an installation or other munitions response area. These objectives include:

- Organize site information in a consistent manner.
- Support hazard communication for the project team and with stakeholders.
- Provide site-specific information for selection of alternative responses.
- Provide site-specific information on land use decisions.
- Support site-specific prioritization efforts where there are multiple sites that will need responses actions.
- Build confidence in the decision-making process.

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[1] Page 50905, "Application of the Protocol", first paragraph, 32 CFR Part 179, as published in the *Federal Register*, vol. 68, No. 163/Friday, August 22, 2003/Proposed Rules.

The MEC HA can be applied as early as the Preliminary Assessment/Site Inspection but the most value and greatest use will be later in the munitions response process (see Figure 1 for places in the process where the MEC HA will be applied).

3.0   DIFFERENCES IN STRUCTURE

The EHE module of the MRSPP is organized around traditional conceptual site model factors and on information that should be available at the CERCLA Preliminary Assessment Stage. This makes the EHE most appropriate for national level MRA/MRS prioritization. The components of the EHE include:

- Explosive Hazard – including munitions type and source of hazard

- Accessibility – including the potential for receptors to encounter UXO or DMM

- Receptors – including activities and structures, population size and density

The MEC HA is organized around components of explosive hazard, thus fulfilling its objective of helping inform decision-making on land use and selection of alternatives. The components that organize the MEC HA include:

- Potential severity of the impact should an MEC item function

- Likelihood that a receptor can interact with an MEC item

- Likelihood that the item will function should receptor interaction occur

While a number of the same factors are addressed in both the EHE and the MEC HA, there are fundamental differences that result from the process that relates directly to each specific use.

4.0   <u>General Comparison</u>

The different purposes between the two different hazard assessment instruments are further reflected in the specific input factors that are proposed for use in the MRSPP and the MEC HA. Some of the differences are not always with regard to the specific inputs, but rather the way they are combined. For example, the MRSPP Explosive Hazard factor has an input factor called munitions type. This combines a variety of munitions characteristics that determine hazard level (e.g. filler type, condition such as UXO or DMM, fuzing sensitivity). The combining of these characteristics into a single high-level factor by the MRSPP both accurately reflects the inherent hazard of the munition, but also reflects the purpose of the MRSPP (prioritization) and the amount and type of information likely to be available at an early stage of investigation. The MEC HA calls out these characteristics (Type of Filler, Condition, Fuzing Sensitivity) as separate factors, and adds a separate category (Amount of Filler) that relates to the "potential severity of the impact should an MEC item function.

Other differences between the MRSPP and the MEC HA are reflected in the MRSPP categories of Accessibility and Receptors. In addition to the fact that specific input factors are different, a significant difference is the emphasis that the MRSPP places on current activities and use of the land, versus future use. This emphasis may be appropriate for funding prioritization, but does not facilitate understanding of the impact of future use options on alternative selection. Another difference is that MRSPP input factors for receptors emphasize population density and

population near a hazard. This will be appropriate for national prioritization of large MRAs and even installations, but it will not be appropriate when examining current and future hazards associated with a particular site.

Table 1 further summarizes the differences between the structure and input factors of the MRSPP and the MEC HA.

4.2   <u>Introduction to Detailed Comparison</u>:

The detailed analysis that follows compares the MRSPP EHE module data elements as published in draft Federal Register notice with the preliminary consensus input factors of the MEC HA. The analysis is organized in accordance with the organization of the MRSPP. Since the two tools are structured differently, selecting one as an organizing principle provides a convenient way to understand the differences.

The comparison below must be seen as limited, since the MEC HA input factors and elements that may go into scoring those factors are not yet well defined. Each section that follows contains a brief summary of the differences between the identified sets of data elements/input factors, and in addition, contains the detailed scoring instructions for each of the MRSPP input factors. This is done to show how some of the MEC HA input factors are sometimes indirectly incorporated into the MRSPP as well as highlighting the differences.

4.2.1   Explosives Hazard (MRSPP)
The category of Explosives Hazard is used in the MRSPP to provide information about the inherent hazard of the munitions at the MRA/MRS. The MEC HA on the other hand, uses a category called the "Potential Severity of the impact should an MEC item function" that includes some of the input factors of the MRSPP and adds others.   Both methods use this category for input factors that describe the munitions of concern themselves. Because of the emphasis in the MEC HA on the potential severity of the impact, there are three factors (Proximity to Occupied Buildings or Commonly Used Public Facilities; Proximity to Critical Infrastructure, Cultural Resources or Ecological Resources; and Amount of Filler) in the MEC HA that are not included in the MRSPP Explosives Hazard Category. Two of these (Proximity to Occupied Buildings or Commonly Used Public Facilities and Proximity to Critical Infrastructure, Cultural Resources or Ecological Resources) are partly included under the MRSPP receptors category; one factor, Amount of Filler, is not included in the MRSPP.

4.2.1.1 Munitions Type
Both the MRSPP and the MEC HA include a factor for the type of munitions at the site. MRSPP calls this *Munitions Type*, while MEC HA calls it *Type of Filler*. In both cases "type" addresses the characteristics of the munitions that make the munition hazardous. The MRSPP includes factors such as sensitivity, type of explosive material (e.g. HE, pyrotechnics), condition of munition (e.g. used and fuzed, discarded military munitions, small arms) in munitions type, and weighs these factors to come up with a single score for munitions type. The MEC HA also includes another factor (amount of filler) that is not included in the MRSPP. This factor is designed to address a situation where the amount of spotting charge in an otherwise inert munitions item poses a significant hazard. *Fuzing Sensitivity and the condition of munitions (e.g. UXO, DMM)* which are encompassed in the

MRSPP factor *Munitions Type* are called out in another MEC HA category that relates to "Likelihood that the Item will Function Should Receptor Interaction Occur."

The MRSPP classifications and scoring for this input factor are included below to show how the other factors are implicitly included in munitions type:

Sensitive (Score=30):
- All UXO that are considered likely to function upon any interaction with exposed persons, including: submunitions, cluster munitions, 40mm high-explosive grenades, white phosphorus (WP) munitions (including practice munitions with sensitive fuzes, but excluding all other practice munitions), and high-explosive antitank (HEAT) munitions.
- All hand grenades containing an explosive filler.

High explosive (used or damaged) (Score=25):
- All UXO containing a high-explosive filler (e.g., RDX, Composition B) that are not considered ''sensitive''.
- All DMM containing a high-explosive filler that have been damaged by burning or detonation.
- All DMM containing a high-explosive filler that have deteriorated to the point of instability.

Pyrotechnic (Score=20)
- All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades).
- All DMM containing pyrotechnic fillers other than white phosphorous (*e.g.*, flares, signals, simulators, smoke grenades) that have been damaged by burning or detonation or that have deteriorated to the point of instability.

High explosive (unused) (Score=15)
- All DMM containing a high-explosive filler that have not been damaged by burning or detonation.
- All DMM containing a high explosive filler that are not deteriorated to the point of instability.

Propellant (Score=15)
- All UXO containing only a single-, double-, or triple-based propellant, or composite propellants (*e.g.*, a rocket motor).
- All DMM containing only a single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor).

Bulk HE, pyrotechnics, or propellant (Score=10)
- Bulk high explosives, including: demolition charges (e.g., C4 blocks), high explosives not contained in a munition, and concentrated mixtures of high explosives or other munitions constituents mixed with environmental media or debris in concentrations that result in the mixture being explosive (e.g., ''explosive soil'').
- All pyrotechnic material that is not contained in a munition (i.e., ''bulk pyrotechnics'').
- All single-, double-, or triple-based propellant, or composite propellants that are not contained in a munition (i.e., ''bulk propellant'').

Practice (Score=5)
- All UXO that are a practice munition not associated with a sensitive fuze
- All DMM that are a practice munition not associated with a sensitive fuze that have been damaged by burning or detonation.

- All DMM that are a practice munition not associated with a sensitive fuze that have deteriorated to the point of instability.

Riot control (Score=3)
- All UXO or DMM containing only a riot control agent (e.g., tear gas)

Small arms (Score =2)
- All UXO or DMM that are classified as small arms ammunition. Evidence that no other munitions type (e.g., grenades, subcaliber training rockets, demolition charges) was used or is present on the MRS is required for selection of this category.

Evidence of no munitions (Score=0)
- Following investigation of the MRS, there is physical evidence there are no UXO or DMM present or there is historical evidence indicating that no UXO or DMM are present.

4.2.1.2 Source of Hazard

The MRSPP also uses a factor in the explosive hazard component to describe the source of the munitions. This is called *Source of Hazard*. This encompasses the type of munitions activity that occurred (e.g. firing range, target area). This factor is not included in the MEC HA as a recommended input factor. Instead the Source of Hazard will be used by the MEC HA to indicate the relative amount of MEC within an MRS.

The MRSPP classifications are as follows:

Former range (Score=10)
- The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include: impact or target areas, associated buffer and safety zones, firing points, and live-fire maneuver areas.

Former munitions treatment (i.e., OB/OD) unit. (Score=8)
- The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.

Former practice munitions range (Score=6)
- The MRS is a former range on which only practice munitions without sensitive fuzes were used.

Former maneuver area (Score=5)
- The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.

Former burial pit or other disposal area (Score=5)
- The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.

Former industrial operating facilities (Score=4)
- The MRS is a location that is a former munitions manufacturing or demilitarization facility.

Former firing points (Score=4)
- The MRS is a firing point, when the firing point is delineated as an MRS separate from the rest of a former range.

Former missile or air defense artillery emplacements (Score=2)
- The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a range.

Former storage or transfer points (Score=2)
- The MRS is a location where munitions were stored or handled for transfer between modes (e.g., rail to truck, truck to weapon system).

Former small arms range (Score=1)
- The MRS is a former military range where only small arms were used. There must be evidence that no other type of munitions (e.g., grenades) were used or are present at the location to place an MRS into this category.

Evidence of no munitions (Score=0)
- Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.

4.2.1.3 Additional MEC HA Factors

In addition to the input factors described above, the MEC HA also includes three additional factors in the category that is designed to assess "potential severity of the impact should an MEC item function." These are: *Amount of Filler*; *Proximity to Occupied Buildings or Commonly Used Public Facilities*; and *Proximity to Critical Infrastructure, Cultural Resources or Ecological Resources*.

While *Amount of Filler* is not included in the MRSPP, some elements of the two proximity factors are included under the Receptor Category.

4.2.2   Accessibility (MRSPP) and Likelihood that Interaction can Occur

The MRSPP category of Accessibility and the MEC HA category of Likelihood that Interaction can Occur are designed to represent the similar but not identical information. The MRSPP data elements and MEC HA input factors are closely related and often overlapping.

4.2.2.1 Information on the Location of Munitions

Both the MRSPP and the MEC HA include this information, although as in the previous category the MRSPP incorporates it into one factor, while it is represented by multiple factors in the MEC HA. Specifically, the MRSPP data element *Information on the Location of Munitions* incorporates the MEC HA factors *Minimum Depth of Munitions/Maximum Intrusive Depth* and *Potential for MEC Migration* into one factor. The manner in which depth is addressed considers whether the munition is on the surface or subsurface, and requires judgments as to whether intrusive activities or migration will cause exposure. In addition, the MRSPP also includes information on physical constraints to access to MEC, munitions type (e.g. small arms), and on the certainty of the presence or absence of munitions (i.e. confirmed, suspected etc.) which is not included in the MEC HA.

Since the values for the initial MEC HA factors have not yet been defined, it is not clear whether the depth characterization of the MRSPP is the same, or will be different than the MEC HA. However, in the MEC HA the factor related to munitions depth is based on the relationship of the munition depth to the intrusive depth of activity. The factor for migration is separated out from the depth factor.

The MRSSP classifications and scoring for this input factor are:

Confirmed surface (Score=25)
- Physical evidence indicates there are UXO or DMM on the surface of the MRS
- Historical evidence (e.g., a confirmed incident report or accident report) indicates there are UXO or DMM on the surface of the MRS.

Confirmed, subsurface, active (Score=20)
- Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed in the future by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or there are on-going intrusive activities (e.g., plowing, construction, dredging) at the MRS that are likely to expose UXO or DMM.
- Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed in the future by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or there are on-going intrusive activities (e.g., plowing, construction, dredging) at the MRS that are likely to expose UXO or DMM.

Confirmed subsurface, stable (Score=15)
- Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed in the future by naturally occurring phenomena, or there are no intrusive activities occurring at the MRS that are likely to either occur, or if the activities do occur, are likely to cause UXO or DMM to be exposed.
- Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed in the future by naturally occurring phenomena, or there are no intrusive activities occurring at the MRS that are likely to either occur, or if the activities do occur, are likely to cause UXO or DMM to be exposed

Suspected (physical evidence) (Score=10)
- There is physical evidence other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.

Suspected (historical evidence) (Score=5)
- There is historical evidence indicating that UXO or DMM may be present at the MRS.

Subsurface, physical constraint (Score=2)
- There is physical or historical evidence indicating the UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.

Small arms (regardless of location) (Score=1)
- The presence of small arms ammunitions is confirmed or suspected, regardless of other factors such as geological stability. There must be evidence that no other types of munitions (e.g., grenades) were used or are present at the MRS to include it in this category.

Evidence of no munitions (Score=0)
- Following investigation of the MRS, there is physical evidence there are no UXO or DMM present or there is historical evidence indicating that no UXO or DMM are present.

4.2.2.2 Ease of Access

Both the MRSPP and MEC HA incorporate this information in a single factor. MRSPP uses the category name *Ease of Access*, and the MEC HA uses *Site Accessibility*. The MRSPP does not separate man-made and natural barriers, but both are included. The initial MEC HA consensus list includes physical site features and thereby may separate man-made and geographic/geologic barriers. In the MEC HA, this element refers to land use and could be evaluated both for the current usage as well as for potential future situations to evaluate the impact of different land use choices.

The MRSPP classifications for this data element are:
No barrier (Score =10)
- There is no barrier preventing access to all parts of the MRS (*i.e.*, all parts of the MRS are accessible).

Barrier to MRS access is incomplete (Score=8)
- There is a barrier preventing access to parts of the MRS but not the entire MRS

Barrier to MRS access is complete but not monitored. (Score=5)
- There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.

Barrier to MRS access is complete and monitored. (Score=0)
- There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.

4.2.2.3 Status of Property

The MRSPP and the MEC HA diverge considerably in this area. The MRSPP *Status of Property* is used to identify the individual or entity that has control of the land where the MRS is found, specifically whether or not the MRS is under DoD control. This factor is not recommended for inclusion in the MEC HA. While it is important for prioritization, current status of property may not be a factor in long-term hazard management, including evaluation of land uses and alternatives.

The MRSPP classifications are as follows:
Non-DoD control (Score=5)
- The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by the DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by American Indian or Alaskan Native Tribes, or State or local governments; and lands or water bodies managed by other Federal agencies.

Scheduled for transfer from DoD control (score=3)
- The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a State, American Indian, Alaskan Native, or local government; a private party; or another Federal agency) within 3 years from the date the Protocol is applied.

DoD control (Score=0)
- The MRS is on land or is a water body that is owned, leased, or otherwise possessed by the DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24-hours per day, every day of the calendar year.

4.2.2.4 Additional MEC HA Input Factors
    The MEC HA also includes additional input factors that relate to the Likelihood that Interaction can Occur category.   These include *Amount of MEC* and *Frequency of Entry*.

    Amount of MEC is designed to provide a qualitative assessment of whether the MRS is in an area of high density MEC (e.g. target area) or an area where there may be one or two MEC items. Source of Hazard (found in the MRSPP Explosive Hazard Factor category) may be one of the types of information considered in this category. Both are used to represent hazard based on the previous uses of the MRS.

    The other MEC HA factor in this category is *Frequency of Entry*. This has some relation to the MRSPP element *Types of Activities/Structures*, which is in the Receptors category. That element is designed to represent the frequency of entry in an indirect manner by classifications that incorporate both activities and structures that represent various types of interaction by receptors. The recommended MEC HA factor is a direct representation of the number of entries that occur within a given time period. As with other factors related to land use, in the MEC HA this factor could be evaluated both in the current situation, as well as for potential future situations.

4.2.3   Receptors
Both the MRSPP and the MEC HA focus on the populations that could be impacted by the presence of MEC in the Receptors category, however they take somewhat different approaches. The MRSPP focuses on total populations and population density. The MEC HA is more focused on the single receptor that may face a hazard situation under current or future activities. In addition, the MRSPP uses a "receptor" category. The MEC HA focuses the input factors on the explosive hazard by describing the "Likelihood that an item will function should receptor interaction occur." The proposed MEC HA factors are very site specific, and reflect the goals of the MEC HA to provide site-specific information on land use decisions and to provide information related to the selection of alternatives.

4.2.3.1 Types of Activities/ Structure
    The MRSPP factor *Types of Activities/Structures* incorporates the information from two separate MEC HA factors: *Frequency of Entry*, and the *Intrusive Depth* portion of *Minimum Depth of MEC/Maximum Intrusive Depth*. A separate MEC HA factor, *Intensity of Receptor Activity*, is focused on a specific aspect that affects the likelihood of the MEC item functioning if interaction occurs. That is the energy imparted to the ground to cause munitions to function.

    The classifications of the MRSPP are:
    <u>Residential, educational, commercial, or subsistence</u>. (Score=5)
- Activities are conducted or inhabited structures are located up to 2 miles from the MRS's boundary or, within the MRS's boundary that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, play grounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.

Parks and recreational areas (Score=4)
- Activities are conducted or inhabited structures are located up to 2 miles from the MRS's boundary or within the MRS's boundary that are associated with parks, nature preserves or other recreational uses.

Agricultural, forestry (Score=3)
- Activities are conducted or inhabited structures are located up to 2 miles from the MRS's boundary or within the MRS's boundary that are associated with agriculture or forestry.

Industrial or warehousing (Score=2)
- Activities are conducted or inhabited structures are located up to 2 miles from the MRS's boundary or within the MRS's boundary that are associated with industrial activities or warehousing.

No known or recurring activities (Score=1)
- There are no known or recurring activities occurring up to 2 miles from the MRS's boundary or within the MRS's boundary.

4.2.3.2 Ecological and/or Cultural Resources

The MRSPP element *Ecological and/or Cultural Resources* is very similar to the MEC HA factor *Proximity to Critical Infrastructure*, *Cultural Resources or Ecological Resources*. It is used to assess the threat to resources such as threatened and endangered species, critical habitat, historical sites, American Indian and Alaskan Native sacred sites, and others.

The MRSPP classifications are:
Ecological and cultural resources present (Score=5)
- There are both ecological and cultural resources present on the MRS

Ecological resources present (score=3)
- There are ecological resources present on the MRS

Cultural resources present (Score=3)
- There are cultural resources present on the MRS

No ecological or cultural resources present. (Score=0)
- There are no ecological resources or cultural resources present on the MRS

4.2.3.3 MRSPP Factors not included in MEC HA

The MRSPP includes two factors in this category that are not included in the MEC HA. Those are: *Population Density*, and *Population Near Hazard*. *Population Near Hazard* has some similarity to the proposed MEC HA factor *Proximity to Occupied Buildings or Other Commonly Used Facilities*. However, the MRSPP uses the number of inhabited buildings within 2 miles of the MRS, where the recommended MEC HA factor is based on the actual distance of structures from the hazard. In addition, the MEC HA factor *Frequency of Entry*, is used in the category "Potential Severity of Impact" to assess the number of times the MRS is entered.

The MRSPP population-related factors may be appropriate for national level prioritization. However, the MEC HA should consider the likelihood of a catastrophic reaction with consequences for a single receptor.

The MRSPP factors are listed below with their classifications:

Population Density describes the population that has the potential to access the MRS and thus be at risk from the MEC. The classifications are:

> 500 persons per square mile (Score=5)
- There are more than 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.

100–500 persons per square mile (Score=3)
- There are 100 to 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.

< 100 persons per square mile (Score=1)
- There are fewer than 100 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.

Population Near Hazard is another way of estimating the number of people with the potential to access the MRS, based on the number of inhabited structures within a certain radius of the site. The classifications are:

26 or more structures (Score=5)
- There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.

16 to 25 (Score=4)
- There are 16–25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.

11 to 15 (Score=3)
- There are 11–15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.

6 to 10 (Score=2)
- There are 6–10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.

1 to 5 (Score=1)
- There are 1–5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.

0 (Score=0)
- There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.

4.2.3.4 Additional MEC HA Input Factors

The MEC HA includes three additional factors in this category that do not directly relate to an MRSPP Receptor Factor. Two relate back to factors in another category, and the other is not included in the MRSPP. These factors are *MEC Category*, *Fuzing Sensitivity*, and *MEC Portability*.

Details of *MEC Category* are incorporated into the MRSPP *Munitions Types*, in the Explosives Hazard Category. *Fuzing Sensitivity* is also incorporated into the classifications of *Munitions Type* in the Explosives Hazard category. Both of these factors are recommended as separate MEC HA factors in the category of *Likelihood that an item will function should receptor interaction occur*.

MEC Portability is not specifically included in the MRSPP, but may be indirectly addressed by special consideration given to grenades in the Explosive Hazard Category. The portability

is critical when evaluating the likelihood of a catastrophic reaction with consequences for a single receptor and so it is included in the MEC HA as a separate factor.

5.0   CONCLUSION

The MRSPP EHE module was designed to prioritize the explosive hazard of a MRA/MRS based on screening-level information. It is meant to be applied as part of a funding allocation tool. As such, it incorporates many of the factors one would consider in a site-specific hazard assessment, but nearly all of the MRSPP receptor factors apply to an entire installation or other MRA, restricting its use as an MRS-specific hazard assessment tool. Additionally, the MRSPP factors have not been designed to capture the potential effects of different response alternatives (e.g., surface clean-up, subsurface cleanup, LUCs, etc.) on the potential explosive hazards and long-term management of a site.

Although many aspects of the MRSPP can, and do, serve as starting points for the recommended MEC HA framework options, the unmodified MRSPP would not provide the sensitivity, accuracy and representativeness necessary to fulfill the objectives for the MEC HA process.

The MRSPP will serve as a basis and reference for the development of the MEC HA guidance. Data elements will be added or subtracted and scoring changed as necessary during development and testing of the framework and inputs to fulfill the performance objectives of the MEC HA. Throughout the development of the MEC HA guidance, the MRSPP will be referred to and the guidance will track back to the MRSPP, but it will use different input factors and scoring where necessary to attain the sensitivity, accuracy and representativeness required for site specific hazard management decision-making related to land use and alternative selection.
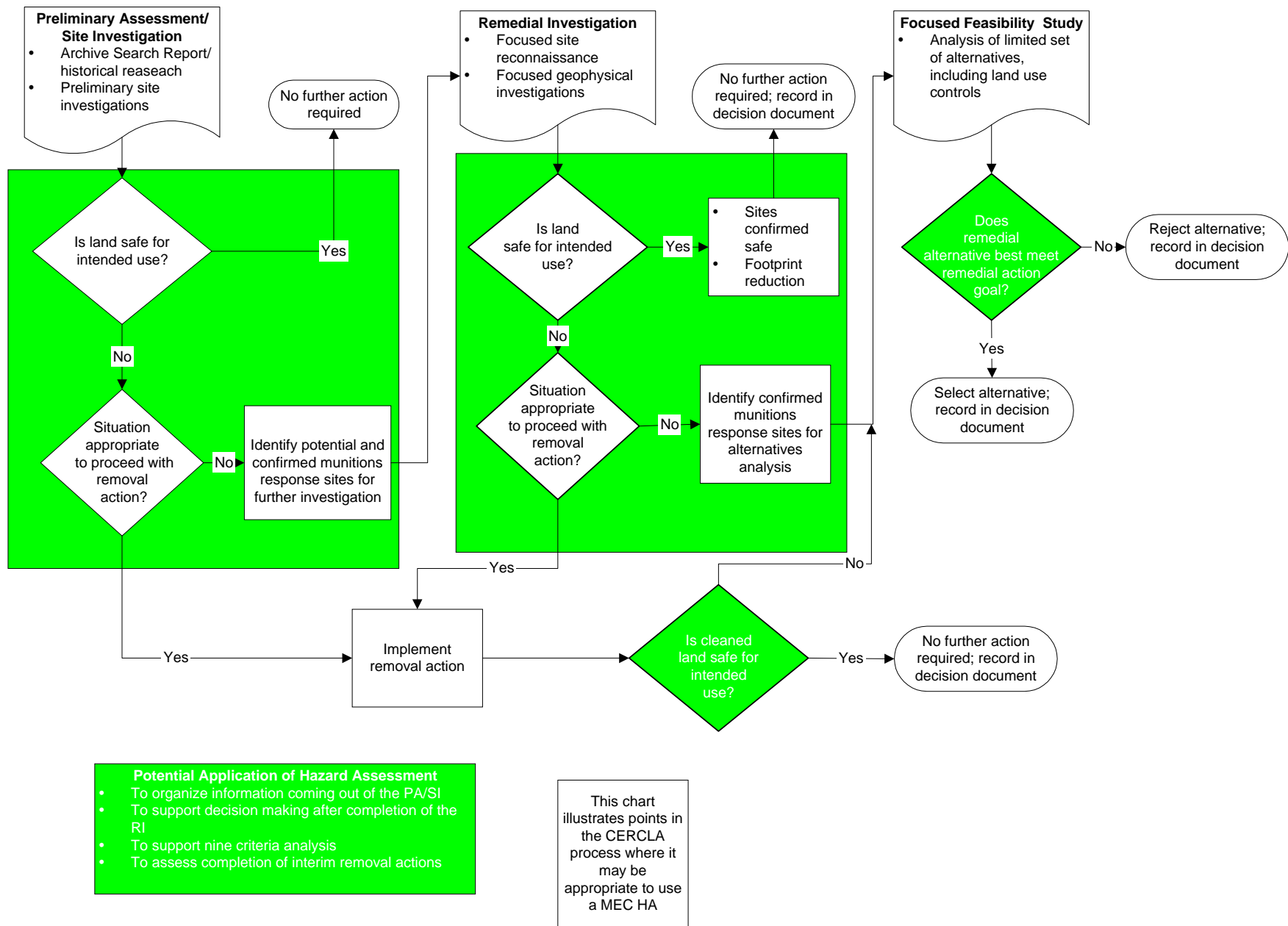
Preliminary Assessment/ Site Investigation
- Archive Search Report/ historical reaseach
- Preliminary site investigations

Remedial Investigation
- Focused site reconnaissance
- Focused geophysical investigations

Focused Feasibility Study
- Analysis of limited set of alternatives, including land use controls

No further action required

No further action required; record in decision document

Is land safe for intended use? → Yes

Situation appropriate to proceed with removal action? → No → Identify potential and confirmed munitions response sites for further investigation

Is land safe for intended use? → Yes →
- Sites confirmed safe
- Footprint reduction

Situation appropriate to proceed with removal action? → No → Identify confirmed munitions response sites for alternatives analysis

Does remedial alternative best meet remedial action goal? → No → Reject alternative; record in decision document

→ Yes → Select alternative; record in decision document

Yes → Implement removal action → Is cleaned land safe for intended use? → Yes → No further action required; record in decision document

Potential Application of Hazard Assessment
- To organize information coming out of the PA/SI
- To support decision making after completion of the RI
- To support nine criteria analysis
- To assess completion of interim removal actions

This chart illustrates points in the CERCLA process where it may be appropriate to use a MEC HA

Figure 1:Integration of MEC HA in the CERCLA Process

Table 1: Summary Comparison of MRSPP and MECHA Data Elements/Input Factors

MRSPP Category	Name and Definition (as described in the MRSPP documentation)	MEC HA Category	Name and Definition	Differences between two approaches
	MRSPP		*MEC HA*	
Explosives Hazard Factor	The **Munitions Type** data element classifies munitions according to their potential to detonate and their inherent explosive power. Portability, the ability for a munition to be readily transported, is indirectly accounted for in this element. DoD determined the need for separate classifications for many common munitions types but also recognized that there are exceptions to several categories. For example, although there is a separate classification for practice munitions, when the associated fuze is determined to be sensitive by a technically qualified individual, the munition will be classified as sensitive not as practice to more accurately reflect the greater explosive hazard presented by sensitive fuzes.	Potential severity of the impact should an MEC item function.	**Type of Filler:** Values for this factor include: · High Explosive (HE) · Incendiary (e.g., white phosphorous) · Spotting Charge · Completely Inert In the case where multiples types of fillers are at a site, the value assigned to this factor should be the filler that poses the most severe hazard.	The MRSPP element, Munitions Type incorporates most of the MEC HA items. Spotting charges are not addressed by the MRSPP. Also the MRSPP incorporates a scoring for Evidence of No Munitions.
			Amount of Filler: This factor can be used to describe potential severity of impact in three different ways. First, this factor addresses the situation when the amount of spotting charge in an otherwise inert munition poses a significant hazard in itself. The second possible way this to use this factor is where the amount of filler factor can be used to distinguish between the likely consequences of a detonation. In other words the potential impact of the functioning of a 20mm projectile is different than the impact of the functioning of a 100 lb bomb. The third way to use this factor is for HE. The functioning of any HE round can result in death.	The MRSPP does not include amount of filler in its input factors
	The **Source of Hazard** data element considers the previous uses of the MRS. It reflects the type of munitions that may be present and the manner and extent munitions were used or disposed of at the MRS. The classifications provided are the common locations where a munition can be found during its lifecycle (e.g. target areas, firing ranges).			This factor is not included as a recommended input factor for the MEC HA. Instead the Source of Hazard will become a consideration under the Amount of MEC.

	MRSPP		*MEC HA*		
MRSPP Category	Name and Definition (as described in the MRSPP documentation)	**MEC HA Category**	Name and Definition	Differences between two approaches
Explosives Hazard Factor		Potential severity of the impact should an MEC item function.	**Proximity to Occupied Buildings or Commonly Used Public Facilities**: The other explosive hazard components in this category assume the functioning of a munition due to the interaction of a single individual, but it may be useful to incorporate the potential for injuring or killing additional people, in the determination of the severity of impact. If inclusion of this factor is deemed appropriate, then it may be most useful to assign values to the proximity factor based on the explosive quantity safety distance (or some similar measure) for the NEW of the filler.	This factor has some similarity to the Population Near Hazard data element in the MRSPP; however the MRSPP uses the number of inhabited buildings within 2 miles of the MRS, whereas the recommended MEC HA factor is based on the actual distance of structures from the hazard.
	`		**Proximity to Critical Infrastructure, Cultural Resources or Ecological Resources**: This factor recognizes that the severity of the explosive hazard will affect more than buildings. Since the issue is not death but destruction of important locations/infrastructure valuation of this area must be carefully considered.	This factor is very similar to the MRSPP data element Ecological and/or Cultural Resources.
Accessibility Factor	The data element **Information on the Location of Munitions** is an evaluation of the following three conditions that were combined into one data element to best represent the potential for encountering munitions. • The confirmed or suspected presence of munitions based on physical evidence (e.g., presence or absence of munitions, fragments, firing records, anecdotal information) • The likelihood for direct contact with the munition based on its proximity to the surface • The potential for the munitions to be brought to the surface by dynamic site conditions (e.g., erosion). This data element differentiates among MRS where intact UXO or DMM are present, as opposed to the MRS where only munitions fragments are found. This data element also differentiates between "confirmed" versus "suspected" evidence.	Likelihood that a receptor can interact with an MEC item	**Minimum Depth of MEC and Maximum Intrusive Depth**: Most existing hazard assessment methods treat these as two separate factors, but the contribution of these factors to the likelihood of receptor interaction comes from the relationship between these two depths. Explicitly quantifying this relationship for assessment in the MEC HA will highlight the importance of this factor in determining likely receptor exposure to MEC.	The MRSPP and the recommended MEC HA factors both incorporate the interaction between the depth of the MEC and the intrusion level of the activity taking place there. However the MEC HA proposes doing this in a more proactive way. The recommended MEC HA factor would explicitly quantify the relationship whereas the MRSPP uses more general classifications indicating surface or subsurface with confirmed or suspected, and with or without natural factors or human activities that would bring the munitions into likely contact with receptors.

MRSPP		MEC HA		
MRSPP Category	Name and Definition (as described in the MRSPP documentation)	**MEC HA Category**	Name and Definition	Differences between two approaches
Accessibility Factor		Likelihood that a receptor can interact with an MEC item.	**Potential for MEC Migration**: This factor addresses the potential for MEC to migrate either laterally or vertically to a location that makes it accessible to receptors. An example of lateral migration is MEC "washing down" from an inaccessible area to an accessible one due to the mechanism of erosion. Another example is MEC washing up to an onshore MRS from an offshore source area. There may also be the potential for the MEC depth to decrease due to erosion or frost heave.	The MRSPP incorporates Migration into the element Information on the Location of Munitions with regard to confirmed subsurface locations. The recommended MEC HA factor would include this as a separate factor and would address suspected as well as confirmed locations.
	The **Ease of Access** data element focuses on the means for a receptor to encounter a munition based on the extent of controls preventing access or entry to the MRS. Both natural obstacles (e.g., dense vegetation, rugged terrain, water) and man-made controls (e.g., fencing) are considered in this analysis.		**Site Accessibility**: Suggested values for this factor are: · Fully accessible (includes sites wholly or partially surrounded by unguarded barbed-wire fencing) · Accessibility limited by unguarded fence, dense vegetation, or moderately steep terrain · Accessibility limited by guarded fence or less than 4 feet of water · Accessibility limited by extremely steep terrain or more than 4 feet of water.	The MRSPP and recommended MEC HA factors are very similar and differ only in the specificity. In the MEC HA, this element relates to the land use, and would be evaluated both for the current situation as well as for potential future situations to evaluate the impact of different land use choices.
	The purpose of the **Status of Property** data element is to differentiate between MRS that DoD controls and MRS that DoD does not control. There are three property classifications, DoD control, Scheduled for transfer from DoD control, and Non-DoD control.			This factor is not included in the recommended MEC HA factors. While important for prioritization, current status of property may not be a factor in long term hazard management, including evaluation of land uses and alternatives.
	See "Source of Hazard" above		**Amount of MEC**: The recommended approach to determining values for this factor is to use the past munitions-related use of a site (i.e., the source area type) as an indicator of the amount of MEC, perhaps modifying the score for the factor based on intensity of past use and whether or not some cleanup had occurred at the site.	The recommended MEC HA factor is similar to the MRSPP element of Source of Hazard. Both are used to represent hazard based on the previous uses of the MRS. The specific measures of the MEC HA factor have not yet been specified, but the MRSPP element incorporates elements of MEC Type in the classifications for Source of Hazard, where the MEC HA factor is predominantly recommended to identify the amount of MEC at the site.

	MRSPP		MEC HA		
MRSPP Category	Name and Definition (as described in the MRSPP documentation)	**MEC HA Category**	Name and Definition	Differences between two approaches	
Accessibility Factor	See "Types of Activities/Structures" below	Likelihood that a receptor can interact with an MEC item.	**Frequency of Entry:** Usually, the values for this input factor are specified as ranges of absolute numbers per day or week or month (e.g., 0-2 entries per day, 2-10 entries per week, etc.). Use of ranges of absolute values for this factor may limit its usefulness in helping to prioritize sites, for example, on MRAs or installations with multiple sites where the frequency of entries are all within one or two ranges. It may be more useful to determine the value of this factor based on MRA- or installation-specific relative rankings of the frequency of entry for all sites within the MRA or installation.	The MRSPP element, Types of Activities/Structures is designed to represent the Frequency in an indirect manner, by classifications that incorporate both activities and structures that represent various types of interaction by receptors. The recommended MEC HA factor is a direct representation of the number of entries that occur within a given time period. As with other factors related to land use, this could be evaluated both in the current situation, as well as potential future situations.	
Receptor Factor	The **Types of Activities/Structures** data element is used to assess the nature of the population near the hazard. Through this element, DoD strives to address multiple factors, including the amount, type, and intrusiveness of activities that may result in an encounter with UXO or DMM and the likelihood of people to congregate onsite and within a 2-mile radius of the MRS.	Likelihood that item will function should receptor interaction occur.	**Intensity of Receptor Activity**: This factor describes the amount of energy imparted to the ground by receptor activities. This factor has been used in other hazard assessment methodologies to capture the possibility that receptor activities on the surface may cause subsurface MEC items (presumably at shallow depths) to function.	The MRSPP incorporates categories of activities in the classifications that imply a certain intensity of activity, but does not explicitly consider the physical intensity of the activity on the ground. The recommended MEC HA factor will be used to characterize the physical amount of energy imparted to the ground through the activities that take place there. This is another area where both current and future activities could be considered.	
	See "Munitions Type" above		**MEC Category:** The values for this factor are: · Unexploded Ordnance (UXO) · Discarded Military Munitions (DMM) UXO items are fuzed and assumed to be armed. DMM items are either unfuzed or fuzed but unarmed.	The MRSPP incorporates the details of MEC Category into Munitions Type, through the classifications. The recommended MEC HA factor would be a separate factor.	
	See "Munitions Type" above		**Fuzing Sensitivity:** Fuzing sensitivity may be described by four values: · UXO with sensitive fuzing · UXO with fuzing of normal sensitivity · DMM with HERO-sensitive (electronic) fuze · DMM, unfuzed or with unarmed non-electronic fuze This set of values takes into account the idea that unarmed, HERO-sensitive fuzes (i.e., electronic fuzes) may be somewhat more hazardous than other unarmed fuzes, due to the sensitivity to electromagnetic radiation.	The MRSPP incorporates the details of Fuzing Sensitivity into Munitions Type, through the classifications. The recommended MEC HA factor would be a separate, more detailed factor.	

	MRSPP			MEC HA	
MRSPP Category	Name and Definition (as described in the MRSPP documentation)	**MEC HA Category**		Name and Definition	Differences between two approaches
Receptor Factor		Likelihood that item will function should receptor interaction occur.		**MEC Portability:** The more portable an MEC item is, the more likely it is to be picked up or be moved in another way, either advertently or inadvertently. This increase in the likelihood that the item may be moved increases the likelihood that the item may function.	The MRSPP describes portability as being indirectly accounted for in the Munitions Type data element, although it is not clear how this is accomplished. MEC Portability is included as a separate recommended MEC HA factor.
	The **Population Near Hazard** data element is estimated based on the number of inhabited structures 2 on the MRS and within a 2-mile distance, extending out from the boundary of the MRS. Although this data element is defined based on the number of inhabited structures, DoD's focus is on the potential for people to be present in the structures, not on the structures themselves.			See Proximity to Occupied Buildings or Commonly Used Public Facilities above.	This factor has some similarity to the Proximity to Occupied Buildings or Commonly Used Public Facilities recommended MEC HA factor, however the MRSPP uses the number of inhabited buildings within 2 miles of the MRS, whereas the recommended MEC HA factor is based on the actual distance of structures from the hazard.
	Through the **Ecological and/or Cultural Resources** data element, DoD recognizes the importance of ecological and cultural resources present on an MRS. This data element considers threatened and endangered species, critical habitat, sensitive ecosystems, natural resources, historical sites, historic properties, cultural items, archaeological resources, and American Indian and Alaska Native sacred sites.			See Proximity to Proximity to Critical Infrastructure, Cultural Resources or Ecological Resources above.	Factors are similar in both the MRSPP and the MEC HA.
	The **Population Density** data element is used to assess the number of persons that could potentially access the MRS and potentially be at risk from any known or suspected UXO or DMM present. Using U.S. Census Bureau statistics, Population Density is based on the number of people per square mile in the county in which the MRS is located.				Not included as recommended MEC HA factor